United States Environmental Protection Agency
Region 10, Air & Radiation Division
1200 Sixth Avenue, Suite 155, 15-H13
Seattle, Washington 98101-3188

Permit Number: R10TNSR01800
Issued: June 21, 2019
Effective: July 23, 2019
AFS Plant I.D. Number: 16-009-00001

Permit Analysis

Minor New Source Review Permit

Permit Writer: Dan Meyer

PotlatchDeltic Land and Lumber, LLC – St. Maries Complex

Coeur d'Alene Reservation
St. Maries, Idaho

Purpose of Permit and Permit Analysis

Title 40 of the Code of Federal Regulations, 49.151-165, establish a federal new source review program in Indian Country that, among other things, establishes (a) a preconstruction permitting program for new and modified minor stationary sources and minor modifications at major sources to meet the requirements of Section 110(a)(2)(C) of the Clean Air Act; (b) a mechanism for otherwise major sources (including major sources of hazardous air pollutants) to voluntarily accept restrictions on potential to emit to become synthetic minor sources; and (c) a mechanism for case-by-case maximum achievable control technology determinations for those major sources of HAPs subject to such determinations under Section 112(g)(2) of the Clean Air Act.

This document, the Permit Analysis, fulfills the requirements of 40 CFR 49.157(a)(3) and (4) by describing the reviewing authority's analysis of the application. Unlike the minor new source review permit, this Permit Analysis is not legally enforceable. The Permittee is obligated to comply with the terms of the Permit. Any errors or omissions in the summaries provided here do not excuse the Permittee from the requirements of the permit.

Table of Contents

1. Introduction and Summary

On November 16, 2017, EPA Region 10 received a combined PSD/mNSR application from PotlatchDeltic Land and Lumber, LLC (PotlatchDeltic) requesting authorization to construct a lumber kiln.[1] The application was determined incomplete on December 15, 2017. On February 2, 2018, Region 10 received from PotlatchDeltic a response to the incompleteness determination. PotlatchDeltic also provided additional information in response to requests from Region 10, as shown below in Table 1-1:

Table 1-1 – List of PSD/mNSR Application Material Submitted before Start of the Public Comment Period

Request from Region 10	Receipt from PotlatchDeltic
February 22, 2018	March 2, 2018
March 26, 2018	April 16, 2018
May 2, 2018	May 15, 2018
July 17, 2018	July 29, 2018
July 31, 2018	August 7, 2018
August 10, 2018	August 17, 20 and 21, 2018

Region 10 drafted a mNSR permit and supporting Permit Analysis for the proposed project and presented the documents to the public for review and comment from September 6 through October 11, 2018. Region 10 received comments from the public, including PotlatchDeltic, during the comment period. Region 10 and PotlatchDeltic continued to discuss the proposed permit after the close of the comment period, and in the process, PotlatchDeltic submitted additional information that has been added to the administrative record.

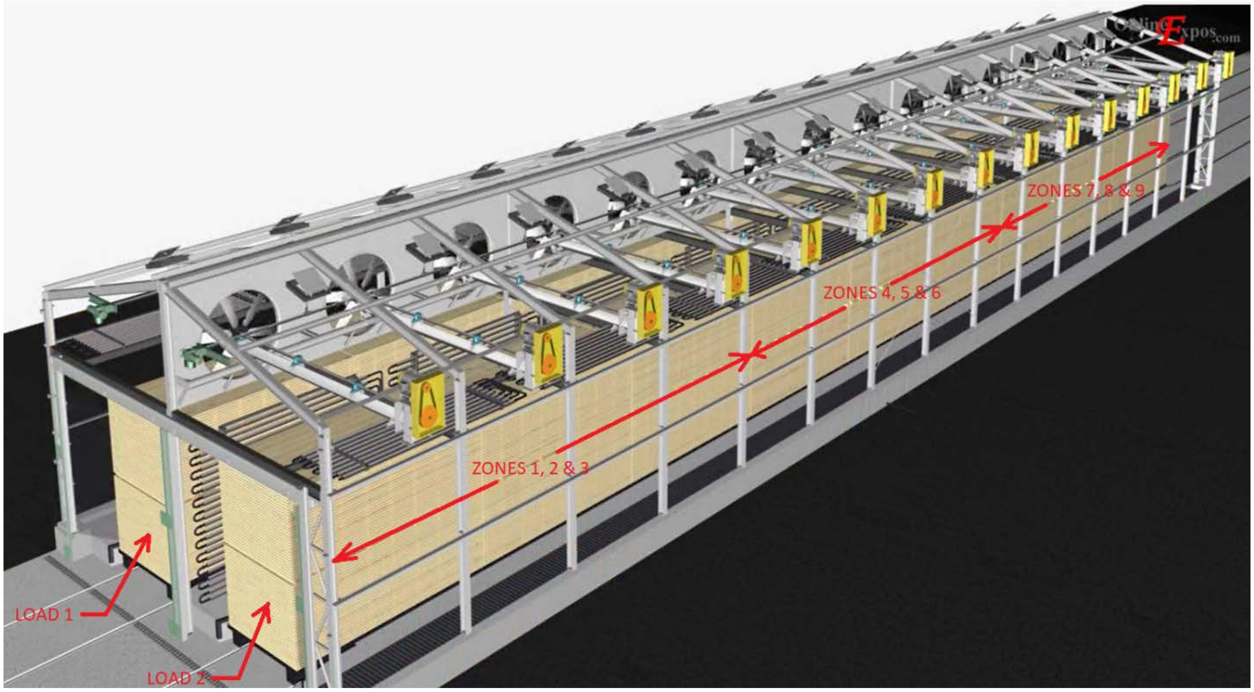
Region 10 considered all of the comments received during the comment period, as well as the additional information submitted by the Permittee after the close of the public comment period to support its application. The final permit and final Permit Analysis reflect our consideration of all input received. See Region 10's separate Response to Comments in the administrative record for this permit.

PotlatchDeltic is proposing to construct a 280,000 board foot dual-track batch-type indirect steam-heated lumber kiln to dry White Fir, Grand Fir and Western Hemlock lumber at its St. Maries Complex (SMC). The track system is used for moving carts carrying stacks of lumber into and out of the kiln between batch drying cycles. The lumber carried by the carts on a single track inside the kiln is considered one load, so there are two loads (one on each track system) in each batch of lumber dried. A batch drying cycle duration can range from about one day to several days depending upon several factors. The kiln is designed with ten heating zones arranged along the length of the kiln from the entrance to the exit wherein the drying process can be separately controlled. See Figure 1-1 for illustration.

Figure 1-1 – Illustration of a Typical Dual-track Batch-type

[1] The facility began operating as PotlatchDeltic Land and Lumber, LLC as of March 2, 2018 pursuant to a commercial transaction completed February 20, 2018. Prior to March 2, 2018, the facility was operating as Potlatch Land and Lumber, LLC.

Indirect Steam-heated Lumber Dry Kiln



The objective of the project is to eliminate the need for contract drying of green lumber (manufactured at SMC) at an off-site, independent mill. Existing boiler capacity is available to provide steam to existing equipment at current operating levels and to meet the steam demand of the new kiln. Following installation of the new kiln, the sawmill and the planer mill will operate on a schedule similar to its current one, and the new kiln will operate as near to continuously as possible.

2. Source Information

PotlatchDeltic's SMC is located along the St. Joe River near the intersection of Railroad Avenue and Mill Road in northwest St. Maries, Idaho. The facility is within the Coeur d'Alene Indian Reservation and is in Indian Country as defined in 40 CFR part 71. The SMC consists of a sawmill, lumber dry kiln, planer mill and plywood mill. The SMC is part of a larger "stationary source" (as that term is defined by the Clean Air Act) that consists of PotlatchDeltic's activities at both the SMC and the Lumber Drying Division (LDD). Region 10 refers to the larger "stationary source" as St. Maries Operations (SMO). The LDD (AFS Plant I.D. Number 16-009-00030) is adjacent to the SMC but outside the reservation within state jurisdiction. At the LDD, Potlatch operates a biomass boiler to generate steam, and that steam is employed to indirectly heat kilns that dry rough green lumber. Some of the rough green lumber produced at the SMC is transported to the nearby LDD where it is kiln dried and then returned to the SMC's planer mill. To be clear, the permit supported by this Permit Analysis authorizes emission-generating activities at the SMC only.

<u>Sawmill</u>
Logs are transported to the SMC via trucks. Wood species typically consist of Western Hemlock, Grand Fir and Douglas Fir. Smaller amounts of Engelmann Spruce, Lodgepole Pine, Subalpine Fir, Western Red Cedar, Ponderosa Pine and White Pine are also processed. The logs are

unloaded from delivery trucks and stacked in the log yard. Sprinklers are used to keep the logs wet during storage.

Logs are transferred from the log yard to the sawmill merchandiser, where the logs are loaded onto one of two decks and "singulated." On one deck, the log is debarked with an A8 22-inch debarker and then cut to length by the #2 cut-off saw. On the other deck, log defects are removed by the #1 cut-off saw, and then the log is debarked with an A5 22-inch debarker and then cut -to-length by the #3 cut-off saw. The logs from both decks are then conveyed into the Sawmill Building. Sawdust and trim from the cut-off saws, along with bark from the debarkers, are routed to an enclosed hog crusher. The resultant hog fuel is conveyed by chain conveyers to the hog fuel bin, fuel storage truck bin or ground storage.

Logs entering the Sawmill Building are directed to the Chip-and-Saw which consists of the following three machine centers: four-sided canter, quad band mill and vertical arbor gang saw. The four-sided canter removes the exterior of the log through a chipping process and produces a profiled log and chips. The quad band mill removes the sideboards of the log and produces a cant, sideboards and sawdust. The vertical arbor gang breaks the cant down into lumber and sawdust.

Sideboards from the quad band mill are conveyed to a chipper edger, which produces squared-end lumber and wood chips. The lumber from the edger and the lumber from the vertical arbor gang are conveyed to trim saws, where they are scanned for defects and trimmed. Lumber is then transferred to the bin sorter and stacked according to size in rough green lumber storage. Trim ends are sent to a chipper. Fine dust from the quad band mill, trimmer, chipping edger and vertical arbor gang is controlled by baghouse BH-10. Collected dust goes to the hog fuel storage bin.

Wood chips from the Chip-and-Saw, chipper edger and chipper are conveyed to a screener. The screener sorts the incoming material into overs, wood chips and sawdust. Overs are sent back to the chipper. Chips are pneumatically routed to the chip bin through the Sawmill Chip Bin Cyclone CY-2. Sawdust from the screen, quad band mill, and vertical arbor gang are pneumatically conveyed to the sawdust truck bin. Sawdust Bin Baghouse BH-11 controls the bin exhaust.

From rough green lumber storage, the lumber is either planed green in the planer mill or dried in a lumber dry kiln located at the SMC, Potlatch's adjacent LDD or at Stimson's St. Maries mill. The existing lumber dry kiln located at the SMC has a capacity of 290,000 board feet per batch. Dry kiln operating temperature and dry time per batch is wood species dependent. Potlatch operates the existing SMC dry kiln at a temperature up to 245°F for air exiting the load (the temperature of air entering the load is hotter), but some wood species (i.e. Western Red Cedar and Ponderosa Pine) are dried at lower temperatures.

<u>Planer Mill</u>
As lumber enters the planer mill, a break down hoist "singulates" and transfers the lumber to the pineapple rollers, which feeds the rough lumber into the planer. Planer shavings are pneumatically conveyed to the planer shavings bin through the Planer Shavings Baghouse BH-2. Baghouse BH-5 controls the exhaust from the planer shavings bin. The surfaced lumber is graded and trimmed to length. A sorter is used to separate planed lumber by grade and length. The sorted lumber is then stacked, banded and wrapped with paper. Finished units are transferred to surfaced lumber storage until shipment off-site.

Trim ends are sent to a chipper or stored for finger joints. Dust pickups from the breakdown hoist, pineapple rolls, trimmer and chipper are controlled by the Trimmer/Chipper Baghouse BH-3. Collected dust goes to the planer shavings bin. Chips from the chipper are pneumatically conveyed to the plytrim bin. The Plytrim Truck Bin Baghouse BH-4 controls the ply trim bin exhaust.

Plywood Mill

PotlatchDeltic operates a plywood mill at SMC separate and apart from the sawmill and planer mill. Logs are received at the mill, and plywood is manufactured by employing various equipment including log steaming vats, a lathe, veneer dryers, presses and sanders. The veneer dryers' heating zone emissions are captured and controlled employing a regenerative catalytic oxidizer. No equipment within the plywood mill is participating in PotlatchDeltic's Kiln No. 6 project.

Steam Generating Plant

Potlatch operates two biomass boilers at the SMC to provide steam for block conditioning vaults, veneer dryers, plywood presses, the lumber dry kiln and building heat. Heat for the CE boiler (PB-1) is provided by two Wellons fuel cells, which are controlled by a multiclone and a two-cell PPC dry electrostatic precipitator (ESP). The CE boiler's demonstrated heat input capacity is 58 mmbtu/hr and produces up to 43,034 pounds of steam per hour. The Riley boiler (PB-2) is controlled by a multiclone and a three-cell PPC dry ESP. The Riley boiler's demonstrated heat input capacity is 131 mmbtu/hr and produces up to 98,000 pounds of steam per hour. The Riley boiler is also capable of burning sander dust generated from dry-end plywood operations. Fly ash from both the CE and Riley boilers is re-injected into the Riley boiler.

The air pollution emission units and control devices that are a part of the project and emit PM/PM10/PM2.5 are listed and described in Table 2-1. Of that group, only PB-1 and PB-2 also emit CO and NO_X (the other pollutants subject to minor NSR for this project).

Table 2-1 – Emission Units and Control Devices

EU ID	Emission Unit Description	PM/PM10/PM2.5 Control Device/Work Practices[1]
New (Proposed) Emission Generating Activities		
LK-6	Lumber Dry Kiln No. 6. Dual-track, 280,000 board foot per batch, indirect steam-heated lumber dry kiln	Wood species restriction, air temperature ≤ 245°F, final lumber moisture content ≥ 13% (dry basis), operation and maintenance requirements
Existing Emission Generating Activities		
PB-1	CE Boiler. 43,034 lb steam/hr and 58 mmbtu/hr, fuel cell wet biomass-fired boiler, installed 1964, dutch oven firebox replaced with fuel cells in 1979	Multiclone installed 1979 and PPC Industries dry ESP installed 1995
PB-2	Riley Boiler. 98,000 lb steam/hr and 131 mmbtu/hr, spreader stoker wet biomass-fired boiler with fly ash reinjection, installed 1966	Multiclone installed 1987 and PPC Industries dry ESP installed 1995
PCWR-PM-SH	Planer shavings pneumatically conveyed to baghouse BH-2	Donaldson/Torit 276-RF10 baghouse BH-2

EU ID	Emission Unit Description	PM/PM10/PM2.5 Control Device/Work Practices[1]
		with internal cyclone pre-cleaner design, installed 1996
PCWR-PM-SD	Planed lumber trimmer, trim ends chipper, breakdown hoist and infeed rolls dust generating activities	Donaldson/Torit 276-RF10; 1996 baghouse BH-3 with internal cyclone pre-cleaner design, installed 1996
PCWR-PM-PTB	Plywood Mill dry veneer chips and fines and Planer Mill trim ends chips pneumatic conveyance to ply trim bin	PM Hagel R9 baghouse BH-4, installed 1997
PCWR-PM-PSB	Dust transfer from baghouses BH-2 and BH-3 to planer shavings bin	Baghouse BH-5
PCWR-SM-SD	Dust from vertical arbor gang, vertical arbor gang trimmer, quad band mill and edger	Clarke PAF95-20 baghouse BH-10 with internal cyclone pre-cleaner design, installed 2008
PCWR-SM-SDB	Sawdust from vertical arbor gang and hog fuel screen pneumatic conveyance to sawdust bin	Hagel baghouse BH-11, installed 2001
PCWR-SM-CH	Green chips pneumatically conveyed from sawmill chipper screen to chip bin via cyclone CY-2	None
BV-2	Building Vent No. 2 exhausts emissions from miscellaneous indoor activities within Sawmill Building	None
BV-3	Building Vent 3 exhausts emissions from miscellaneous indoor activities within Boiler Building	None
DB	Log debarking (22-inch two debarkers; A8 and A5)	None
COS	Log bucking (three cut-off saws)	None
WRD-SH	Wood residue drops into trucks – shavings	None
WRD-CH	Wood residue drops into trucks – chips (all chips assumed green)	None
WRD-SD	Wood residue drops into trucks – sawdust (all sawdust assumed green)	None
WRD-HF	Wood residue drops into trucks & fuel bin – hog fuel	None
HFP	Wind erosion of outdoor hog fuel pile	None
PT	Plant traffic by vehicles on paved and unpaved roads related to lumber manufacturing	Paved areas: sweeping and watering. Unpaved areas: watering and 15 mph speed limit

[1] Use of the listed control devices and work practices are required by the permit.

3. Applicability

3.1 Pre-Project Potential to Emit

PotlatchDeltic's combined application for PSD and mNSR permits does not include a complete emissions inventory documenting the facility's pre-project potential to emit. Region 10 created one based upon information presented in PotlatchDeltic's combined construction application and Title V application. Region 10's Emissions Evaluation presented in Appendix A to this Permit Analysis estimates the facility's pre-project potential emissions on an emission-unit-by-emission-unit basis. In some instances, Region 10 revised the emission estimates provided by PotlatchDeltic (in its March 25, 2015 Part 71 application) to more accurately reflect the potential to emit of the facility.

A summary of PotlatchDeltic's pre-project non-fugitive PTE (except for HAPs which are not subject to the mNSR program) is presented in Table 3-2 below. Note that fugitive emissions are not included for non-HAP emissions because, for wood products facilities, fugitive emissions are not considered in determining whether the source is a major source for the PSD program. Because the facility's non-fugitive CO and VOC emissions are greater than 250 tpy, it is a major source for the purpose of determining PSD and mNSR applicability.

Table 3-2 – SMO Potential to Emit[1], tons per year

Portion of Facility	CO	Pb	NO_X	PM	PM10	PM2.5	SO_2	VOC	H_2SO_4	CO_2e[2]
LDD	249	0.01	40	7	12	12	2	284	1	42,184
SMC	945	0.04	172	227	225	212	8	367	2	179,465
Total	1,194	0.05	212	234	237	224	10	651	3	221,648

[1] Fugitive emissions are not included in this table because fugitives are not considered in determining whether the facility is major for this source type (see Section 4.1). For fugitive emission estimates, see Appendix A.

[2] Greenhouse gas emissions, quantified as CO_2e, are presented for informational purposes only. CO_2e is not regulated through the mNSR program but is regulated through the PSD program.

3.2 Attainment Status

The PSD program applies in areas designated as either attaining the national ambient air quality standards (NAAQS) or unclassifiable for a particular regulated NSR pollutant. The mNSR program applies in areas designated both unclassifiable/attainment and non-attainment, but with different emissions increase thresholds for applicability depending upon the area's designation. The area in which the SMO is located is currently designated unclassifiable/attainment for the PM2.5, ozone, CO, NO_2 and SO_2 standards. There is a PM2.5 ambient air quality monitoring station in St. Maries. Over the time period 2015 through 2017, air quality was 91 and 76 percent of the 24-hour and annual PM2.5 NAAQS, respectively.[2] Thus, there is reason to be concerned that operation of this project will cause or contribute to a violation of the PM2.5 NAAQS without appropriate emission limitations. The area is currently designated unclassifiable for the PM10 and lead standards. In such an area, a major source for the purpose of pre-construction permit review is one with potential emissions equal to or greater than 250 tons per year for at least one regulated NSR pollutant.[3]

3.3 NSR Applicability Thresholds

For existing major sources like the SMO proposing a modification to the facility, the project is subject to PSD review for a regulated NSR pollutant if the emissions increase (considering

---

[2] See 40 CFR 50.18 and Appendix N to 40 CFR part 50 for methodology to determine whether the NAAQS have been met for a given set of ambient PM2.5 concentrations.

[3] For certain categories of sources, the major source threshold is 100 tpy pursuant to 40 CFR 52.21(b)(1)(i)(a).

increases and decreases)[4] and net emissions increase are equal to or exceed the PSD significant emission rate thresholds presented in Table 3-3. The major modification to the existing major source is required to get a PSD permit pursuant to 40 CFR 52.21 for a regulated NSR pollutant prior to beginning actual construction of the project. If the project does not qualify as a major modification for a regulated NSR pollutant, it is subject to mNSR review (a minor modification) if the emissions increase (considering increases and decreases) and net emissions increase are equal to or exceed the mNSR thresholds presented in Table 3-3. See 40 CFR 49.153, Table 1. A minor modification to an existing major source is required to get a mNSR permit under the Federal Minor New Source Review Program in Indian Country, 40 CFR 49.151 to 161, for a regulated NSR pollutant prior beginning actual construction of the project.

Table 3-3 – PSD and mNSR Thresholds for Modifications to Existing Major Sources in Attainment Areas, tons per year

Regulated NSR Pollutant	PSD Significant Emission Rate Threshold	mNSR Threshold for Attainment Areas
CO	100	10
Pb	0.6	0.1
NO_X	40	10
PM	25	10
PM10	15	5
PM2.5	10	3
SO_2	40	10
VOC	40	5
H_2SO_4	7	2
CO_2e[1]	75,000	N/A

[1] The modification is subject to review under PSD for greenhouse gases, quantified as CO_2e, only if subject to review for some other regulated NSR pollutant. See 40 CFR 52.21(b)(49)(iv)(b).

3.4 The Project's Emissions Increase and Net Emissions Increase

The emission units participating in this project are listed in Table 2-1. This project involves both new and existing emission units, and the emissions increase calculation is different for the two categories of units. The only new unit participating in this project is LK-6, so its emissions increase is calculated employing the actual-to-potential test pursuant to 40 CFR 52.21(a)(2)(iv)(d) and (f). See 40 CFR 49.153(a)(1)(i). For existing emission units, the emissions increases (and decreases) are calculated employing the actual-to-projected-actual applicability test pursuant to 40 CFR 52.21(a)(2)(iv)(c) and (f). See 40 CFR 49.153(a)(1)(ii). Fugitive emissions are considered in determining the emissions increases (and decreases) associated with both categories of emission units.[5]

---

[4] March 13, 2018 Administrator E. Scott Pruitt memorandum entitled, "Project Emissions Accounting Under the New Source Review Preconstruction Permitting Program."
[5] See 76 Fed. Reg. 17548 (March 30, 2011) indefinitely staying 40 CFR 52.21(b)(2)(v).

PotlatchDeltic performed calculations to determine the project's emissions increase considering the emission units listed in Table 2-1. See Appendix B to this Permit Analysis for PotlatchDeltic's calculations. Table 3-4 summarizes the project's emissions increases (and decreases). For each NSR regulated pollutant, PotlatchDeltic is anticipating no emissions decreases at any emission unit.

Table 3-4 – Emissions Increase, tons per year

Emission Generating Activity	CO	Pb	NO_X	PM	PM10	PM2.5	SO_2	VOC	H_2SO_4	CO_2e
LK-6				1.7	1.7	1.7		50.0		
PB-1 & PB-2	49.5		15.4	1.0	1.3	0.9	1.9	0.5	0.1	16,958
Building Vents and Baghouses				2.6	2.5	1.3				
Fugitives				10.5	2.1	0.265		12		
Total	50	0.004	15	16	8	4	2	63	0.058	16,958

PotlatchDeltic did not calculate the project's net emissions increase. In the interest of processing the application based upon the information submitted, and for those pollutants for which PSD or mNSR would otherwise be triggered based upon the project's emissions increase, Region 10 is assuming that the project's net emissions increase is at least equal to or greater than the relevant PSD or mNSR applicability threshold. For those pollutants for which PSD or mNSR would otherwise not be triggered based upon the project's emissions increase, PSD and mNSR applicability is not contingent upon the net emissions increase.

3.5 Applicability Determination

Based upon PotlatchDeltic's calculations, the project is subject to PSD review for VOC and subject to mNSR for CO, NO_X, PM, PM10 and PM2.5.

4. Case-by-Case Control Technology Review

Pursuant to 40 CFR 49.154(c), Region 10 conducted a case-by-case control technology review to determine the appropriate level of control, if any, necessary to assure that NAAQS are achieved, as well as the corresponding emission limitations for the affected emissions units that comprise the project. Pursuant to 40 CFR 49.154(c)(2), Region 10 must require a numerical limit on emissions for each regulated pollutant emitted by each affected emission unit if technically and economically feasible. Emission limitations may also consist of pollution prevention techniques, design standards, equipment standards, work practices, operational standards, or requirements relating to operation and maintenance of the source. 40 CFR 49.154(c)(3).

Affected units are defined under 40 CFR 49.152(d) as new, modified and replacement emission units involved in a modification to an existing source. Proposed kiln LK-6 is the project's only affected (new) emission unit, and PM, PM10 and PM2.5 are the only pollutants emitted by the kiln that are subject to the mNSR program. Because lumber dry kilns do not emit either NOX or CO given the nature of the pollutant-emitting activity, the permit does not impose emission limitations for these pollutants on LK-6. In carrying out our review, Region 10 considered the following factors specified in 40 CFR 49.154(c)(1): (1) local air quality conditions, (2) typical control technology or other emission reduction measures used by similar sources in surrounding areas, (3) anticipated economic growth in the area, and (4) cost-effective emission reduction alternatives.

With respect to factor (1), the PM10 background air quality value is not near the NAAQS; no NAAQS currently applies to PM; and the PM2.5 background air quality value is near the NAAQS (see Sections 3.2 and 5 of this Permit Analysis). Limits on PM2.5 emissions have been added to the permit, as a result of the ambient analysis, to protect the PM2.5 NAAQS (see Permit Conditions 3.6 and 3.7).

With respect to factor (2), Region 10 is not aware of any facility that captures and controls emissions to explicitly limit PM, PM10 or PM2.5 emissions generated by lumber drying. However, some Pacific Northwest permit authorities[6] require work practice standards to reduce VOC and HAP emissions by limiting a lumber dry kiln's maximum drying temperature. Also, the accompanying PSD permit for this project requires work practice standards to reduce VOC emissions by limiting the maximum drying temperature, limiting the final moisture content of lumber dried in the kiln, using a computerized kiln management system, and requiring the implementation of operation and maintenance procedures. PM10 and PM2.5 emissions are defined as the sum of condensible particulate matter (CPM) plus filterable PM10 and PM2.5, respectively.[7] Reducing VOC emissions will effectively reduce PM10 and PM2.5 because CPM is primarily made up of semi-volatiles which are emitted from wood via the same mechanism as VOC.[8] As a result, the work practices found in the PSD permit for this project and other Northwest agency permits will help reduce PM10 and PM2.5 emissions.

With respect to factor (3), Region 10 has no information about the project's impact upon the area's economic growth but assumes that, because there will be only a small increase in lumber milled and dried in the St. Maries area, there will be little impact on the local economy whether the project happens or not. A nonattainment designation resulting from a violation of the PM2.5 NAAQS, however, could negatively impact the economy.

With respect to factor (4), Region 10 estimates that the cost of capturing PM, PM10 and PM2.5 emissions and oxidizing the stream in a regenerative thermal oxidizer is above $400,000 per ton of PM, PM10 or PM2.5 reduced, which is far in excess of costs considered reasonable under mNSR.[9] The high cost in dollars per ton reduction makes requiring capture and control of PM2.5 emissions from LK-6 unreasonable. Because the Permittee has proposed the work practice standards required in the accompanying PSD permit, those emission control techniques are

---

[6] See document "180612 id, or & wa kilns at major sources with links to T5 permits – draft" in the administrative record for this permit action.

[7] As defined in 40 CFR 51.50, condensible particulate matter is material that is vapor phase at stack conditions, but which condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM immediately after discharge from the stack. Note that all condensible particulate matter, if present from a source, is typically in the PM2.5 size fraction and, therefore, all of it is a component of both primary PM2.5 and primary PM10.

[8] Most volatile organic compounds (quantified via RM25A) will not be double-counted as CPM (quantified through RM202). In other words, VOC and semi-volatile organics can be considered separate pollutants.

[9] Region 10 performed a VOC BACT analysis on LK-6 in support of our proposal to issue a PSD permit for this project. Region 10 estimates that it would cost well above $10,000 per ton to reduce LK-6 VOC emissions through implementation of an RTO control option given that the facility's VOC emissions are limited to 50 tpy. Uncontrolled LK-6 PM, PM10, and PM2.5 emissions are projected to be approximately 1.2 tpy or only 3% of its VOC emissions. Region 10 estimates the RTO control option to cost above $400,000 per ton of PM, PM10 or PM2.5 reduced, which is far in excess of costs considered reasonable under mNSR.

assumed to be cost effective.

Our case-by-case control technology review is a site-specific determination resulting in the selection of an emission limitation that represents application of control technology or control methods appropriate for the particular facility. Taking all the factors into consideration, Region 10's case-by-case control technology review for a single kiln using high temperature drying has concluded for PM10/PM2.5 that the emission limitations in Permit Conditions 3.2 through 3.5 and 3.10 are technically and economically feasible. These limitations on the proposed kiln are also necessary to assure the PM10 and PM2.5 NAAQS are achieved. The additional daily and annual PM2.5 emission limits for LK-6 in Permit Conditions 3.6 and 3.7 are necessary to assure the PM2.5 NAAQS are achieved. Permit Conditions 3.7 for PM2.5 and 3.8 for PM10 fulfill the minor NSR obligation to create an annual emission limit for an affected unit in the case where implementation of the control technology review requirement upon a unit results in a reduction in the unit's PTE. These requirements are further explained in Section 7 of this Permit Analysis.

5. Ambient Air Quality Impact Analysis (AQIA)

Under 40 CFR 49.151(e)(4) and 49.154(d)(1), the permitting authority may require the submission of an AQIA if it has reason to be concerned that the construction of the minor source or modification would cause or contribute to a NAAQS or PSD increment violation. As stated previously, the project is subject to mNSR for CO, NO_X, PM, PM10 and PM2.5. Region 10 examined the estimated regional background concentrations in the St. Maries area to gauge the need to assess air quality impacts of NO_X, CO and PM10 associated with the project. Because estimated concentrations are well below the NAAQS for these pollutants, Region 10 did not require submission of an AQIA for these pollutants. With respect to PM, no NAAQS currently applies to this pollutant (PM air quality impacts are addressed through assessment of respirable PM10 and PM2.5). As discussed in Section 3.3, because an IDEQ air quality monitor has recently measured high background concentrations of PM2.5 in the vicinity of the PotlatchDeltic facility, Region 10 has reason to be concerned that operation of the project would cause or contribute to a violation of the 24-hour and annual PM2.5 NAAQS. Region 10 therefore requested the Permittee to provide an AQIA for primary PM2.5 in accordance with 40 CFR 49.151(e)(4) and 154(d)(1).[10] See Appendix C to this Permit Analysis for the details of our AQIA evaluation.

PotlatchDeltic performed a cumulative analysis to determine if projected emissions, in conjunction with emissions from nearby sources, would be expected to cause or contribute to a violation of the PM2.5 NAAQS. The nearest representative PM2.5 monitor is located very near to the project source and is impacted by both project source emissions and local residential woodsmoke during cold stagnant periods. Based on the unique circumstances presented, actual emissions from the existing facility were assumed to be conservatively represented in the background design value determined from the St. Maries monitor dataset. Therefore, only emission increases related to the project were explicitly modeled and impacts were added to the background concentration to determine a cumulative impact. Although the refined modeling approach relied on in this permit action is not specifically recommended in regulation or

[10] Because NOx and SO2 emissions are below the SERs and because maximum primary impacts occur only during stagnant nighttime conditions, secondary PM2.5 impacts were not assessed. See Guidance for PM2.5 Permit Modeling, EPA-454/B-14-001, May 2014.

guidance, Region 10 determined it was adequate for estimating cumulative impacts. Additional analysis was conducted to provide a "weight of evidence" to support the modeling approach and ensure the NAAQS will be protected.

Based upon the results of the PM2.5 cumulative modeling analysis presented in Table 5-1[11], Region 10 concludes that the project will not cause or contribute to a violation of the PM2.5 NAAQS.

Table 5-1 – PM2.5 Modeling Results

NAAQS Averaging Period	Modeled Impact of the Project's Emissions Increase (μg/m^3)	Background concentration (μg/m^3)	Resultant Pollutant Concentration (μg/m^3)	NAAQS (μg/m^3)
Annual	2.48	9.3	11.78	12.0
24-hour	3.79	31	34.79	35

6. Additional Analyses

EPA Trust Responsibility. As part of Region 10's direct federal implementation and oversight responsibilities in Indian Country, Region 10 has a trust responsibility to each of the 271 federally recognized Indian tribes within the Pacific Northwest and Alaska. The trust responsibility stems from various legal authorities including the U.S. Constitution, Treaties, statutes, executive orders, historical relations with Indian tribes and, in this case, the 1873 Executive Order and subsequent series of treaty agreements. In general terms, EPA is charged with considering the interest of tribes in planning and decision-making processes. Each office within EPA is mandated to establish procedures for regular and meaningful consultation and collaboration with Indian tribal governments in the development of EPA decisions that have tribal implications. Region 10's Office of Air and Waste has contacted the Tribe to invite consultation on this minor NSR permit project and has maintained ongoing communications with Tribal environmental staff throughout the permitting process.

Endangered Species Act. Under this act, EPA is obligated to consider the impact that a federal project may have on listed species or critical habitats. The bull trout is a listed species and the North American wolverine is proposed for listing. Correspondence from the U.S. Fish and Wildlife Service (USFWS) indicates that bull trout are the only ESA threatened or endangered aquatic species with critical habitat in the vicinity of the proposed project. Region 10 has concluded that the proposed project may affect, but is not likely to adversely affect, ESA-listed bull trout and their designated critical habitat, and we have received concurrence from the USFWS on our determination. The project will have no effect on the North American wolverine.

National Historic Preservation Act. Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires federal agencies to consider the effects on historic properties of projects they carry out, assist, fund, permit, license, or approve throughout the country. If a federal or federally-assisted project has the potential to affect historic properties, a Section 106 review is conducted. As noted earlier, the issuance of this mNSR permit would authorize construction of a 104-foot kiln beside an existing 104-foot kiln installed in 2006. The new kiln would be constructed on ground currently serving as a roadway within the SMC and which has therefore already been disturbed to some extent. PotlatchDeltic states that the new lumber dry kiln will

[11] Compliance with the annual NAAQS is based upon the arithmetic mean of monitored values while compliance with the 24-hour NAAQS is based upon the 98th percentile of daily averages.

likely not affect cultural resources. A review of the National Register of Historic Places finds no record of historic places within the SMC. The nearest historic place to where the proposed kiln is to be constructed is the St. Maries 1910 Fire Memorial within Woodlawn Cemetery, about a quarter mile south of the proposed construction site with trees, residences, streets, a highway and a railway coming between the two.

On the Coeur d'Alene Reservation, the Tribal Historic Preservation Officer (THPO) is the lead for the historic preservation program. On June 20, 2018, Region 10 contacted the THPO requesting concurrence on Region 10's preliminary determination that no historic properties would be affected by the proposed project. On July 27, 2018, the THPO responded that she did not expect to see in-situ cultural resources or any human remains being disturbed by the project and concurred with a finding of "no historic properties affected." The THPO requested that the Permittee agree to a protocol in the event of inadvertent discoveries of human remains or cultural resources. Region 10 shared the protocol with the Permittee on July 31, 2018. Although the Permittee verbally agreed the protocol would be a good idea, the Permittee declined to make a written commitment prior to the public comment period. During the public comment period, the Permittee indicated that the Permittee and the THPO have agreed to a protocol in the event of inadvertent discoveries of human remains or cultural resources. Based on the THPOs concurrence that this project will not adversely affect historical or cultural resources, Region 10 is concluding the Section 106 process.

Environmental Justice Policy - Under Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* signed on February 11, 1994, EPA is directed, to the greatest extent practicable and permitted by law, to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States. Region 10 employed EPA's Environmental Justice Screening and Mapping Tool (EJSCREEN)[12] to identify places that may be candidates for further review, analysis or outreach to support implementation of the executive order as it relates to this proposed permitting action. EJSCREEN identified a candidate area (score of 86.0) southwest of the facility. The area is as close as about 1,500 feet from the property line at Danielson Rock/Danielson Logging on the south side of Idaho State Highway 5. EJSCREEN screen areas are those with a score over the 80th percentile benchmark. Based upon our review of the AQIA performed by the Permittee, the project's greatest impact on PM2.5 air quality will be experienced in areas other than the candidate area southwest of the facility. Modeling has demonstrated highest PM2.5 impacts occur near to the fenceline on the west and east borders of the facility and not within the candidate area. Also, the modeling demonstrated any elevated PM2.5 concentrations would generally occur north of Highway 5 (see modeling results plots in Figures 11 and 12 of Appendix C to this Permit Analysis). North winds, that could transport air pollutants into the identified area, are infrequent.

This permit will ensure that the new operation will not cause or contribute to a violation of a NAAQS (see Appendix C to this Permit Analysis). Region 10 therefore concludes that this permit action will not have a disproportionately high or adverse human health effects on nearby communities, including the candidate EJ area.

---

[12] For more information on EJ SCREEN, See https://www.epa.gov/ejscreen/technical-information-about-ejscreen

Title V Operating Permit Program. Title V of the CAA and the implementing regulation found in 40 CFR part 71 require Title V major sources (as well as a selection of non-major sources) of air pollution to obtain operating permits. A source is major for Title V purposes if it has the potential to emit 100 tons per year or more of any air pollutant subject to regulation, 25 tons per year or more of HAPs (in aggregate) or 10 tons per year or more of any single HAP (see 40 CFR 71.2). PotlatchDeltic's St. Maries Operations (SMC and LDD, together) is a single Title V major source because it has the potential to emit more than 100 tons per year CO, NO_X, PM10, PM2.5 and VOC[13]. It is also considered major because it has the potential to emit 25 tons per year or more of HAPs (in aggregate) or 10 tons per year or more of any single HAP. With respect to SMC, PotlatchDeltic submitted a timely application for a Title V permit, which Region 10 will act on through a separate permitting process.

New Source Performance Standards. Region 10 considered the applicability of four combustion-related NSPS standards to boilers PB-1 and PB-2 at SMC, each a steam generating unit: 40 CFR 60, Subparts D (Fossil-Fuel-Fired Steam Generators), Da (Electric Utility Steam Generating Units), Db (Industrial-Commercial-Institutional Steam Generating Units) and Dc (Small Industrial-Commercial-Institutional Steam Generating Units). NSPS Subparts D and Da do not apply to either PB-1 or PB-2 because each boiler's heat input capacity is less than the applicability threshold of 250 mmbtu/hr. PB-2's heat input capacity of 131 mmbtu/hr is within the applicability range of 100 mmbtu/hr to 250 mmbtu/hr of NSPS Subpart Db. But given that PB-2 was constructed in 1966 before the June 19, 1984 applicability date, and because it has not been modified or reconstructed since that date based on information provided by PotlatchDeltic, NSPS Db does not apply. PB-1's heat input capacity of 58 mmbtu/hr is within the applicability range of 10 mmbtu/hr and 100 mmbtu/hr of NSPS Dc. But given that PB-1 was constructed in 1964 before the June 9, 1989 applicability date, and because it has not been modified or reconstructed since that date based on information provided by PotlatchDeltic, NSPS Dc also does not apply. According to PotlatchDeltic's Title V application, PB-1 was last modified in 1979 when the Wellons firing system was installed.

National Emission Standards for Hazardous Air Pollutants. 40 CFR 63, Subpart DDDDD (Industrial, Commercial and Institutional Boilers and Process Heaters at Major Sources) applies to PB-1 and PB-2. CO, PM, hydrogen chloride and mercury emission limits apply to each boiler along with various operating limits. The Boiler MACT[14] compliance date was January 31, 2016.

Section 111(d) and Section 129 Regulations. There is no CAA Section 111(d) or 129 regulation that applies to the type of emission units at SMC.

Federal Air Rules for Reservations. On April 8, 2005, EPA promulgated a Federal Implementation Plan for Reservations in Idaho, Oregon and Washington, commonly referred to as the Federal Air Rules for Reservations (FARR), containing rules that generally apply to Indian Reservations in Idaho, Oregon, and Washington in 40 CFR 49.121 to 49.139. The FARR rules that specifically apply on the Coeur d'Alene Reservation (Sections 123, 124, 125, 126, 129, 130, 131, 135, 137, 138 and 139) are codified at 40 CFR 49.9921 to 49.9930. FARR requirements that limit potential to emit have been taken into consideration in calculating SMC potential emissions in Region 10's Emissions Evaluation in Appendix A.

[13] Although PM and greenhouse gas potential emissions exceed 100 tons per year, Title V applicability is not based upon either of these pollutants.
[14] MACT standards are a subset of NESHAP standards.

Acid Rain Program. Title IV of the CAA created a SO_2 and NO_X reduction program found in 40 CFR Part 72. The program applies to any facility that includes one or more "affected units" that combust a fossil fuel and serve a generator that produces electricity. The boilers at SMC are not a "unit" as defined in 40 CFR 72.2 because neither boiler combusts a fossil fuel and neither serves a generator that produces electricity.

7. Permit Content

The permit content requirements can be found in 40 CFR 49.155. The permit is organized into the following five sections:

Permit Section 1: Source Information and Project Description
Permit Section 2: General Requirements
Permit Section 3: Emission Limitations and Work Practice Requirements
Permit Section 4: Monitoring and Recordkeeping Requirements
Permit Section 5: Reporting Requirements
Permit Section 6: Abbreviations and Acronyms

Each permit condition in the permit is explained below. Specific analyses that were performed in development of the permit are described or referenced.

Permit Section 1 – Source Information and Project Description

This permit section contains a brief description of the facility and a list of emission units. A more detailed description of the facility can be found in Section 2 of this Permit Analysis. The final permit adds a brief discussion of the basic components of a lumber kiln drying system, including use of the terms "batch," "track system," "load," and "heating zone" to provide clarity for their use later in the permit. The terms "charge" and "cross sectional area" from the proposed permit are no longer employed. Table 1-1 of the final permit provides a more accurate description of emission unit PCWR-PM-PTB. Table 1-1 of the final permit reflects the work practices Region 10 ultimately determined to be technically and economically feasible to limit PM10/PM2.5 emissions from the proposed kiln. Reference to "PM10/PM2.5" control device/work practices has been added to the field in the first row/last column of Table 1-1. As provided in Permit Conditions 3.11 and 3.12, the use of the control devices and work practices listed and described in Table 1-1 of the permit is required by the permit.

Permit Section 2 – General Requirements

Permit Condition 2.1 is a new condition that identifies the emission units subject to the terms and conditions of the permit and clarifies the scope of the permit.

Permit Condition 2.2 is the severability clause required by 40 CFR 49.155(a)(6).

Permit Conditions 2.3 through 2.9 are specific general provisions required by 40 CFR 49.155(a)(7).

Permit Condition 2.10 is the permit invalidation provision required by 40 CFR 49.155(b).

Permit Condition 2.11 requires the Permittee to comply with all other applicable requirements as required as required by 40 CFR 49.151(d)(4).

Permit Condition 2.12 requires the Permittee to construct and operate the source in accordance with the permit as required by 40 CFR 49.151(d)(2).

Permit Condition 2.13 provides authority to establish alternative testing, monitoring, recordkeeping and reporting requirements through our Title V monitoring authority through issuance, renewal, or significant modification of a Part 71 permit.

Permit Condition 2.14 provides that, with some exceptions otherwise specified in the permit, the Permittee must comply with permit requirements only after initial startup of LK-6. Initial startup occurs when lumber is dried in LK-6 for the first time. For example, compliance with Permit Conditions 4.1, 5.1, 5.2 and 5.3 is required upon the effective date of the permit.

Permit Section 3 – Emission Limitations and Work Practice Requirements

The emission limitations in this section of the permit are based on Region 10's case-by-case control technology review for LK-6 pursuant to 40 CFR 49.154(c), the air quality impact analysis performed pursuant to 40 CFR 49.151(e)(4) and 154(d), and the requirement to establish annual limits in the permit for LK-6 pursuant to 40 CFR 49.155(a)(2).

Permit Condition 3.1 reflects the revised scope of the project proposed by PotlatchDeltic on November 13, 2018: that LK-6 will be used to dry only Grand Fir, White Fir and Western Hemlock. The term "White Fir" in this context refers to the species White Fir and not to the group of several species of true fir grown in the West. This restriction on wood species is expected to limit the VOC emissions from LK-6 (pertinent to the related PSD permit for this project) because the species dried are considered generally lower VOC-emitting species than Ponderosa Pine and Douglas Fir as explained earlier. This restriction was relied on for the AQIA and the control technology review for the minor NSR permit and therefore is included as a permit condition.

Permit Condition 3.2 reflects a case-by-case control technology review work practice requirement. Limiting maximum drying temperature limits PM10 and PM2.5 emissions. Data in Appendix E illustrates that higher drying temperature generates more VOC emissions and, by extension, more semi-volatiles which primarily make up CPM, a large component of PM10 and PM2.5 emissions from lumber kilns. The 245°F stack exit temperature limitation is different than the 245°F limit proposed by the Permittee in two ways. First, the permit condition limits the actual temperature in the kiln and not the "set point" value that is an element of the computerized kiln management system controlling kiln operations. Secondly, the limit applies to each load (there is one load per track) in each zone of the kiln. By applying the temperature limit to each load, the final permit will better reflect the permittee's existing monitoring and better ensure that neither load is overdried, which would result in more emissions. By using the term "60-minute average" in the final permit, Region 10 is clarifying that compliance is determined over 60-minute periods of time that do not necessarily correspond to clock hours. The first 60-minute period begins when drying begins. Condition 4.4.6 of the final permit requires tracking the zone-specific temperatures exiting each load to confirm compliance with this permit condition. If fan reversals are not synchronized with the start/finish of the 60-minute periods (during which data is used to calculate an average temperature used to assure compliance with the 245°F limit) that begin with the start of the drying cycle, then it will be necessary for the Permittee to gather data from two separate dry bulb temperature sensors to calculate the 60-minute average temperatures of heated air that exits a load of lumber.

Permit Condition 3.3 also reflects a case-by-case control technology review work practice requirement. Limiting the lowest moisture content of the lumber also limits VOC and semi-volatile emissions and, by extension, CPM, PM10 and PM2.5 emissions, by avoiding over-drying the lumber. Drying lumber beyond the target moisture content extends the drying schedule and unnecessarily generates additional emissions. The Permittee indicates that its lowest target moisture content for any lumber that would be dried in this kiln is 13 percent (dry basis). More typically, the target moisture content would be 15 percent (dry basis). Unlike the temperature limit in Permit Condition 3.2, this limit applies to the batch as a whole and not separately to individual portions of a load. Condition 4.4.7 of the final permit requires measuring and tracking lumber moisture content in the kiln.

As evidenced by information presented in undated slides from a presentation at the June 2018 NCASI Region Conference in Atlanta, Georgia entitled, “Development of a Proposed PCWP MACT Work Practice Standard for Lumber Kilns,” other permitting authorities have set limits on the final moisture content of the dried lumber. According to the document, Georgia Pacific sawmills in Alabama, Georgia, North Carolina and South Carolina currently have kiln work practice requirements in Title V permits, including a minimum limit on dried lumber moisture content.

Permit Condition 3.4 also reflects a case-by-case control technology review work practice requirement. Employing a computerized kiln management system with software developed by the kiln manufacturer enables the Permittee to avoid over-drying its lumber and unnecessarily generating additional emissions.

Permit Condition 3.5 also reflects a case-by-case control technology review work practice requirement. This permit condition requires the development and implementation of an operating and maintenance manual to assure good air pollution control practices and efficient operation. It requires that specified minimum elements be addressed to minimize over-drying lumber and thus minimize emissions. The minimum required elements are practices recommended by the United States Forest Services – Forest Products Laboratory in its September 1991 General Technical Report FPL-IMP-GTR-1 entitled, “Quality Drying of Softwood Lumber.” A copy of the document is provided in the administrative record for this permit action, and the document is also available online at https://www.fpl.fs.fed.us/documnts/fplgtr/impgtr01.pdf.

Permit Conditions 3.6 and 3.7 limit daily and annual emissions to assure the 24-hour and annual NAAQS are protected. As required by 40 CFR 49.151(e)(5), if the permitting authority requires an AQIA for a pollutant, the permitting authority must determine that construction of the new minor source or modification will not cause or contribute to a violation of the NAAQS or PSD increment for that pollutant. 40 CFR 49.154(d)(3) provides that, if a required AQIA reveals that construction of the new source or modification would cause or contribute to a NAAQS or PSD increment violation, the permitting authority must require that such impacts be reduced or mitigated before it can issue the permit. 40 CFR 49.154(d)(2) requires the AQIA to be conducted using the dispersion models and procedures of 40 CFR Part 51, Appendix W. For the purpose of demonstrating NAAQS compliance, the new or modifying stationary point source shall be modeled with “allowable” emissions in the regulatory dispersion modeling (see Appendix W, 8.2.2(c)).

As discussed above, Region 10 required the Permittee to conduct an AQIA for PM2.5 because we had reason to be concerned that operation of the project would cause or contribute to a violation of the 24-hour and annual PM2.5 NAAQS. Details of the AQIA evaluation are discussed in Section 5 and in Appendix C of this Permit Analysis. Permit Conditions 3.6 and 3.7 establish allowable daily and annual emission limits that reflect the emission rates modeled to protect the PM2.5 NAAQS. These permit conditions specify the emission factors and daily and annual operational rates to use in calculating daily and annual PM2.5 emissions for determining compliance. The emission factors and calculated daily and annual emissions reflect the use of control devices and work practices specified in this permit. The permit does not limit emissions from the following emission units as their contribution to ambient impacts is insignificant or reflects allowable emission levels: BV-2, BV-3, DB, COS, WRD-SH, WRD-CH, WRD-SD, WRD-HF and HFP.

Tables 3-1 and 3-3 of the permit refer to the permit conditions wherein the operations, needed to calculate emissions, are required to be monitored. Permit Table 3-2 lists the methods that must be used in the event emission testing is required. See Permit Conditions 4.1 and 4.2 for testing requirements that will result in new emission factors for PB-1, PB-2, PCWR-PM-SH and PCWR-PM-SD. Permit Condition 3.9 specifies how to implement the emission factors that result from testing required by the permit.

Permit Condition 3.6 also reflects the numeric emission limitation for LK-6 that resulted from Region 10's case-by-case control technology review. Daily PM2.5 emissions are limited to the levels used in the modeling that demonstrated that the 24-hour PM2.5 NAAQS will be achieved. Compliance is determined as specified in Permit Conditions 3.6 and 3.9. Permit Condition 3.7 also reflects the annual allowable emission limit for LK-6. Pursuant to 40 CFR 49.155(a)(2), the permit must include an annual allowable emissions limit for each affected emissions unit and for each regulated NSR pollutant emitted by the emission unit.

Permit Condition 3.8 is a new condition (added after the draft permit was proposed) that reflects the annual allowable emission limit for PM10. Pursuant to 40 CFR 49.155(a)(2), the permit must include an annual allowable emissions limit for each affected emissions unit and for each regulated NSR pollutant emitted by the emission unit if the unit is issued an enforceable emission limitation lower than the potential to emit of that unit. As explained earlier, the only affected emission unit is LK-6, and PM10 is one of the regulated NSR pollutants emitted by LK-6 and subject to this requirement. Because PM10 emissions are assumed to be equal to PM2.5 emissions from LK-6, this permit condition employs the emission limit in Permit Table 3-3 to satisfy 40 CFR 49.155(a)(2).

Permit Condition 3.9 requires the Permittee to use emission factors derived from source testing required by this permit for certain emission units when calculating the daily and annual emissions beginning the date the Permittee submits the test report to Region 10, but no later than 60 days after the test. Permit Conditions 4.1 and 4.2 require testing of boilers PB-1 and PB-2 and baghouses BH-2 and BH-3 which control emissions from emissions units PCWR-PM-SH and PCWR-PM-SD, respectively. This permit condition includes specific instructions for applying the new emission factors for the boilers. Because boiler testing may be required at one or two operating loads, there may be one or two emission factors developed from the testing. If two emission factors are developed from testing, this permit condition explains when to use each emission factor as well as how to calculate daily and annual emissions using the new emissions factors.

Permit Condition 3.10 reflects the FARR visible emissions limit in 40 CFR 49.124(d) that applies to LK-6 and serves as a control technology review requirement to satisfy 40 CFR 49.154(c). This limit is imposed to mitigate PM2.5 impacts because PM2.5 levels in the area are near the level of the PM2.5 NAAQS.

Permit Condition 3.11 reflects a case-by-case control technology review work practice requirement for LK-6. Because PM2.5 levels in the area are near the level of the PM2.5 NAAQS, application of this requirement to all the emission units in Table 1-1 will help mitigate PM2.5 NAAQS impacts. In the final permit, the phrase "including associated air pollution control equipment" has been added to clarify that the requirement applies to the emission units and associated control device and/or work practices to minimize emissions and for consistency with requirements in federal regulations such as 40 CFR 60.11(d).

Permit Conditions 3.12 and 3.13 are work practice requirements to mitigate PM2.5 impacts because PM2.5 levels in the area are near the level of the PM2.5 NAAQS. Permit Conditions 3.13.1 through 3.13.8 reflect the requirements of 40 CFR 49.126(d)(2). The Permittee's Fugitive Dust Plan (FDP) for this facility is part of the administrative record for this permitting action and was provided to Region 10 in a February 1, 2018 letter. The Permittee was required to develop and implement its plan pursuant to the FARR rule for limiting fugitive PM emissions. The plan covers the entire facility, parts of which extend beyond the activities associated with this project. Only those aspects of the plan related to emission units presented in Permit Table 2-1 are imposed through this permit. Conditions 3.13.1 through 3.13.8 contain the control measures that are specifically identified in 49.126(d)(2) and are also included in the Permittee's FDP. Permit Conditions 3.13.9 through 3.13.11 reflect aspects of the FDP not explicitly identified in the list of measures under the FARR's rule for limiting fugitive PM (40 CFR 49.126(d)(2). The Permittee will be required to maintain the mitigation measures in Permit Conditions 3.13.9 through 3.13.11 even if the FDP is amended to no longer require them.

Permit Conditions 3.14 and 3.15 are necessary for the protection of the NAAQS. The May 2019 modeling demonstration assumed stack configurations for BH-10 and BH-11 that do not reflect present-day reality. The stack modifications must be completed prior to LK-6 startup.

Permit Section 4 – Testing, Monitoring and Recordkeeping Requirements

The permit is required, in 40 CFR 49.155(e)(3) and (4), to include testing, monitoring and recordkeeping requirements sufficient to assure compliance with the emission limitations and limits in the permit.

Permit Condition 4.1 requires the Permittee to conduct emissions testing of PB-1 and PB-2 under representative operating conditions. One-time testing of PB-1 and PB-2 is required to derive new emission factors that would supersede the emission factors specified in Permit Tables 3-1 and 3-3 as instructed in Permit Condition 3.9. The permit requires the PM2.5 testing to be conducted at the same time the Permittee first performs any testing (CO, HCl, Hg or RM5 PM) to fulfill its Boiler MACT testing obligations. Testing of the different pollutants can be on different schedules, and the PM2.5 testing requirement may not necessarily align with Boiler MACT RM5 PM testing. It may align instead with any of the other three Boiler MACT pollutants.

Initially for PB-1, the permit requires that daily emissions be calculated by multiplying the day's steam production by a PM2.5 emission factor of 0.01488 lb/mlb steam. The Permittee used the 0.01488 lb PM2.5/mlb steam emission factor to determine emission rates used in its May 2019 revised AQIA. Table 7-2 presents PM2.5 emission factors for PB-1 resulting from testing of PB-1 conducted on behalf of the Permittee in April 2008, February 2016, March 2017 and March 2019. The four-run average PM2.5 emission factor (excluding two low-load test results given PotlatchDeltic's post-project steaming rate forecast) is 0.0108 lb/mlb steam as noted in the table above. That is 73% of the emission factor employed to estimate emissions for the AQIA.

Table 7-2 – CE Boiler PB-1 PM2.5 Test-Derived Emission Factors

Test Event	Steaming Rate (lb/hr)	RM5 PM (lb/hr)	Estimate Filterable PM2.5[1] (lb/hr)	Filterable PM2.5 (lb/mlb Steam)	CPM[2] (lb/mlb Steam)	PM2.5 (lb/mlb Steam)
April 2008	23,700	0.21	0.10752	0.0045	0.0063	0.0108
February 2016	34,311	0.28	0.14336	0.0042	0.0063	0.0105
March 2017	24,790	0.354	0.18125	0.0073	0.0063	0.0136
March 2017[3]	~~9,985~~	~~0.156~~	~~0.07987~~	~~0.0080~~	~~0.0063~~	~~0.0143~~
March 2019	25,388	0.10	0.0512	0.0020	0.0063	0.0083
March 2019[3]	~~9,137~~	~~0.17~~	~~0.08704~~	~~0.0095~~	~~0.0063~~	~~0.0158~~
			Average	0.0045	0.0063	0.0108

[1] Estimate of filterable PM2.5 = RM5 PM x 0.512, where 0.512 is ratio of filterable PM2.5 to RM5 PM based upon July 2009 testing of CE Boiler. See Table A37 in NCASI Technical Bulletin No. 1013 – A Comprehensive Compilation and Review of Wood-Fired Boiler Emissions.

[2] A CPM emission rate of 0.0063 lb/mlb steam was measured in April 2008. Because CPM was not measured in subsequent emissions testing events, a CPM emission rate of 0.0063 lb/mlb steam is assumed for those subsequent testing events.

[3] Low steaming rate test results are lined out and not considered for this analysis given PotlatchDeltic's post-project steaming rate forecast.

Initially for PB-2, the permit requires that daily emissions be calculated by multiplying the day's steam production by a PM2.5 emission factor of 0.00722 lb/mlb steam. The Permittee used the 0.00722 lb PM2.5/mlb steam emission factor to determine emission rates used in its May 2019 revised AQIA. Table 7-3 presents PM2.5 emission factors for PB-2 resulting from testing of PB-2 conducted on behalf of the Permittee in May 2008, February 2016, March 2017, March 2018 and March 2019. The five-run average PM2.5 emission factor (excluding three low-load test results given PotlatchDeltic's post-project steaming rate forecast) is 0.0048 lb/mlb steam as noted in the table above. That is 66% of the emission factor employed to estimate emissions for the AQIA.

Table 7-3 – Riley Boiler PB-2 PM2.5 Test-Derived Emission Factors

Test Event	Steaming Rate (lb/hr)	RM5 PM (lb/hr)	Estimate Filterable PM2.5[1] (lb/hr)	Filterable PM2.5 (lb/mlb Steam)	CPM[2] (lb/mlb Steam)	PM2.5 (lb/mlb Steam)
May 2008	96,900	0.48	0.1968	0.0020	0.0023	0.0043
February 2016	90,101	0.43	0.1763	0.0020	0.0023	0.0043
March 2017	91,420	0.747	0.3063	0.0034	0.0023	0.0057
March 2017	79,227	0.516	0.2116	0.0027	0.0023	0.0050
March 2017[3]	~~29,862~~	~~1.8~~	~~0.7380~~	~~0.0247~~	~~0.0023~~	~~0.0270~~
March 2018[3]	~~30,781~~	~~0.333~~	~~0.1365~~	~~0.0044~~	~~0.0023~~	~~0.0067~~
March 2019	82,303	0.49	0.2009	0.0024	0.0023	0.0047

Test Event	Steaming Rate (lb/hr)	RM5 PM (lb/hr)	Estimate Filterable PM2.5[1] (lb/hr)	Filterable PM2.5 (lb/mlb Steam)	CPM[2] (lb/mlb Steam)	PM2.5 (lb/mlb Steam)
March 2019[3]	~~33,664~~	~~1.06~~	~~0.4346~~	~~0.0129~~	~~0.0023~~	~~0.0152~~
			Average	0.0025	0.0023	0.0048

1 Estimate of filterable PM2.5 = RM5 PM x 0.41, where 0.41 is ratio of filterable PM2.5 to RM5 PM based upon average of test results for 11 wood and bark-fired boilers with electrostatic precipitator/fabric filters. See Table 5.3 in NCASI Technical Bulletin No. 1013 – A Comprehensive Compilation and Review of Wood-Fired Boiler Emissions.

2 A CPM emission rate of 0.0023 lb/mlb steam was measured in May 2008. Because CPM was not measured in subsequent emissions testing events, it is appropriate to assume a CPM emission rate of 0.0023 lb/mlb steam for those subsequent testing events.

3 Low steaming rate test results are lined out and not considered for this analysis given PotlatchDeltic's post-project steaming rate forecast.

Although these revised emission estimates suggest that the PB-1 and PB-2 should meet the emission rates used in the May 2019 AQIA, PM2.5 testing has never been performed on the Riley Boiler and apparently only once on the CE Boiler (in July 2009 as reported by NCASI). The boilers' CPM emissions data is over ten years old. Given that the boilers are on a set test schedule pursuant to the Boiler MACT, Region 10 has determined it is appropriate to require one-time testing at the time of the next MACT testing (CO, HCl, Hg or RM5 PM) to determine PM2.5 emissions and a new emission factor for use in this permit.

PotlatchDeltic is required to conduct RM201A (or RM5 in lieu of RM201A) and 202 testing at least eight months after LK-6 has begun operation and the first time thereafter that unit-specific Boiler MACT testing is required. This approach minimizes the overall testing requirements for the Permittee by allowing testing for this permit to be conducted at the same time as testing required under the Boiler MACT standard. Testing must be performed consistent with an approved test plan that specifies the load(s) at which testing is to be performed. At least six months of steaming data will be available to inform Region 10's review and action on the test plan.

<u>Permit Condition 4.2</u> requires the Permittee to conduct emissions testing of PCWP-PM-SH and PCWP-PM-SD to develop emission factors that reflect representative operating conditions. Permit Conditions 3.6 and 3.7 rely on these emission factors to determine compliance with the daily and annual emission limits in those conditions. Permit Condition 3.9 instructs the Permittee on the implementation of the emission factors that result from the testing.

The emission factors for PCWR-PM-SH and PCWR-PM-SD (controlled by BH-2 and BH-3, respectively) listed in Tables 3-1 and 3-3 of the permit are based, in part, upon average PM2.5 exhaust concentrations measured during source testing of BH-2 and BH-3 in May 1996. During testing of BH-2, the planer was processing 23.2 mbf/hr of softwood lumber. During testing of BH-3, the planer (and/or trimmer) was processing 22.8 mbf/hr of softwood lumber. Planer throughput rates can be much higher than the rates at which testing was conducted, as demonstrated by more recent production data.

For instance, the 98th percentile 2016-2017 daily planer production rate and operating hours were 1292 mbf/day and 20.2 hours/day. Based upon these values, today's approximate 98th percentile hourly planer production rate is 64 mbf/hr (1292 divided by 20.2). That is approximately three times greater than the production rate at which the planer was operated during the tests upon which the emission factors in Tables 3-1 and 3-3 of the permit are based.

Because PM2.5 loadings may be three times higher under current operations as compared to the conditions under which testing was performed to derive the emission factors in Tables 3-1 and 3-3 of the permit, the exhaust concentration of PM2.5 exiting baghouses BH-2 and BH-3 may also be greater. Therefore, the Permittee is required to conduct source testing of BH-2 and BH-3 to derive new emission factors for PCWR-PM-SH and PCWR-PM-SD and begin using the resulting emission factors to calculate daily and annual emissions as provided in the permit.

Permit Condition 4.3 requires the Permittee to track various parameters characterizing each batch of lumber dried in LK-6. The Permittee is also required to track the annual volume of lumber dried. The information required to be tracked in Condition 4.3.1 is necessary to assure compliance with Condition 3.1. The information required to be tracked in Conditions 4.3.2 through 4.3.5 is used to determine a batch's daily emissions.

Typically, it will take LK-6 about 36 hours to dry a batch of lumber, which means the batch might extend over two or three calendar days. To determine the daily emissions from the kiln, the "equivalent volume of daily lumber dried per day" must be multiplied by the PM2.5 emission factor. The "equivalent volume of daily lumber dried per day" (see Condition 4.3.5) must be determined based on the proportion of drying hours for each batch that occurs on that day. Condition 4.3.5 requires that the "daily lumber volume dried per batch" (based on the proportion of hours that occurred on that day for that batch) be determined. To determine the "daily volume of lumber dried per batch", the "batch drying time per day" (Condition 4.3.3) and the "entire batch drying time" (Condition 4.3.4) must be tracked. The "entire batch drying time" begins when the kiln doors are closed and the kiln heat is turned on and ends when the kiln doors are opened and the roof vents stop exhausting kiln gases. The batch drying time per day is those hours in the "entire batch drying time" that occur on each calendar day. By summing the proportion of "daily lumber volume dried" for all batches that occur on the same day, the "equivalent volume of daily lumber dried per day" is determined.

As an example, if a 280 mbf batch of lumber is dried for 35 hours over two days, with 14 hours of drying on day one and 21 hours on day two, the "daily lumber volume dried" on day one would be 280 x 14 / 35 = 112 mbf, and the "daily lumber volume dried" on day two would be 280 x 21 / 35 = 168 mbf. Note that 112 + 168 = 180 mbf. If another batch of lumber was dried on day one, similar proportioning must be done, so the sum of the proportions of the two batches dried on day one equal the equivalent volume of daily lumber dried on that day. The process is repeated for each day of the year.

Permit Condition 4.3.2 requires the Permittee to track the total volume of lumber dried in a year, which enables calculation of annual emissions.

Permit Condition 4.3.6 of the final permit requires tracking the zone-specific (10 zones across the kiln) temperatures exiting each load (not just the downstream load as was proposed in the draft permit) and requires 60-minute average values (clarified from draft permit) be recorded. For each of the 10 zones, the permit requires the Permittee to record a 60-minute average exiting air temperature for each load. Permit Condition 4.3.7 of the final permit requires tracking the moisture content at four equally-spaced locations in each load of lumber and calculation of a two-load average value every 60 seconds and record the lowest average value calculated during the drying cycle. These changes were made in the final permit to better reflect the permittee's existing monitoring.

Permit Condition 4.4 requires that the air temperature and lumber moisture monitoring systems/equipment be maintained and accurate, consistent with the calibration schedule presented in the United States Forest Service document referenced above. This provision was added after the draft permit was proposed to ensure the monitoring equipment is properly maintained and the data quality assured.

Permit Condition 4.5 requires the Permittee to track various parameters that reflect the boilers' hourly operation along with associated control device performance. This information is important for determining the conditions under which source testing must be conducted to ensure the resultant emission factors are representative of operation at either a typical weekday or weekend steaming rate. The typical steam demand over the weekend is less than during the week because a number of steam-consuming process units (e.g. veneer dryers and log steaming vats) do not operate over the weekend. Condition 4.5.1 generates information for determining the emission factor used to estimate emissions, hour by hour, if more than one emission factor is necessary to characterize emissions across the range of steaming rates.

Permit Condition 4.6 requires the Permittee to track sawmill operating hours to calculate emissions for (a) pneumatic conveyance of wood residue at the sawmill and (b) plant traffic. Condition 4.6 also requires the Permittee to track planer mill operating hours along with BH-4 fan hours to calculate emissions for pneumatic conveyance of wood residue at the planer mill. BH-4 controls PCWR-PM-PTB emissions exhausting from the ply trim bin. The bin serves both the planer mill and the plywood mill. Because the annual PM2.5 AQIA emissions increase calculation for PCWR-PM-PTB considered all BH-4 fan hours in the '15-'16 baseline regardless of duty to either sawmill or plywood mill, the Permittee must continue to track all BH-4 fan hours regardless of duty. In addition, daily planer production (Condition 4.6.4) and hours of operation (Condition 4.6.1) information must be tracked and later used to determine the representative conditions under which testing of PCWR-PM-SH and PCWR-PM-SD must be conducted to ensure that the resultant emission factors are representative of worst-case particulate loading to the baghouses. Worst-case particulate loadings occur when the planer and trim saw are processing lumber at the highest volumetric flow rate (mbf/hr). Emissions from these activities are controlled by BH-2 and BH-3, respectively. Once testing of BH-2 and BH-3 is complete and reports submitted to Region 10, the Permittee must begin calculating emissions for PCWR-PM-SH and PCWR-PM-SD by multiplying the test-derived emission factors by the daily planer lumber throughputs.

A number of baghouses and a cyclone are employed in the sawmill and planer mill. Without the use of these air pollution control devices, the Permittee would be unable to comply with the associated PM2.5 emission limits in Tables 3-1 and 3-3 of the permit. The emission factors the Permittee is required to use to calculate emissions assume a certain degree of emission reduction. Region 10 considered requiring the Permittee to install equipment to monitor baghouse performance. The best indicators of fabric filter performance are the particulate matter outlet concentration, which can be measured with a PM continuous emissions monitoring system (CEMS) or a bag leak detection system used to monitor bag breakage and leakage. Opacity monitoring is also an indicator of fabric filter performance. Other indicators of performance include pressure differential, inlet temperature, temperature differential, exhaust gas flow rate, cleaning mechanism operation and fan current. Permit Condition 4.11 discussed below requires the Permittee to visually observe baghouse exhaust at least monthly as part of facility-wide plant walkthrough obligation. Some problems with baghouse performance will be detected during walkthroughs. The emission limits in Conditions 3.6 and 3.7 of the final permit (necessary for NAAQS protection) were based upon a very stringent 0.0032 gr/dscf emission factor. At this time, Region 10 is making the determination that the walkthroughs adequately assure compliance with the emission limits in Tables 3-1 and 3-3 of the permit. However, Region 10 will re-evaluate this monitoring determination in the context of Title V permit drafting (under the authority of 40 CFR 71.6(a)(3)(i)(B) and 71.6(c)(1) and/or 40 CFR 49.159(e)) upon receipt and evaluation of BH-2 and BH-3 test reports.

Permit Condition 4.7 requires the Permittee to track activities that influence PM2.5 emissions generated by plant traffic on paved and unpaved areas. Table 3-1 of the permit limits these emissions to 19.39 lb/day. The emission factor the Permittee is required to use to calculate daily emissions assumes a certain degree of emission reduction as the result of restricting traffic speed to 15 miles-per-hour on unpaved areas, watering paved and unpaved areas, and sweeping paved areas. Monitoring and recording some of the details of these work practices is important to assure the representativeness of the emission factor employed, and moreover to assure that actual emissions are not greater than reported.

In determining the appropriate level of monitoring, recordkeeping, and reporting, we considered the fact that the highest ambient PM2.5 concentrations in the vicinity of the facility are observed in the winter during cold stable weather episodes resulting in stagnant atmospheric conditions. Winter is the time of year least conducive to plant traffic fugitive dust formation given the relative abundance of rainfall (increasing moisture content of surface material). In addition, stagnant air reduces the likelihood of PM entrainment into the atmosphere.

Permit Conditions 4.8 and 4.9 specify the frequency for calculating daily emissions and the deadline for calculating annual emissions to determine compliance with the limits in Tables 3-1 and 3-3 of the permit along with new Permit Condition 3.8.

Permit Condition 4.10 is a general recordkeeping requirement as required in 40 CFR 49.155(a)(4), enhanced with similar language from 40 CFR Part 63. This condition establishes the time frame for retaining records and details the information that is subject to this retention requirement.

Permit Conditions 4.11 through 4.16 require a monthly survey (also called a plant walkthrough) for visible and fugitive emissions as well as specific follow-up steps (investigation, corrective action, RM9 observation and additional recordkeeping and reporting) if visible or fugitive emissions are observed. If observed visible or fugitive emissions cannot be eliminated within 24 hours, a tiered sequence of RM9 opacity determinations must be performed beginning with an initial 30-minute period of readings every 15 seconds. The frequency (e.g. daily) for conducting follow-up RM9 opacity readings is based upon whether any 6-minute average opacity exceeds 20%. Observations of visible or fugitive emissions during a survey are not considered deviations; however, any resulting RM9 6-minute average opacity determination above 20% is considered a permit deviation pursuant to Permit Condition 5.4. The annual fugitive particulate matter survey required in Permit Condition 4.18 can be accomplished simultaneously with a monthly survey required in this permit condition as long as both requirements are fully complied with. Permit Condition 4.12 relaxes survey frequency from monthly to quarterly for those activities documented to have not been generating visible or fugitive emissions for three consecutive monthly surveys. This opportunity for reduced monitoring frequency is not available to those activities employing an air pollution control device or following work practice requirements. The Permittee is required to maintain a list of the potential sources of fugitive dust or visible particulate emissions for which it is conducting surveys, and the list is to identify the monitoring frequency (monthly or quarterly) for each activity.

Permit Condition 4.17 states that the monthly plant walkthrough requirement is not applicable to PB-1 and PB-2. The Permittee measures visible emissions generated by each boiler continuously by employing a continuous opacity monitor as required by the boiler MACT.

Permit Conditions 4.18 through 4.22 require the Permittee to develop and update a fugitive dust plan consistent with the FARR.

Permit Conditions 4.23 specifies general requirements that any emission testing must follow, including the restrictions during testing.

Permit Conditions 4.24 and 4.25 provide the Permittee an opportunity to request changes to test methods in advance of testing.

Permit Condition 4.26 provides the Permittee an opportunity to request extensions of source test deadline in advance of testing.

Permit Section 5 – Reporting Requirements

Pursuant to 40 CFR 49.155(e)(5), the permit must require the submission of an annual report and prompt reporting of deviations. The permit also specifies required notifications, submission of test plans and test results and the locations for submitting reports.

Permit Condition 5.1 requires the Permittee to notify Region 10 of the dates of various events related to LK-6 and modifications to stacks serving BH-10 and BH-11. Permit Condition 2.14 states that permit requirements (with a few exceptions) apply upon initial startup of LK-6.

Permit Conditions 5.2 and 5.3 specifies general requirements that any emission testing must follow, including submitting a test plan before testing and a test report after having completed testing.

Permit Condition 5.4 requires promptly reporting deviations as required in 40 CFR 49.155(a)(5). An initial notification by phone and follow-up written notification is required. The permit defines "promptly" consistent with Region 10-issued Title V permits.

Permit Condition 5.5 requires an annual report to be submitted to Region 10 as required in 40 CFR 49.155(a)(5)(i).

Permit Condition 5.6 requires that the operation and maintenance manual in Permit Condition 3.5 be submitted and kept up to date.

Permit Condition 5.7 specifies where to submit reports, noting that a copy should always be sent to the Tribal environmental office.

8. Public Participation

8.1 Public Notice and Comment

As required in 40 CFR 49.157, all draft mNSR permits must be publicly noticed and made available for public comment for 30 days. For the draft permit, the public comment period began on September 6 and ended on October 11, 2018.

40 CFR 49.157(b)(1) requires the reviewing authority to provide adequate public notice to ensure that the affected community and the general public have reasonable access to the application and draft permit information, as set out in 40 CFR 49.157(b)(1)(i) and (ii). The public notice must provide an opportunity for public comment and notice of a public hearing, if any, on the draft permit. 40 CFR 49.157(b)(2) lists the information that must be included in the public notice. 40 CFR 49.157(c) explains how to submit comments and what the requirements are for holding a public hearing. For the draft permit, the notice was posted on Region 10's website at https://www.epa.gov/publicnotices/notices-search/location/Idaho and mailed to required persons. Region 10 announced an opportunity for a public hearing on the draft permit contingent upon the public expressing interest. Region 10 cancelled the hearing after receiving no requests for a public hearing. The cancellation announcement was posted on Region 10's website at https://www.epa.gov/caa-permitting/proposed-psd-air-permit-potlatchdeltic-st-maries-complex-idaho.

40 CFR 49.157(a) requires the reviewing authority to make available for public inspection at the appropriate EPA Regional Office and in at least one location in the area affected by the source, such as the Tribal environmental office or a local library, the application, additional information requested, a copy of the draft permit and the reviewing authority's analysis of the application including the control technology review and analysis of the effect on ambient air quality. This information was made available on Region 10's website and at the St. Maries Public Library and the Region 10 Library.

8.2 Response to Public Comments and Permit Issuance

During the public comment period, Region 10 received comments from the following parties: Benewah County Board of Commissioners, PotlatchDeltic, Idaho Forest Group, National Council for Air and Stream Improvement, American Wood Council and Western Wood Products Association. Region 10 considered all comments received during the public comment period, as well as application updates received from the Permittee after the close of the comment period, in making a final permit decision. See Region 10's separate Response to Comments document for a summary of the comments and our responses. As required in 40 CFR 49.159, Region 10 will notify the Permittee in writing of the final decision and will provide adequate public notice of the final permit decision to ensure that the affected community, general public and any individuals who commented on the draft permit have reasonable access to the decision and supporting materials.

As provided in 40 CFR 49.159(a), the permit becomes effective 30 days after service of notice of the final permit decision, unless review of the final permit is requested under 40 CFR 49.159(d) (in which case the specific terms and conditions of the permit that are the subject of the request for review must be stayed).

9. Abbreviations and Acronyms

Bf	Board feet
Btu	British thermal units
CAA	Clean Air Act [42 U.S.C. section 7401 et seq.]
CFR	Code of Federal Regulations
CO	Carbon monoxide
EJ	Environmental Justice
EPA	United States Environmental Protection Agency (also U.S. EPA)

ESA	Endangered Species Act
ESP	Electrostatic Precipitator
EU	Emission Unit
F	Fahrenheit
FARR	Federal Air Rules for Reservations
FDP	Fugitive Dust Plan
HAP	Hazardous air pollutant
Hr	Hour
Lb	Pound (lbs = pounds)
m	Thousand
mm	Million
MACT	Maximum Achievable Control Technology (40 CFR Part 63)
mNSR	Minor New Source Review program
NAAQS	National Ambient Air Quality Standard
NESHAP	National Emission Standards for Hazardous Air Pollutants (40 CFR Parts 61 and 63)
NHPA	National Historical Preservation Act
NO_X	Nitrogen oxides
NSPS	New Source Performance Standard
PM	Particulate matter
PM10	Particulate matter less than or equal to 10 microns in aerodynamic diameter
PM2.5	Particulate matter less than or equal to 2.5 microns in aerodynamic diameter
PSD	Prevention of significant deterioration
PTE	Potential to emit
Region 10	U.S. EPA, Region 10
RM	EPA Reference Method, as in EPA RM 5
SIC	Standard Industrial Code
SO_2	Sulfur dioxide
tpy	Tons per year
VOC	Volatile organic compound

Appendix A

EPA Estimation of PotlatchDeltic St. Maries Operations Non-HAP Potential Air Pollutant Emissions

St. Maries Operations Consist of Activities at St. Maries Lumber Drying Division (AFS ID No. 16-009-00030) and St. Maries Complex (AFS ID No. 16-009-00001)

Technical Support Document
PSD Permit No. R10PSD00100 &
Minor NSR Permit No. R10TNSR01800

St. Maries, Idaho

Appendix A: Potential Emissions Inventory

Summary of St. Maries Operations Non-HAP Potential to Emit[1]

Potential to Emit, (tons per year)

Non-Fugitive Emissions[2], (tons per year)

Pollutant	LDD Lumber Drying Division	SMC St. Maries Complex	**Non-Fugitive Subtotal**
Carbon Monoxide (CO)	249.1	945	1,194
Lead (Pb)	0.01	0.04	0.05
Nitrogen Oxides (NO_X)	40.3	172	212
Particulate (PM)	7.5	226.9	234
Inhalable Coarse Particulate (PM_{10})	12.3	225.0	237
Fine Particulate ($PM_{2.5}$)	12.3	211.6	224
Sulfur Dioxide (SO_2)	1.8	8.2	10
Volatile Organic Compounds (VOC)	284.2	367.1	651
Sulfuric Acid Mist (H_2SO_4)	0.9	2.3	3
Greenhouse Gas (CO_2e)	42,184	179,465	221,648

Fugitive Emissions, (tons per year)

Pollutant	LDD Lumber Drying Division	SMC St. Maries Complex	**Fugitive Subtotal**
Carbon Monoxide (CO)			
Lead (Pb)			
Nitrogen Oxides (NO_X)			
Particulate (PM)		597.5	598
Inhalable Coarse Particulate (PM_{10})		156.0	156
Fine Particulate ($PM_{2.5}$)		18.7	19
Sulfur Dioxide (SO_2)			
Volatile Organic Compounds (VOC)			
Sulfuric Acid Mist (H_2SO_4)			
Greenhouse Gas (CO_2e)			

All Emissions[3], (tons per year)

Pollutant	LDD Lumber Drying Division	SMC St. Maries Complex	**Total**
Carbon Monoxide (CO)	249.1	945.3	1,194
Lead (Pb)	0.01	0.04	0.05
Nitrogen Oxides (NO_X)	40.3	172.1	212
Particulate (PM)	7.5	824.5	832
Inhalable Coarse Particulate (PM_{10})	12.3	381.0	393
Fine Particulate ($PM_{2.5}$)	12.3	230.3	243
Sulfur Dioxide (SO_2)	1.8	8.2	10
Volatile Organic Compounds (VOC)	284.2	367.1	651
Sulfuric Acid Mist (H_2SO_4)	0.9	2.3	3
Greenhouse Gas (CO_2e)	42,184	179,465	221,648

[1] LDD non-HAP PTE estimates presented here do not reflect hog-fuel pile emissions and plant traffic emissions as Potlatch provided no information to EPA regarding these emission generating activities.

[2] Only non-fugitive emissions are considered for this facility in determining whether it is a major PSD source given that neither its sawmill or plywood mill are one of the 27 listed source categories required to consider fugitive emissions. See definition of "major stationary source" at 40 CFR 52.21(b)(1)(iii).

[3] The "All Emissions" table sums the values in the "Non-Fugitive Emissions" and "Fugitive Emissions" tables.

Summary of LDD Non-HAP Potential to Emit[1]

Potential to Emit, (tons per year)

Non-Fugitive Emissions[2], (tons per year)

Pollutant	PB-3 Hurst Boiler	LK-1 to LK-4 Lumber Drying Kilns 1, 2, 3 and 4	**Non-Fugitive Subtotal**
Carbon Monoxide (CO)	249.1	0	249
Lead (Pb)	0.01	0	0
Nitrogen Oxides (NO_X)	40.3	0	40
Particulate (PM)	7.4	0.1	8
Inhalable Coarse Particulate (PM_{10})	10.8	1.5	12
Fine Particulate ($PM_{2.5}$)	10.8	1.5	12
Sulfur Dioxide (SO_2)	1.8	0	2
Volatile Organic Compounds (VOC)	0.5	283.7	284
Sulfuric Acid Mist (H_2SO_4)	0.9	0	1
Greenhouse Gas (CO_2e)	42,184	0	42,184

Fugitive Emissions, (tons per year)

Pollutant	PB-3 Hurst Boiler	LK-1 to LK-4 Lumber Drying Kilns 1, 2, 3 and 4	**Fugitive Subtotal**
Carbon Monoxide (CO)			0
Lead (Pb)			0
Nitrogen Oxides (NO_X)			0
Particulate (PM)			0
Inhalable Coarse Particulate (PM_{10})			0
Fine Particulate ($PM_{2.5}$)			0
Sulfur Dioxide (SO_2)			0
Volatile Organic Compounds (VOC)			0
Sulfuric Acid Mist (H_2SO_4)			0
Greenhouse Gas (CO_2e)			0

All Emissions[3], (tons per year)

Pollutant	PB-3 Hurst Boiler	LK-1 to LK-4 Lumber Drying Kilns 1, 2, 3 and 4	**Total**
Carbon Monoxide (CO)	249.1		249
Lead (Pb)	0.01		0
Nitrogen Oxides (NO_X)	40.3		40
Particulate (PM)	7.4	0.1	8
Inhalable Coarse Particulate (PM_{10})	10.8	1.5	12
Fine Particulate ($PM_{2.5}$)	10.8	1.5	12
Sulfur Dioxide (SO_2)	1.8		2
Volatile Organic Compounds (VOC)	0.5	283.7	284
Sulfuric Acid Mist (H_2SO_4)	0.9		1
Greenhouse Gas (CO_2e)	42,184		42,184

[1] LDD non-HAP PTE estimates presented here do not reflect hog-fuel pile emissions and plant traffic emissions as Potlatch provided no information to EPA regarding these emission generating activities.

[2] Only non-fugitive emissions are considered for this facility in determining whether it is a major PSD source source given that neither its sawmill or plywood mill are one of the 27 listed source categories required to consider fugitive emissions. See definition of "major stationary source" at 40 CFR 52.21(b)(1)(iii).

[3] The "All Emissions" table sums the values in the "Non-Fugitive Emissions" and "Fugitive Emissions" tables.

LDD Non-HAP Potential to Emit

Emission Unit:	**HB - Hurst Boiler**	
Manufacturer:	Hurst Boiler & Welding Company	
Manufacture/Modification Date:	1987	
Model:	HYB-6500-150	
Serial Number:	?	
Burner Type:	Underfeed stokers(?)	
Oxygen Trim System:	No (as defined by Boiler MACT)	
Fly Ash Reinjection:	?	
Sand Classifier:	?	
Maximum Steam Production:	34,500	pounds saturated steam per hour at __ psig and ___ °F
Nameplate Heat Input Capcity:	49	MMBtu/hr
FHISOR:	1.321	MMBtu/Mlb steam. Fuel heat input (based upon HHV) to steam output ratio measured during February 25, 2016 Boiler MACT testing @ 28,492 lb/hr steam
Maximum Operation:	8760	hours per year
Fuel:	Wet biomass (greater than 20% moisture content, wet basis) comprised of SMC wood residuals. Dry biomass combusted during startup.	
Boiler MACT Subcategory:	Stokers/sloped grate/other units designed to burn wet biomass/bio-based solid	
Particulate Matter Control Device No. 1:	Multiclone (required by Idaho DEQ Title V permit No. T1-2012.0059)	
Manufacturer:	Hurst	
Manufacture Date:	1987	
Particulate Matter Control Device No. 2:	Two-field dry electrostatic precipitator (required by Idaho DEQ Title V permit No. T1-2012.0059)	
Manufacturer:	McGill	
Model:	AirClean Intercept Model 2-75	
Installation Date:	2003	

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Criteria Pollutant Emissions	EF (lb/MMBtu)	EF (lb/Mlb steam)	PTE (tpy)	EF Reference
Carbon Monoxide (CO)	1.248	~~0.641~~	249.1	Boiler MACT CO emission limit of 1500 ppmdv @ 3% O2 equivalent to 1.248 lb/MMBtu for biomass combusted during February 2016 Boiler MACT testing in which Fd = 9806 dscf/MMBtu. See July 8, 2016 Notification of Compliance Status for Potlatch's selection of 3-hour average compliance option rather than 720 ppmdv @ 3% O2 30-day rolling average. Row 7.a of Table 2 to 40 CFR 63 subpart DDDDD. Boiler MACT emission limit applicable at all times unit is operating except startup and shutdown. For derivation of the "lb/MMBtu" emission rates, see EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf. See Option 2 for Boiler MACT CO emission limit applicable to existing stokers/sloped grate/others designed to burn wet biomass fuel. Measured CO emission rate of 0.641 lb/MMBtu is not employed because the source is not required to achieve the emission rate observed. See Bison Engineering, Inc. April 22, 2016 Boiler MACT Stack Test Report prepared for Potlatch Land and Lumber, LLC. Table 7 of the report documents February 25, 2016 testing of Hurst boiler while generating approximately 28,500 lb steam/hr. 0.641 lb CO/Mlb steam = [(28.0 lb/hr / 28.389 Mlb steam/hr) + (5.9 lb/hr / 27.844 Mlb steam/hr) + (21.2 lb/hr / 29.244 Mlb steam/hr)] / 3.
Lead (Pb)	0.000048		0.01	AP-42, September 2003. Table 1.6-4.
Nitrogen Oxides (NO_X)		0.267	40.3	Spidell and Associates. August 27, 2004 Source Test Report prepared for Potlatch Corporation. Table 2 of the report documents August 4, 2004 testing of Hurst boiler while generating approximately 31,500 lb steam/hr. 0.267 lb NO_X/Mlb steam = [(8.84 lb/hr / 30.990 Mlb steam/hr) + (7.02 lb/hr / 32.271 Mlb steam/hr) + (9.32 lb/hr / 31.113 Mlb steam/hr)] / 3. No NO_X testing reported in 2016 Boiler MACT Stack Test Report.

Particulate (PM)	0.037	~~0.033~~	7.4	Boiler MACT PM emission limit applicable at all times unit is operating except startup and shutdown. See July 8, 2016 Notification of Compliance Status for Potlatch's selection of PM compliance option rather than total selected metals. For PM limit, see row 7.b of Table 2 to 40 CFR 63 subpart DDDDD. PM emissions are the "filterable" fraction quantified via EPA RM5. PM emissions do not include the "condensible" fraction. See EPA final rulemaking in the October 25, 2012 Federal Register, pages 65107-65119, at http://www.gpo.gov/fdsys/pkg/FR-2012-10-25/pdf/2012-25978.pdf. The 0.033 lb/mlb steam PM EF derived from stack testing is not employed to determine PTE because (a) control devices (multiclones and electrostatic precipitator (ESP)) were employed to reduce PM emission during the test and (b) the source is not required to achieve the emission rates observed. See Bison Engineering, Inc. April 22, 2016 Boiler MACT Stack Test Report prepared for Potlatch Land and Lumber, LLC. Table 7 of the report documents February 25, 2016 testing of Hurst boiler while generating approximately 28,500 lb steam/hr. 0.033 lb PM/Mlb steam = [(1.01 lb/hr / 28.389 Mlb steam/hr) + (0.81 lb/hr / 27.844 Mlb steam/hr) + (0.98 lb/hr / 29.244 Mlb steam/hr)] / 3.
Inhalable Coarse Particulate (PM_{10})	0.054		10.8	Boiler MACT for filterable portion and AP-42's Table 1.6-1, September 2003 for condensible portion. Assume all PM is also PM_{10}. 0.037 lb/MMBtu (filterable) + 0.017 lb/MMBtu (condensible) = 0.054 lb/MMBtu.
Fine Particulate ($PM_{2.5}$)	0.054		10.8	Boiler MACT for filterable portion and AP-42's Table 1.6-1, September 2003 for condensible portion. Assume all PM is also PM_{10}. 0.037 lb/MMBtu (filterable) + 0.017 lb/MMBtu (condensible) = 0.054 lb/MMBtu.
Sulfur Dioxide (SO_2)	0.009		1.8	Biomass fuel upper bound sulfur estimate of 0.026% by weight (dry) and 15% conversion to SO_2. See derivation of 0.009 lb/MMBtu EF below.
Volatile Organic Compounds (VOC)	0.0023		0.5	Travis Energy & Environment, Inc. December 18, 1994 Emission Test Report prepared for Potlatch Corp. Table 3-3b of the report documents November 16, 1994 testing of the Hurst boiler. The portions of the report provided to EPA do not present the heat input or steam generating rates experienced during testing. We assume the heat input was approximately 49 MMBtu/hr during November 1994 testing as that was the rate calculated for the 2016 Boiler MACT testing. The 2016 Boiler MACT Stack Test Report indicates that no VOC testing was performed at that time, and the VOC testing conducted on August 4, 2004 was determined to be invalid by Idaho DEQ. See derivation of 0.002 lb/MMBtu EF below.
Sulfuric Acid Mist (H_2SO_4)	0.0043		0.9	8 percent of PM2.5 emissions, based on BART-recommended PM2.5 / sulfate speciation for hog fuel boilers.

Greenhouse Gas Emissions (CO_2 Equivalent)	EF (lb/MMBtu)	EF (lb/mlb steam)	PTE (tpy)	EF Reference
Carbon Dioxide (CO_2)	206.8		41,280.7	GHG Reporting Rule (40 CFR 98) is considered the primary reference for estimating GHG emissions when preparing or processing permit applications.
Methane (CH_4)	1.764		352.1	GHG Reporting Rule (40 CFR 98) is considered the primary reference for estimating GHG emissions when preparing or processing permit applications.
Nitrous Oxide (N_2O)	2.759		550.7	GHG Reporting Rule (40 CFR 98) is considered the primary reference for estimating GHG emissions when preparing or processing permit applications.
TOTAL			42,184	

<u>SO_2 EF: 0.009 lb/MMBtu</u>

Basis: Maximum sulfur content of 0.026% by weight, dry basis was measured during March 2017 sampling event at the facility. Upper bound 15% conversion to SO_2. See H. S. Oglesby & R. O. Blosser (1980) Information on the Sulfur Content of Bark and its Contribution to SO_2 Emissions when Burned as a Fuel, Journal of the Air Pollution Control Association, 30:7, 769-772, DOI:10.1080/00022470.1980.10465107. A 15% sulfur to SO_2 conversion factor is a reasonable upper bound estimate given 10% conversion measured by Oglesby and Blosser based upon limited amount of data from a handful of species.

EF (lb/MMBtu) = {[Upper bound S Content (%S) / 100] X $CF_{S \rightarrow SO2}$ / HV_{fuel} (Btu/lb)} X $CF_{Btu \rightarrow MMBtu}$ (Btu/MMBtu)

• $CF_{S \rightarrow SO2}$ = 2 lb SO_2/lb S. S + $O_2 \rightarrow SO_2$. For every 1 mol S (16 lb/lb-mol) reactant, there is 1 mol SO_2 (32 lb/lb-mol) product. 32 / 16 = 2. Assume that only 15% of sulfur is exhausted to atmosphere as SO_2. The balance precipitates out as sulfates in the ash. Multiplying by 0.15, resultant CFS→SO_2 = 0.3 lb SO_2/lb S.

• HHV (higher heating value) fuel= 8587 Btu/lb. This is the heating value of the fuel sample with sulfur content of 0.026% by weight, dry.

Reasonable Upper Bound Fuel Sulfur Content (% by weight)	Reasonable Upper Bound 15% Conversion $CF_{S \rightarrow SO2}$ (lb SO_2/lb S)	HHV_{fuel} (Btu/lb)	$CF_{Btu \rightarrow MMBtu}$ (Btu/MMBtu)	Calculated EF (lb/MMBtu)
0.026	0.3	8587	1.0E+06	0.009

Calculation to convert VOC (as carbon) to VOC (as compound)

VOC (as weighted-average VOC) = $(VOC_C) \times [(MW_{wt\text{-}avg\ VOC}) / (MW_C)] \times [(\#C_C) / (\#C_{wt\text{-}avg\ VOC})]$

where:

VOC_C equals "0.0017 lb/MMBtu" from December 18, 1994 Emission Test Report. Method 25A 0.0017 lb/MMBtu = 0.082 lb/hr / 49 MMBtu/hr.

$MW_{wt\text{-}avg\ VOC}$ equals "64.689 lb/lb-mol" and is the weighted-average molecular weight for VOC assuming speciated organic compound ratios supported by AP-42 Table 1.6-3

MW_C equals "12.0110 lb/lb-mol" and represents the molecular weight for carbon

$\#C_C$ equals "1" as the single carbon atom was the "basis" for which Method 25A VOC test results were determined

$\#C_{wt\text{-}avg\ VOC}$ equals "3.975" and is the weighted-average number of carbon atoms present in VOC assuming speciated organic compound ratios supported by AP-42 Table 1.6-3

Calculating value for VOC (as weighted-average VOC):

VOC (as carbon):	0.0017	lb/MMBtu
$MW_{wt\text{-}avg\ VOC}$:	64.689	lb/lb-mol
MW_C:	12.011	lb/lb-mol
$\#C_C$:	1	
$\#C_{wt\text{-}avg\ VOC}$:	3.975	
VOC (as weighted average VOC)	0.0023	lb/MMBtu

Factor to convert VOC_C to VOC (as weighted average VOC) = 1.355

The first two columns of the following table are extracted from AP-42, September 2003. Table 1.6-3. The third and fourth columns were created based upon information widely available over the internet. The fifth and sixth columns illustrate calculations necessary to determine weighted-average molecular weight and weighted-average number of carbon atoms comprising VOC emissions resulting from wood residue combustion.

Wood Residue Combustion Organic Compounds	EF (lb/MMBtu)	MW lb/lb-mol	Number of Carbon Atoms	EF x MW	EF X #C atoms
Acenaphthene	9.10E-07	154.21	12	1.40E-04	1.09E-05
Acenaphthylene	5.00E-06	152.19	12	7.61E-04	6.00E-05
Acetaldehyde	8.30E-04	44.05	2	3.66E-02	1.66E-03
Acetone	1.90E-04	58.08	3	1.10E-02	5.70E-04
Acetophenone	3.20E-09	120.15	8	3.84E-07	2.56E-08
Acrolein	4.00E-03	56.06	3	2.24E-01	1.20E-02
Anthracene	3.00E-06	178.23	14	5.35E-04	4.20E-05
Benzaldehyde	8.50E-07	106.12	7	9.02E-05	5.95E-06
Benzene	4.20E-03	78.11	6	3.28E-01	2.52E-02
Benzo(a)anthracene	6.50E-08	228.29	18	1.48E-05	1.17E-06
Benzo(a)pyrene	2.60E-06	252.31	20	6.56E-04	5.20E-05
Benzo(b)fluoranthene	1.00E-07	252.31	20	2.52E-05	2.00E-06
Benzo(e)pyrene	2.60E-09	252.31	20	6.56E-07	5.20E-08
Benzo(g,h,i)perylene	9.30E-08	276.33	22	2.57E-05	2.05E-06
Benzo(j,k)fluoranthene	1.60E-07	202.26	16	3.24E-05	2.56E-06
Benzo(k)fluoranthene	3.60E-08	252.31	20	9.08E-06	7.20E-07
Benzoic acid	4.70E-08	122.12	7	5.74E-06	3.29E-07
Bis(2-ethylhexyl)phthalate (DEHP)	4.70E-08	390.56	24	1.84E-05	1.13E-06
Bromomethane (Methyle bromide)	1.50E-05	94.94	1	1.42E-03	1.50E-05
2-Butanone (MEK)	5.40E-06	72.11	4	3.89E-04	2.16E-05
Carbazole	1.80E-06	167.21	12	3.01E-04	2.16E-05
Carbon tetrachloride	4.50E-05	153.82	1	6.92E-03	4.50E-05
Chlorobenzene	3.30E-05	112.56	6	3.71E-03	1.98E-04
Chloroform	2.80E-05	119.38	1	3.34E-03	2.80E-05
Chloromethane (Methyl chloride)	2.30E-05	50.49	1	1.16E-03	2.30E-05
2-Chloronaphthalene	2.40E-09	162.62	10	3.90E-07	2.40E-08
2-Chlorophenol	2.40E-08	128.56	6	3.09E-06	1.44E-07
Chrysene	3.80E-08	228.28	18	8.67E-06	6.84E-07
Crotonaldehyde	9.90E-06	70.09	4	6.94E-04	3.96E-05
Decachlorobiphenyl	2.70E-10	498.6584	12	1.35E-07	3.24E-09
Dibenzo(a,h)anthracene	9.10E-09	278.35	22	2.53E-06	2.00E-07
1,2-Dibromoethene	5.50E-05	185.85	2	1.02E-02	1.10E-04

Dichlorobiphenyl	7.40E-10	223.09792	12	1.65E-07	8.88E-09
1,2-Dichloroethane (Ethylene dichloride)	2.90E-05	98.96	2	2.87E-03	5.80E-05
Dichloromethane (Methylene chloride)	2.90E-04	84.93	2	2.46E-02	5.80E-04
1,2-Dichloropropane (Propylene dichloride)	3.30E-05	122.99	3	4.06E-03	9.90E-05
2,4-Dinitrophenol	1.80E-07	184.11	6	3.31E-05	1.08E-06
Ethyl benzene	3.10E-05	106.17	8	3.29E-03	2.48E-04
Fluoranthene	1.60E-06	202.26	16	3.24E-04	2.56E-05
Fluorene	3.40E-06	166.22	13	5.65E-04	4.42E-05
Formaldehyde	4.40E-03	30.03	1	1.32E-01	4.40E-03
Heptachlorobiphenyl	6.60E-11	395.32322	12	2.61E-08	7.92E-10
Hexachlorobiphenyl	5.50E-10	360.87816	12	1.98E-07	6.60E-09
Hexanal	7.00E-06	100.15888	6	7.01E-04	4.20E-05
Heptachlorodibenzo-p-dioxins	2.00E-09	425.30614	12	8.51E-07	2.40E-08
Heptachlorodibenzo-p-furans	2.40E-10	409.30674	12	9.82E-08	2.88E-09
Hexachlorodibenzo-p-dioxins	1.60E-06	390.82	12	6.25E-04	1.92E-05
Hexachlorodibenzo-p-furans	2.80E-10	374.86168	12	1.05E-07	3.36E-09
Indeno(1,2,3-cd)pyrene	8.70E-08	326.34	22	2.84E-05	1.91E-06
Isobutyraldehyde	1.20E-05	72.10572	4	8.65E-04	4.80E-05
2-Methylnaphthalene	1.60E-07	142.20	11	2.28E-05	1.76E-06
Monochlorobiphenyl	2.20E-10	187.64492	12	4.13E-08	2.64E-09
Naphthalene	9.70E-05	128.17	10	1.24E-02	9.70E-04
2-Nitrophenol	2.40E-07	139.11	6	3.34E-05	1.44E-06
4-Nitrophenol	1.10E-07	139.11	6	1.53E-05	6.60E-07
Octachlorodibenzo-p-dioxins	6.60E-08	459.7512	12	3.03E-05	7.92E-07
Octachlorodibenzo-p-furans	8.80E-11	443.7518	12	3.91E-08	1.06E-09
Pentachlorodibenzo-p-dioxins	1.50E-09	356.41602	12	5.35E-07	1.80E-08
Pentachlorodibenzo-p-furans	4.20E-10	340.41662	12	1.43E-07	5.04E-09
Pentachlorobiphenyl	1.20E-09	326.4331	12	3.92E-07	1.44E-08
Pentachlorophenol	5.10E-08	266.34	6	1.36E-05	3.06E-07
Perylene	5.20E-10	252.31	20	1.31E-07	1.04E-08
Phenanthrene	7.00E-06	178.23	14	1.25E-03	9.80E-05
Phenol	5.10E-05	94.11	6	4.80E-03	3.06E-04
Propanal	3.20E-06	58.08	3	1.86E-04	9.60E-06
Propionaldehyde	6.10E-05	58.08	3	3.54E-03	1.83E-04
Pyrene	3.70E-06	202.25	16	7.48E-04	5.92E-05
Styrene	1.90E-03	104.15	8	1.98E-01	1.52E-02
2,3,7,8-Tetrachlorodibenzo-p-dioxins	8.60E-12	321.97096	12	2.77E-09	1.03E-10
Tetrachlorodibenzo-p-dioxins	4.70E-10	321.97096	12	1.51E-07	5.64E-09
2,3,7,8-Tetrachlorodibenzo-p-furans	9.00E-11	305.97156	12	2.75E-08	1.08E-09
Tetrachlorodibenzo-p-furans	7.50E-10	305.97156	12	2.29E-07	9.00E-09
Tetrachlorobiphenyl	2.50E-09	291.98804	12	7.30E-07	3.00E-08
Tetrachloroethene (Tetrachloroethylene)	3.80E-05	165.83	2	6.30E-03	7.60E-05
o-Tolualdehyde	7.20E-06	120.15	8	8.65E-04	5.76E-05
p-Tolualdehyde	1.10E-05	120.15	8	1.32E-03	8.80E-05
Toluene	9.20E-04	92.14	7	8.48E-02	6.44E-03
Trichlorobiphenyl	2.60E-09	257.54298	12	6.70E-07	3.12E-08
1,1,1-trichloroethane (Methyl chloroform)	3.10E-05	133.40	2	4.14E-03	6.20E-05
Trichloroethene (Trichloroethylene)	3.00E-05	131.39	2	3.94E-03	6.00E-05
Trichlorofluoromethane	4.10E-05	137.37	1	5.63E-03	4.10E-05
2,4,6-Trichlorophenol	2.20E-08	197.45	6	4.34E-06	1.32E-07
Vinyl chloride	1.80E-05	62.50	2	1.13E-03	3.60E-05
o-Xylene	2.50E-05	106.16	8	2.65E-03	2.00E-04
TOTAL	1.75E-02			1.13E+00	6.96E-02
				64.689	3.975

weighted-average molecular weight of VOC ↗ 64.689

weighted-average number of carbon atoms comprising VOC ↖ 3.975

LDD Non-HAP Potential to Emit

Emission Unit:	**LK-1, LK-2, LK-3 and LK-4 - Lumber Drying Kilns 1, 2, 3 and 4**
Description:	Four double-track 68-foot-long lumber drying kiln
Manufacturer:	Coe/Moore
Installed:	1987
Heat Source:	Indirect steam provided by emission unit PB-3
Control Device:	None
Work Practice:	None
Fuel:	None
Potential Species Dried:	Douglas fir, western red cedar, grand fir, hemlock, lodgepole pine, subalpine fir, elgelmann spruce, ponderosa pine and western white pine
Annual Capacity:	149 MMbf/yr

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Pollutant Emissions	EF (lb/Mbf)	PTE (tpy)	EF Reference
Carbon Monoxide (CO)	0	0	
Lead (Pb)	0	0	
Nitrogen Oxides (NO_X)	0	0	
Particulate (PM)	0.002	0.1	1 - PM emissions testing conducted in 2013 at Chemco in Ferndale, Washington. Based upon information presented by Potlatch in its February 1, 2018 submittal to EPA Region 10, PM emissions testing conducted by Horizon Engineering at Oregon State University pilot-scale kiln in 1998 is invalid.
Inhalable Coarse Particulate (PM_{10})	0.020	1.5	1 - PM emissions testing conducted in 2013 at Chemco in Ferndale, Washington. Based upon information presented by Potlatch in its February 1, 2018 submittal to EPA Region 10, PM emissions testing conducted by Horizon Engineering at Oregon State University pilot-scale kiln in 1998 is invalid.
Fine Particulate ($PM_{2.5}$)	0.020	1.5	1 - PM emissions testing conducted in 2013 at Chemco in Ferndale, Washington. Based upon information presented by Potlatch in its February 1, 2018 submittal to EPA Region 10, PM emissions testing conducted by Horizon Engineering at Oregon State University pilot-scale kiln in 1998 is invalid.
Sulfur Dioxide (SO_2)	0	0	
Volatile Organic Compounds (VOC)	3.8087	284	2 - Because the facility has the ability to dry resinous and non-resinous softwood species at temperatures in excess of 200ºF, select the highest WPP1 VOC EF from among all softwood species for drying above 200ºF. The Ponderosa Pine EF is highest.
Sulfuric Acid Mist (H_2SO_4)	0	0	

Greenhouse Gas Emissions (CO_2 Equivalent)	EF (lb/Mbf)	PTE (tpy)	EF Reference
Carbon Dioxide (CO_2)	0	0	
Methane (CH_4)	0	0	
Nitrous Oxide (N_2O)	0	0	
TOTAL		0	

EF Reference	Description
1	February & May/June 2013 emissions testing of Hemlock lumber drying at less than 180°F within a pilot-scale kiln at Chemco in Ferndale, Washington. Testing was performed by Emission Technologies, Inc. on behalf of Sierra Pacific Industries and consisted of RM5 and 202. http://www.swcleanair.org/docs/Dry%20Kilns/SourceTests/2013-02-21%20Sierra%20Pacific%20-%20Chemco%20-%20Ferndale%20-%20Dry%20Kiln%20PM%20Test%20Report.pdf & http://www.swcleanair.org/docs/Dry%20Kilns/SourceTests/2013-05-29%20Sierra%20Pacific%20-%20Mt%20Vernon%20-%20Pilot%20Dry%20Kiln%20Filterable%20and%20Condensable%20PM%20Test%20Report.pdf
2	EPA Region 10 HAP and VOC Emission Factors for Lumber Drying, December 2012. https://www.epa.gov/sites/production/files/2016-09/documents/ldkhapvocpteef_memo.pdf

Summary of SMC Non-HAP Potential to Emit

Potential to Emit, (tons per year)

Non-Fugitive Emissions[1], (tons per year)

Emission Unit ID →	PB-1	PB-2	LK-5	VD-1 to VD-4			PV-1 & PV-2	LS-1	PCWR-SM[3]	PCWR-PM	IC-1 & IC-2	IC-3 to IC-10	CA	ES	PP & WP	BV-1 to BV-4	DB & COS	WRD-SM[4]	HFP-SM	PT	
				VDHS-1 to VDHS-4	VDL-1 to VDL-4	VDCS-1 to VDCS-4															
Emission Unit / Emission Generating Activity →	CE Boiler	Riley Boiler	Lumber Drying Kiln 5	Veneer Dryer Heating Section	Veneer Dryer Leaks	Veneer Dryer Cooling Section	Plywood Presses 1 & 2	Log Steaming Vault	Pneumatic Conveyance of Wood Residue at Sawmill	Pneumatic Conveyance of Wood Residue at Plywood Mill	Diesel-Fired Engines	Propane-Fired Engines	Compressed Air Drying Agent System	Edge Seal and Surface Coating Line	Plywood Panel Patching	Building Vents 1 to 4	Log Debarking and Cut-Off Saws	Wood Residue Drops at Sawmill	Wind Erosion of Hog Fuel Pile at Sawmill	Plant Traffic	**Non-Fugitive Subtotal**
Carbon Monoxide (CO)	231.2	705.4		0.7							0.2	7.8									945
Lead (Pb)	0.01	0.03																			0
Nitrogen Oxides (NO_X)	54.7	115.9		0.6							0.8	0.1									172
Particulate (PM)	5.1	21.2	0.2	2.9	4.1	1.5	21.0		81.1	85.8	0.04	0.01				4.1					227
Inhalable Coarse Particulate (PM_{10})	6.3	22.3	1.6	5.9	8.5	3.2	35.6		56.2	81.3	0.04	0.01				4.1					225
Fine Particulate ($PM_{2.5}$)	6.3	22.3	1.6	5.9	8.5	3.2	35.6		53.3	70.8	0.04	0.01				4.1					212
Sulfur Dioxide (SO_2)	2.3	5.2		0.6							0.0934	0.001									8
Volatile Organic Compounds (VOC)	1.7	4.5	112.5	18.2	0.8	6.0	18.0	15.3	68.7	75.1	0.1	0.002	3.3	20.5	22.4						367
Sulfuric Acid Mist (H_2SO_4)	0.5	1.8																			2
Greenhouse Gas (CO_2e)	53,455	121,096		4,876							30	8									179,465

Fugitive Emissions, (tons per year)

Emission Unit ID →	PB-1	PB-2	LK-5	VD-1 to VD-4			PV-1 & PV-2	LS-1	PCWR-SM[3]	PCWR-PM	IC-1 & IC-2	IC-3 to IC-10	CA	ES	PP & WP	BV-1 to BV-4	DB & COS	WRD-SM[4]	HFP-SM	PT	
				VDHS-1 to VDHS-4	VDL-1 to VDL-4	VDCS-1 to VDCS-4															
Emission Unit / Emission Generating Activity →	CE Boiler	Riley Boiler	Lumber Drying Kiln 5	Veneer Dryer Heating Section	Veneer Dryer Leaks	Veneer Dryer Cooling Section	Plywood Presses 1 & 2	Log Steaming Vault	Pneumatic Conveyance of Wood Residue at Sawmill	Pneumatic Conveyance of Wood Residue at Plywood Mill	Diesel-Fired Engines	Propane-Fired Engines	Compressed Air Drying Agent System	Edge Seal and Surface Coating Line	Plywood Panel Patching	Building Vents 1 to 4	Log Debarking and Cut-Off Saws	Wood Residue Drops at Sawmill	Wind Erosion of Hog Fuel Pile at Sawmill	Plant Traffic	**Fugitive Subtotal**
Carbon Monoxide (CO)																					0
Lead (Pb)																					0
Nitrogen Oxides (NO_X)																					0
Particulate (PM)																	20.8	0.16	0.20	576.4	598
Inhalable Coarse Particulate (PM_{10})																	0.6	0.004	0.005	155.4	156
Fine Particulate ($PM_{2.5}$)																	0.1	0.001	0.001	18.6	19
Sulfur Dioxide (SO_2)																					0
Volatile Organic Compounds (VOC)																		59.9			60
Sulfuric Acid Mist (H_2SO_4)																					0
Greenhouse Gas (CO_2e)																					0

All Emissions[2], (tons per year)

Emission Unit ID →	PB-1	PB-2	LK-5	VD-1 to VD-4			PV-1 & PV-2	LS-1	PCWR-SM[3]	PCWR-PM	IC-1 & IC-2	IC-3 to IC-10	CA	ES	PP & WP	BV-1 to BV-4	DB & COS	WRD-SM[4]	HFP-SM	PT	
				VDHS-1 to VDHS-4	VDL-1 to VDL-4	VDCS-1 to VDCS-4															
Emission Unit / Emission Generating Activity →	CE Boiler	Riley Boiler	Lumber Drying Kiln 5	Veneer Dryer Heating Section	Veneer Dryer Leaks	Veneer Dryer Cooling Section	Plywood Presses 1 & 2	Log Steaming Vault	Pneumatic Conveyance of Wood Residue at Sawmill	Pneumatic Conveyance of Wood Residue at Plywood Mill	Diesel-Fired Engines	Propane-Fired Engines	Compressed Air Drying Agent System	Edge Seal and Surface Coating Line	Plywood Panel Patching	Building Vents 1 to 4	Log Debarking and Cut-Off Saws	Wood Residue Drops at Sawmill	Wind Erosion of Hog Fuel Pile at Sawmill	Plant Traffic	**Total**
Carbon Monoxide (CO)	231.2	705.4		0.7							0.2	7.8									945
Lead (Pb)	0.01	0.03																			0
Nitrogen Oxides (NO_X)	54.7	115.9		0.6							0.8	0.1									172
Particulate (PM)	5.1	21.2	0.2	2.9	4.1	1.5	21.0		81.1	85.8	0.04	0.01				4.1	20.8	0.16	0.20	576.4	824
Inhalable Coarse Particulate (PM_{10})	6.3	22.3	1.6	5.9	8.5	3.2	35.6		56.2	81.3	0.04	0.01				4.1	0.6	0.004	0.005	155.4	381
Fine Particulate ($PM_{2.5}$)	6.3	22.3	1.6	5.9	8.5	3.2	35.6		53.3	70.8	0.04	0.01				4.1	0.1	0.001	0.001	18.6	230
Sulfur Dioxide (SO_2)	2.3	5.2		0.6							0.0934	0.001									8
Volatile Organic Compounds (VOC)	1.7	4.5	112.5	18.2	0.8	6.0	18.0	15.3	68.7	75.1	0.1	0.002	3.3	20.5	22.4			59.9			427
Sulfuric Acid Mist (H_2SO_4)	0.5	1.8																			2
Greenhouse Gas (CO_2e)	53,455	121,096		4,876							30	8									179,465

Notes:

[1] Only non-fugitive emissions are considered for this facility in determining whether it is a major PSD source source given that neither its sawmill or plywood mill are one of the 27 listed source categories required to consider fugitive emissions. See definition of "major stationary source" at 40 CFR 52.21(b)(1)(iii).

[2] The "All Emissions" table sums the values in the "Non-Fugitive Emissions" and "Fugitive Emissions" tables.

[3] PCWR-SM consists of individual emission units S-CH, P-SH, P-SD, P-PTB, P-PSB, S-SD, S-SDB and other miscellaneous emission generating activities.

[4] WRD-SM consists of individual emission units WRD-SM-CH, WRD-SM-SD, WRD-SM-HF and WRD-SM-SH.

SMC Non-HAP Potential to Emit

Emission Unit:	**PB-1 - C.E. Boiler**	
Purpose:	Provide steam to block conditioning vaults, veneer dryers, plywood presses, lumber dry kiln and building heat	
Manufacturer:	Combustion Engineering Company Inc.	
Manufacture/Modification Date:	July 1964. 1979 modification replaced original pre-1965 "dutch oven" firebox with two Wellons fuel cells	
Model:	EC2-S-CI-VESSEL	
Serial Number:	8045	
Burner Type:	Fuel cell (2)	
Oxygen Trim System:	No (as defined by Boiler MACT)	
Fly Ash Reinjection:	No, not into PB-1 (fly ash collected from PB-1 and PB-2 exhaust is screened and reinjected into PB-2 furnace)	
Sand Classifier:	Yes (fly ash collected from PB-1 and PB-2 exhaust is screened and reinjected into PB-2 furnace)	
Maximum Steam Production:	43,034	pounds saturated steam per hour. Maximum daily average steaming rate observed 2016-2017.
Maximum Heat Input Capacity:	58	MMBtu/hr
Nameplate Heat Input Capcity:	43	MMBtu/hr
FHISOR:	1.342	MMBtu/Mlb steam. Fuel heat input (based upon HHV) to steam output ratio measured during February 24, 2016 Boiler MACT testing @ 34,311 l
Maximum Operation:	8760	hr/yr
Fuel:	Wet biomass (greater than 20% moisture content, wet basis) comprised of SMC wood residuals. Dry biomass combusted during startup.	
Boiler MACT Subcategory:	Fuel cell unit designed to burn biomass/bio-based solid fuel	
Particulate Matter Control Device No. 1:	Multiclone (required by minor NSR permit)	
Manufacturer:		
Model:		
Installation Date:	March 1979	
Particulate Matter Control Device No. 2:	Two-field dry electrostatic precipitator (required by minor NSR permit)	
Manufacturer:	PPC Industries	
Model:	S-1212	
Installation Date:	April 12, 1995	

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Criteria Pollutant Emissions	EF (lb/MMBtu)	EF (lb/Mlb steam)	PTE (tpy)	EF Reference
Carbon Monoxide (CO)	0.914	~~0.635~~	231.2	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. CO Option 2 for Boiler MACT CO emission limit applicable to existing fuel cell units designed to burn biomass/bio-based solid fuel. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf Boiler MACT CO emission limit of 1100 ppmdv @ 3% O_2 equivalent to 0.914 lb/MMBtu for biomass combusted during February 2016 Boiler MACT testing in which F_d = 9791 dscf/MMBtu. There is only a 3-run average compliance option; there is no 30-day rolling average available. Row 12.a of Table 2 to 40 CFR 63 subpart DDDDD. Boiler MACT emission limit applicable at all times unit is operating except startup and shutdown. Measured CO emission rate of 0.635 lb/Mlb steam is not employed because the source is not required to achieve the emission rate observed. See Bison Engineering, Inc. April 22, 2016 Boiler MACT Stack Test Report prepared for Potlatch Land and Lumber, LLC. Table 5 of the report documents February 24, 2016 testing of CE boiler while generating approximately 34,300 lb steam/hr. 0.635 lb CO/Mlb steam = [(20.2 lb/hr / 33.355 Mlb steam/hr) + (21.2 lb/hr / 34.509 Mlb steam/hr) + (24.0 lb/hr / 35.069 Mlb steam/hr)] / 3.

Lead (Pb)	0.000048		0.01	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. Pb Option 1 as no emission limits apply. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf
Nitrogen Oxides (NO_X)		0.29	54.7	Horizon Engineering. Project No. 3020 Source Evaluation Report prepared for Potlatch Forest Products Corporation. Table 2 of the report documents April 30, 2008 testing of CE boiler while generating approximately 23,700 lb steam/hr. No NO_X testing reported in 2016 Boiler MACT Stack Test Report.
Particulate (PM)	0.020	~~0.006~~	5.1	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. PM Option 4 for Boiler MACT PM emission limit applicable to existing fuel cell units designed to burn biomass/bio-based solid fuel. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf Boiler MACT PM emission limit applicable at all times unit is operating except startup and shutdown. See July 8, 2016 Notification of Compliance Status for Potlatch's selection of PM compliance option rather than total selected metals. For PM limit, see row 7.b of Table 2 to 40 CFR 63 subpart DDDDD. PM emissions are the "filterable" fraction quantified via EPA RM5. PM emissions do not include the "condensible" fraction. See EPA final rulemaking in the October 25, 2012 Federal Register, pages 65107-65119, at http://www.gpo.gov/fdsys/pkg/FR-2012-10-25/pdf/2012-25978.pdf. The 0.008 lb/Mlb steam PM EF derived from stack testing is not employed to determine PTE because (a) control devices (multiclones and electrostatic precipitator (ESP)) were employed to reduce PM emission during the test and (b) the source is not required to achieve the emission rates observed. See Bison Engineering, Inc. April 22, 2016 Boiler MACT Stack Test Report prepared for Potlatch Land and Lumber, LLC. Table 5 of the report documents February 24, 2016 testing of CE boiler while generating approximately 34,300 lb steam/hr. 0.008 lb PM/Mlb steam = [(0.38 lb/hr / 33.355 Mlb steam/hr) + (0.19 lb/hr / 34.509 Mlb steam/hr) + (0.26 lb/hr / 35.069 Mlb steam/hr)] / 3.
Inhalable Coarse Particulate (PM_{10})	0.025		6.3	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. PM_{10} Option 4 for Boiler MACT PM emission limit applicable to existing fuel cell units designed to burn biomass/bio-based solid fuel. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf. Assume all of filterable PM is PM10. Based upon April 2008 testing, condensible fraction is 6.3 lb/MMlb steam which is equivalent to 0.005 lb/MMBtu assuming FHISOR of 1.342 MMBtu/Mlb steam. 0.020 lb/MMBtu (filterable) + 0.005 lb/MMBtu (condensible) = 0.025 lb/MMBtu.
Fine Particulate ($PM_{2.5}$)	0.025		6.3	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. $PM_{2.5}$ Option 4 for Boiler MACT PM emission limit applicable to existing fuel cell units designed to burn biomass/bio-based solid fuel. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf. Assume all of filterable PM is PM10. Based upon April 2008 testing, condensible fraction is 6.3 lb/MMlb steam which is equivalent to 0.005 lb/MMBtu assuming FHISOR of 1.342 MMBtu/Mlb steam. 0.020 lb/MMBtu (filterable) + 0.005 lb/MMBtu (condensible) = 0.025 lb/MMBtu.
Sulfur Dioxide (SO_2)	0.009		2.3	Biomass fuel upper bound sulfur estimate of 0.026% by weight (dry) and 15% conversion to SO_2. See derivation of 0.009 lb/MMBtu EF below.

Volatile Organic Compounds (VOC)		0.0091	1.7	Horizon Engineering. Project No. 3020 Source Evaluation Report prepared for Potlatch Forest Products Corporation. Table 2 of the report documents April 30, 2008 testing of CE boiler while generating approximately 23,700 lb steam/hr. No VOC testing reported in 2016 Boiler MACT Stack Test Report. The three-run average value (as carbon) of 0.0067 lb/mlb steam is converted to 0.009 lb/Mlb steam (as compound emitted) assuming a weighted average VOC molecular weight of 64.7 lb/lb-mol and 4 carbon atoms per compound. The calculation to convert VOC (as carbon) to VOC (as compound) is displayed below.
Sulfuric Acid Mist (H_2SO_4)	0.0020		0.5	8 percent of PM2.5 emissions, based on BART-recommended PM2.5 / sulfate speciation for hog fuel boilers.

Greenhouse Gas Emissions (CO_2 Equivalent)	EF (lb/MMBtu)	EF (lb/Mlb steam)	PTE (tpy)	EF Reference
Carbon Dioxide (CO_2)	206.8		52,310.5	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. CO_2 Option 2 because the GHG Reporting Rule (40 CFR 98) is considered the primary reference for estimating GHG emissions when preparing or processing permit applications. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf.
Methane (CH_4)	1.764		446.2	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. CH_4 Option 2 because the GHG Reporting Rule (40 CFR 98) is considered the primary reference for estimating GHG emissions when preparing or processing permit applications. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf.
Nitrous Oxide (N_2O)	2.759		697.9	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. N_2O Option 2 because the GHG Reporting Rule (40 CFR 98) is considered the primary reference for estimating GHG emissions when preparing or processing permit applications. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf.
TOTAL			53,455	

SO_2 EF: 0.009 lb/MMBtu

Basis: Maximum sulfur content of 0.026% by weight, dry basis was measured during March 2017 sampling event at the facility. Upper bound 15% conversion to SO_2. See H. S. Oglesby & R. O. Blosser

EF (lb/MMBtu) = {[Upper bound S Content (%S) / 100] X $CF_{S\rightarrow SO2}$ / HV_{fuel} (Btu/lb)} X $CF_{Btu\rightarrow MMBtu}$ (Btu/MMBtu)

- $CF_{S\rightarrow SO2}$ = 2 lb SO_2/lb S. S + $O_2 \rightarrow SO_2$. For every 1 mol S (16 lb/lb-mol) reactant, there is 1 mol SO_2 (32 lb/lb-mol) product. 32 / 16 = 2. Assume that only 15% of sulfur is exhausted to atmosphere as SO_2.
- HHV (higher heating value) fuel= 8587 Btu/lb. This is the heating value of the fuel sample with sulfur content of 0.026% by weight, dry.

Reasonable Upper Bound Fuel Sulfur Content (% by weight)	Reasonable Upper Bound 15% Conversion $CF_{S\rightarrow SO2}$ (lb SO_2/lb S)	HHV_{fuel} (Btu/lb)	$CF_{Btu\rightarrow MMBtu}$ (Btu/MMBtu)	Calculated EF (lb/MMBtu)
0.026	0.3	8587	1.0E+06	0.009

Calculation to convert VOC (as carbon) to VOC (as compound)

VOC (as weighted-average VOC) = (VOC_C) X [($MW_{wt\text{-}avg\ VOC}$) / (MW_C)] X [($\#C_C$) / ($\#C_{wt\text{-}avg\ VOC}$)]

where:

VOC_C equals "0.0067 lb/Mlb steam" from April 30, 2008 testing of CE boiler. Value represents average value among three Method 25A test runs.

$MW_{wt\text{-}avg\ VOC}$ equals "64.689 lb/lb-mol" and is the weighted-average molecular weight for VOC assuming speciated organic compound ratios supported by AP-42

MW_C equals "12.0110 lb/lb-mol" and represents the molecular weight for carbon

$\#C_C$ equals "1" as the single carbon atom was the "basis" for which Method 25A VOC test results were determined

$\#C_{wt\text{-}avg\ VOC}$ equals "3.975" and is the weighted-average number of carbon atoms present in VOC assuming speciated organic compound ratios supported by AP-42 Table 1.6-3

Calculating value for VOC (as weighted-average VOC):

VOC (as carbon):	0.0067	lb/Mlb steam
$MW_{wt\text{-}avg\ VOC}$:	64.689	lb/lb-mol
MW_C:	12.011	lb/lb-mol
$\#C_C$:	1	
$\#C_{wt\text{-}avg\ VOC}$:	3.975	
VOC (as weighted average VOC)	0.0091	lb/Mb steam

Factor to convert VOC_C to VOC (as weighted average VOC) = 1.355

The first two columns of the following table are extracted from AP-42, September 2003. Table 1.6-3. The third and fourth columns were created based upon information widely available over the internet. The fifth and sixth columns illustrate calculations necessary to determine weighted-average molecular weight and weighted-average number of carbon atoms comprising VOC emissions resulting from wood residue combustion.

Wood Residue Combustion Organic Compounds	EF (lb/MMBtu)	MW lb/lb-mol	Number of Carbon Atoms	EF x MW	EF X #C atoms
Acenaphthene	9.10E-07	154.21	12	1.40E-04	1.09E-05
Acenaphthylene	5.00E-06	152.19	12	7.61E-04	6.00E-05
Acetaldehyde	8.30E-04	44.05	2	3.66E-02	1.66E-03
Acetone	1.90E-04	58.08	3	1.10E-02	5.70E-04
Acetophenone	3.20E-09	120.15	8	3.84E-07	2.56E-08
Acrolein	4.00E-03	56.06	3	2.24E-01	1.20E-02
Anthracene	3.00E-06	178.23	14	5.35E-04	4.20E-05
Benzaldehyde	8.50E-07	106.12	7	9.02E-05	5.95E-06
Benzene	4.20E-03	78.11	6	3.28E-01	2.52E-02
Benzo(a)anthracene	6.50E-08	228.29	18	1.48E-05	1.17E-06
Benzo(a)pyrene	2.60E-06	252.31	20	6.56E-04	5.20E-05
Benzo(b)fluoranthene	1.00E-07	252.31	20	2.52E-05	2.00E-06
Benzo(e)pyrene	2.60E-09	252.31	20	6.56E-07	5.20E-08
Benzo(g,h,i)perylene	9.30E-08	276.33	22	2.57E-05	2.05E-06
Benzo(j,k)fluoranthene	1.60E-07	202.26	16	3.24E-05	2.56E-06
Benzo(k)fluoranthene	3.60E-08	252.31	20	9.08E-06	7.20E-07
Benzoic acid	4.70E-08	122.12	7	5.74E-06	3.29E-07
Bis(2-ethylhexyl)phthalate (DEHP)	4.70E-08	390.56	24	1.84E-05	1.13E-06
Bromomethane (Methyle bromide)	1.50E-05	94.94	1	1.42E-03	1.50E-05
2-Butanone (MEK)	5.40E-06	72.11	4	3.89E-04	2.16E-05
Carbazole	1.80E-06	167.21	12	3.01E-04	2.16E-05
Carbon tetrachloride	4.50E-05	153.82	1	6.92E-03	4.50E-05
Chlorobenzene	3.30E-05	112.56	6	3.71E-03	1.98E-04
Chloroform	2.80E-05	119.38	1	3.34E-03	2.80E-05
Chloromethane (Methyl chloride)	2.30E-05	50.49	1	1.16E-03	2.30E-05
2-Chloronaphthalene	2.40E-09	162.62	10	3.90E-07	2.40E-08
2-Chlorophenol	2.40E-08	128.56	6	3.09E-06	1.44E-07
Chrysene	3.80E-08	228.28	18	8.67E-06	6.84E-07
Crotonaldehyde	9.90E-06	70.09	4	6.94E-04	3.96E-05
Decachlorobiphenyl	2.70E-10	498.6584	12	1.35E-07	3.24E-09
Dibenzo(a,h)anthracene	9.10E-09	278.35	22	2.53E-06	2.00E-07
1,2-Dibromoethene	5.50E-05	185.85	2	1.02E-02	1.10E-04
Dichlorobiphenyl	7.40E-10	223.09792	12	1.65E-07	8.88E-09
1,2-Dichloroethane (Ethylene dichloride)	2.90E-05	98.96	2	2.87E-03	5.80E-05
Dichloromethane (Methylene chloride)	2.90E-04	84.93	2	2.46E-02	5.80E-04
1,2-Dichloropropane (Propylene dichloride)	3.30E-05	122.99	3	4.06E-03	9.90E-05
2,4-Dinitrophenol	1.80E-07	184.11	6	3.31E-05	1.08E-06
Ethyl benzene	3.10E-05	106.17	8	3.29E-03	2.48E-04
Fluoranthene	1.60E-06	202.26	16	3.24E-04	2.56E-05
Fluorene	3.40E-06	166.22	13	5.65E-04	4.42E-05
Formaldehyde	4.40E-03	30.03	1	1.32E-01	4.40E-03
Heptachlorobiphenyl	6.60E-11	395.32322	12	2.61E-08	7.92E-10
Hexachlorobiphenyl	5.50E-10	360.87816	12	1.98E-07	6.60E-09
Hexanal	7.00E-06	100.15888	6	7.01E-04	4.20E-05
Heptachlorodibenzo-p-dioxins	2.00E-09	425.30614	12	8.51E-07	2.40E-08
Heptachlorodibenzo-p-furans	2.40E-10	409.30674	12	9.82E-08	2.88E-09
Hexachlorodibenzo-p-dioxins	1.60E-06	390.82	12	6.25E-04	1.92E-05
Hexachlorodibenzo-p-furans	2.80E-10	374.86168	12	1.05E-07	3.36E-09
Indeno(1,2,3-cd)pyrene	8.70E-08	326.34	22	2.84E-05	1.91E-06
Isobutyraldehyde	1.20E-05	72.10572	4	8.65E-04	4.80E-05

2-Methylnaphthalene	1.60E-07	142.20	11	2.28E-05	1.76E-06
Monochlorobiphenyl	2.20E-10	187.64492	12	4.13E-08	2.64E-09
Naphthalene	9.70E-05	128.17	10	1.24E-02	9.70E-04
2-Nitrophenol	2.40E-07	139.11	6	3.34E-05	1.44E-06
4-Nitrophenol	1.10E-07	139.11	6	1.53E-05	6.60E-07
Octachlorodibenzo-p-dioxins	6.60E-08	459.7512	12	3.03E-05	7.92E-07
Octachlorodibenzo-p-furans	8.80E-11	443.7518	12	3.91E-08	1.06E-09
Pentachlorodibenzo-p-dioxins	1.50E-09	356.41602	12	5.35E-07	1.80E-08
Pentachlorodibenzo-p-furans	4.20E-10	340.41662	12	1.43E-07	5.04E-09
Pentachlorobiphenyl	1.20E-09	326.4331	12	3.92E-07	1.44E-08
Pentachlorophenol	5.10E-08	266.34	6	1.36E-05	3.06E-07
Perylene	5.20E-10	252.31	20	1.31E-07	1.04E-08
Phenanthrene	7.00E-06	178.23	14	1.25E-03	9.80E-05
Phenol	5.10E-05	94.11	6	4.80E-03	3.06E-04
Propanal	3.20E-06	58.08	3	1.86E-04	9.60E-06
Propionaldehyde	6.10E-05	58.08	3	3.54E-03	1.83E-04
Pyrene	3.70E-06	202.25	16	7.48E-04	5.92E-05
Styrene	1.90E-03	104.15	8	1.98E-01	1.52E-02
2,3,7,8-Tetrachlorodibenzo-p-dioxins	8.60E-12	321.97096	12	2.77E-09	1.03E-10
Tetrachlorodibenzo-p-dioxins	4.70E-10	321.97096	12	1.51E-07	5.64E-09
2,3,7,8-Tetrachlorodibenzo-p-furans	9.00E-11	305.97156	12	2.75E-08	1.08E-09
Tetrachlorodibenzo-p-furans	7.50E-10	305.97156	12	2.29E-07	9.00E-09
Tetrachlorobiphenyl	2.50E-09	291.98804	12	7.30E-07	3.00E-08
Tetrachloroethene (Tetrachloroethylene)	3.80E-05	165.83	2	6.30E-03	7.60E-05
o-Tolualdehyde	7.20E-06	120.15	8	8.65E-04	5.76E-05
p-Tolualdehyde	1.10E-05	120.15	8	1.32E-03	8.80E-05
Toluene	9.20E-04	92.14	7	8.48E-02	6.44E-03
Trichlorobiphenyl	2.60E-09	257.54298	12	6.70E-07	3.12E-08
1,1,1-trichloroethane (Methyl chloroform)	3.10E-05	133.40	2	4.14E-03	6.20E-05
Trichloroethene (Trichloroethylene)	3.00E-05	131.39	2	3.94E-03	6.00E-05
Trichlorofluoromethane	4.10E-05	137.37	1	5.63E-03	4.10E-05
2,4,6-Trichlorophenol	2.20E-08	197.45	6	4.34E-06	1.32E-07
Vinyl chloride	1.80E-05	62.50	2	1.13E-03	3.60E-05
o-Xylene	2.50E-05	106.16	8	2.65E-03	2.00E-04
TOTAL	1.75E-02			1.13E+00	6.96E-02
				64.689	3.975

weighted-average molecular weight of VOC → 64.689

weighted-average number of carbon atoms comprising VOC → 3.975

SMC Non-HAP Potential to Emit

Emission Unit:	**PB-2 - Riley Boiler**		
Purpose:	Provide steam to block conditioning vaults, veneer dryers, plywood presses, lumber dry kiln and building heat		
Manufacturer:	Riley Power, Inc.		
Manufacture/Modification Date:	August 26, 1966		
Model:	N/A		
Serial Number:	23433		130.83
Burner Type:	Spreader Stoker (3)		
Oxygen Trim System:	No (as defined by Boiler MACT)		
Fly Ash Reinjection:	Yes (fly ash collected from PB-1 and PB-2 exhaust is screened and reinjected into PB-2 furnace)		
Sand Classifier:	Yes (fly ash collected from PB-1 and PB-2 exhaust is screened and reinjected into PB-2 furnace)		
Maximum Steam Production:	98,000	pounds saturated steam per hour. Maximum daily average steaming rate observed 2016-2017.	
Maximum Heat Input Capacity:	131	MMBtu/hr	
Nameplate Heat Input Capcity:	113	MMBtu/hr	
FHISOR:	1.335	MMBtu/Mlb steam. Fuel heat input (based upon HHV) to steam output ratio measured during February 23, 2016 Boiler MACT testing @ 90,101 l	
Maximum Operation:	8760	hr/yr	
Fuel:	Wet biomass (greater than 20% moisture content, wet basis) comprised of SMC wood residuals. Dry sanderdust. Dry biomass combusted during startup.		
Boiler MACT Subcategory:	Stokers/sloped grate/other units designed to burn wet biomass/bio-based solid fuel		
Particulate Matter Control Device No. 1:	Multiclone (required by minor NSR permit)		
Manufacturer:			
Model:			
Installation Date:	October 1987		
Particulate Matter Control Device No. 2:	Three-field dry electrostatic precipitator (required by minor NSR permit)		
Manufacturer:	PPC Industries		
Model:	11R-1328-3712S		
Installation Date:	June 24, 1995		

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Criteria Pollutant Emissions	EF (lb/MMBtu)	EF (lb/Mlb steam)	PTE (tpy)	EF Reference
Carbon Monoxide (CO)	1.231	~~0.967~~	705.4	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. CO Option 2 for Boiler MACT CO emission limit applicable to existing stokers/sloped grate/others designed to burn wet biomass fuel. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf. Boiler MACT CO emission limit of 1500 ppmdv @ 3% O2 equivalent to 1.231 lb/MMBtu for biomass combusted during February 2016 Boiler MACT testing in which F_d = 9669 dscf/MMBtu. See July 8, 2016 Notification of Compliance Status for Potlatch's selection of 3-hour average compliance option rather than 720 ppmdv @ 3% O_2 30-day rolling average. Row 7.a of Table 2 to 40 CFR 63 subpart DDDDD. Boiler MACT emission limit applicable at all times unit is operating except startup and shutdown. Measured CO emission rate of 0.967 lb/Mlb steam is not employed because the source is not required to achieve the emission rate observed. See Bison Engineering, Inc. April 22, 2016 Boiler MACT Stack Test Report prepared for Potlatch Land and Lumber, LLC. Table 3 of the report documents February 23, 2016 testing of CE boiler while generating approximately 90,100 lb steam/hr. 0.967 lb CO/Mlb steam = [(91.7 lb/hr / 90.026 Mlb steam/hr) + (98.2 lb/hr / 89.287 Mlb steam/hr) + (71.3 lb/hr / 90.990 Mlb steam/hr)] / 3.

Lead (Pb)	0.000048		0.03	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. Pb Option 1 as no emission limits apply. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf
Nitrogen Oxides (NO_X)		0.27	115.9	Horizon Engineering. Project No. 3020 Source Evaluation Report prepared for Potlatch Forest Products Corporation. Table 4 of the report documents May 1, 2008 testing of Riley boiler while generating approximately 96,900 lb steam/hr. No NO_X testing reported in 2016 Boiler MACT Stack Test Report.
Particulate (PM)	0.037	~~0.005~~	21.2	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. PM Option 4 for Boiler MACT PM emission limit applicable to existing stokers/sloped grate/others designed to burn wet biomass fuel. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf Boiler MACT PM emission limit applicable at all times unit is operating except startup and shutdown. See July 8, 2016 Notification of Compliance Status for Potlatch's selection of PM compliance option rather than total selected metals. For PM limit, see row 7.b of Table 2 to 40 CFR 63 subpart DDDDD. PM emissions are the "filterable" fraction quantified via EPA RM5. PM emissions do not include the "condensible" fraction. See EPA final rulemaking in the October 25, 2012 Federal Register, pages 65107-65119, at http://www.gpo.gov/fdsys/pkg/FR-2012-10-25/pdf/2012-25978.pdf. The 0.005 lb/mlb steam PM EF derived from stack testing is not employed to determine PTE because (a) control devices (multiclones and electrostatic precipitator (ESP)) were employed to reduce PM emission during the test and (b) the source is not required to achieve the emission rates observed. See Bison Engineering, Inc. April 22, 2016 Boiler MACT Stack Test Report prepared for Potlatch Land and Lumber, LLC. Table 3 of the report documents February 23, 2016 testing of Riley boiler while generating approximately 90,100 lb steam/hr. 0.005 lb PM/Mlb steam = [(0.37 lb/hr / 90.026 Mlb steam/hr) + (0.49 lb/hr / 89.287 Mlb steam/hr) + (0.43 lb/hr / 90.990 Mlb steam/hr)] / 3.
Inhalable Coarse Particulate (PM_{10})	0.039		22.3	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. PM Option 4 for Boiler MACT PM emission limit applicable to existing stokers/sloped grate/others designed to burn wet biomass fuel. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf. Assume all of filterable PM is PM10. Based upon May 2008 testing, condensible fraction is 2.3 lb/MMlb steam which is equivalent to 0.002 lb/MMBtu assuming FHISOR of 1.335 MMBtu/Mlb steam. 0.037 lb/MMBtu (filterable) + 0.002 lb/MMBtu (condensible) = 0.039 lb/MMBtu.
Fine Particulate ($PM_{2.5}$)	0.039		22.3	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. PM2.5 Option 4 for Boiler MACT PM emission limit applicable to existing stokers/sloped grate/others designed to burn wet biomass fuel. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf. Assume all of filterable PM is PM2.5. Based upon May 2008 testing, condensible fraction is 2.3 lb/MMlb steam which is equivalent to 0.002 lb/MMBtu assuming FHISOR of 1.335 MMBtu/Mlb steam. 0.037 lb/MMBtu (filterable) + 0.002 lb/MMBtu (condensible) = 0.039 lb/MMBtu.
Sulfur Dioxide (SO_2)	0.009		5.2	Biomass fuel upper bound sulfur estimate of 0.026% by weight (dry) and 15% conversion to SO_2. See derivation of 0.009 lb/MMBtu EF below.
Volatile Organic Compounds (VOC)		0.0106	4.5	Horizon Engineering. Project No. 3020 Source Evaluation Report prepared for Potlatch Forest Products Corporation. Table 4 of the report documents May 1, 2008 testing of Riley boiler while generating approximately 96,900 lb steam/hr. No VOC testing reported in 2016 Boiler MACT Stack Test Report. The three-run average value (as carbon) of 0.0078 lb/mlb steam is converted to 0.011 lb/Mlb steam (as compound emitted) assuming a weighted average VOC molecular weight of 64.7 lb/lb-mol and 4 carbon atoms per compound. The calculation to convert VOC (as carbon) to VOC (as compound) is displayed below.
Sulfuric Acid Mist (H_2SO_4)	0.0031		1.8	8 percent of PM2.5 emissions, based on BART-recommended PM2.5 / sulfate speciation for hog fuel boilers.

Greenhouse Gas Emissions (CO_2 Equivalent)	EF (lb/MMBtu)	EF (lb/Mlb steam)	PTE (tpy)	EF Reference
Carbon Dioxide (CO_2)	206.8		118,503.7	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. CO_2 Option 2 because the GHG Reporting Rule (40 CFR 98) is considered the primary reference for estimating GHG emissions when preparing or processing permit applications. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf.
Methane (CH_4)	1.764		1,010.8	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. CH_4 Option 2 because the GHG Reporting Rule (40 CFR 98) is considered the primary reference for estimating GHG emissions when preparing or processing permit applications. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf.
Nitrous Oxide (N_2O)	2.759		1,581.0	EPA Region 10 Non-HAP Potential to Emit Emission Factors for Biomass Boilers Located in Pacific Northwest Indian Country, May 8, 2014. N2O Option 2 because the GHG Reporting Rule (40 CFR 98) is considered the primary reference for estimating GHG emissions when preparing or processing permit applications. See https://www.epa.gov/sites/production/files/2016-09/documents/bbnonhappteef_memo.pdf.
TOTAL			121,096	

SO_2 EF: 0.009 lb/MMBtu

Basis: Maximum sulfur content of 0.026% by weight, dry basis was measured during March 2017 sampling event at the facility. Upper bound 15% conversion to SO_2. See H. S. Oglesby & R. O. Blosser

EF (lb/MMBtu) = {[Upper bound S Content (%S) / 100] X $CF_{S \rightarrow SO2}$ / HV_{fuel} (Btu/lb)} X $CF_{Btu \rightarrow MMBtu}$ (Btu/MMBtu)

- $CF_{S \rightarrow SO2}$ = 2 lb SO_2/lb S. S + $O_2 \rightarrow SO_2$. For every 1 mol S (16 lb/lb-mol) reactant, there is 1 mol SO_2 (32 lb/lb-mol) product. 32 / 16 = 2. Assume that only 15% of sulfur is exhausted to atmosphere as SO_2.
- HHV (higher heating value) fuel= 8587 Btu/lb. This is the heating value of the fuel sample with sulfur content of 0.026% by weight, dry.

Reasonable Upper Bound Fuel Sulfur Content (% by weight)	Reasonable Upper Bound 15% Conversion $CF_{S \rightarrow SO2}$ (lb SO_2/lb S)	HHV_{fuel} (Btu/lb)	$CF_{Btu \rightarrow MMBtu}$ (Btu/MMBtu)	Calculated EF (lb/MMBtu)
0.026	0.3	8587	1.0E+06	0.009

Calculation to convert VOC (as carbon) to VOC (as compound)

VOC (as weighted-average VOC) = (VOC_C) X [($MW_{wt\text{-}avg\ VOC}$) / (MW_C)] X [($\#C_C$) / ($\#C_{wt\text{-}avg\ VOC}$)]

where:

VOC_C equals "0.0078 lb/Mlb steam" from May 1, 2008 testing of Riley boiler. Value represents average value among three Method 25A test runs.

$MW_{wt\text{-}avg\ VOC}$ equals "64.689 lb/lb-mol" and is the weighted-average molecular weight for VOC assuming speciated organic compound ratios supported by AP-42

MW_C equals "12.0110 lb/lb-mol" and represents the molecular weight for carbon

$\#C_C$ equals "1" as the single carbon atom was the "basis" for which Method 25A VOC test results were determined

$\#C_{wt\text{-}avg\ VOC}$ equals "3.975" and is the weighted-average number of carbon atoms present in VOC assuming speciated organic compound ratios supported by AP-42 Table 1.6-3

Calculating value for VOC (as weighted-average VOC):

VOC (as carbon):	0.0078	lb/Mlb steam
$MW_{wt\text{-}avg\ VOC}$:	64.689	lb/lb-mol
MW_C:	12.011	lb/lb-mol
$\#C_C$:	1	
$\#C_{wt\text{-}avg\ VOC}$:	3.975	
VOC (as weighted average VOC)	0.0106	lb/Mlb steam

Factor to convert VOC_C to VOC (as weighted average VOC) = 1.355

Appendix A: Potential Emissions Inventory

The first two columns of the following table are extracted from AP-42, September 2003. Table 1.6-3. The third and fourth columns were created based upon information widely available over the internet. The fifth and sixth columns illustrate calculations necessary to determine weighted-average molecular weight and weighted-average number of carbon atoms comprising VOC emissions resulting from wood residue combustion.

Wood Residue Combustion Organic Compounds	EF (lb/MMBtu)	MW lb/lb-mol	Number of Carbon Atoms	EF x MW	EF X #C atoms
Acenaphthene	9.10E-07	154.21	12	1.40E-04	1.09E-05
Acenaphthylene	5.00E-06	152.19	12	7.61E-04	6.00E-05
Acetaldehyde	8.30E-04	44.05	2	3.66E-02	1.66E-03
Acetone	1.90E-04	58.08	3	1.10E-02	5.70E-04
Acetophenone	3.20E-09	120.15	8	3.84E-07	2.56E-08
Acrolein	4.00E-03	56.06	3	2.24E-01	1.20E-02
Anthracene	3.00E-06	178.23	14	5.35E-04	4.20E-05
Benzaldehyde	8.50E-07	106.12	7	9.02E-05	5.95E-06
Benzene	4.20E-03	78.11	6	3.28E-01	2.52E-02
Benzo(a)anthracene	6.50E-08	228.29	18	1.48E-05	1.17E-06
Benzo(a)pyrene	2.60E-06	252.31	20	6.56E-04	5.20E-05
Benzo(b)fluoranthene	1.00E-07	252.31	20	2.52E-05	2.00E-06
Benzo(e)pyrene	2.60E-09	252.31	20	6.56E-07	5.20E-08
Benzo(g,h,i)perylene	9.30E-08	276.33	22	2.57E-05	2.05E-06
Benzo(j,k)fluoranthene	1.60E-07	202.26	16	3.24E-05	2.56E-06
Benzo(k)fluoranthene	3.60E-08	252.31	20	9.08E-06	7.20E-07
Benzoic acid	4.70E-08	122.12	7	5.74E-06	3.29E-07
Bis(2-ethylhexyl)phthalate (DEHP)	4.70E-08	390.56	24	1.84E-05	1.13E-06
Bromomethane (Methyle bromide)	1.50E-05	94.94	1	1.42E-03	1.50E-05
2-Butanone (MEK)	5.40E-06	72.11	4	3.89E-04	2.16E-05
Carbazole	1.80E-06	167.21	12	3.01E-04	2.16E-05
Carbon tetrachloride	4.50E-05	153.82	1	6.92E-03	4.50E-05
Chlorobenzene	3.30E-05	112.56	6	3.71E-03	1.98E-04
Chloroform	2.80E-05	119.38	1	3.34E-03	2.80E-05
Chloromethane (Methyl chloride)	2.30E-05	50.49	1	1.16E-03	2.30E-05
2-Chloronaphthalene	2.40E-09	162.62	10	3.90E-07	2.40E-08
2-Chlorophenol	2.40E-08	128.56	6	3.09E-06	1.44E-07
Chrysene	3.80E-08	228.28	18	8.67E-06	6.84E-07
Crotonaldehyde	9.90E-06	70.09	4	6.94E-04	3.96E-05
Decachlorobiphenyl	2.70E-10	498.6584	12	1.35E-07	3.24E-09
Dibenzo(a,h)anthracene	9.10E-09	278.35	22	2.53E-06	2.00E-07
1,2-Dibromoethene	5.50E-05	185.85	2	1.02E-02	1.10E-04
Dichlorobiphenyl	7.40E-10	223.09792	12	1.65E-07	8.88E-09
1,2-Dichloroethane (Ethylene dichloride)	2.90E-05	98.96	2	2.87E-03	5.80E-05
Dichloromethane (Methylene chloride)	2.90E-04	84.93	2	2.46E-02	5.80E-04
1,2-Dichloropropane (Propylene dichloride)	3.30E-05	122.99	3	4.06E-03	9.90E-05
2,4-Dinitrophenol	1.80E-07	184.11	6	3.31E-05	1.08E-06
Ethyl benzene	3.10E-05	106.17	8	3.29E-03	2.48E-04
Fluoranthene	1.60E-06	202.26	16	3.24E-04	2.56E-05
Fluorene	3.40E-06	166.22	13	5.65E-04	4.42E-05
Formaldehyde	4.40E-03	30.03	1	1.32E-01	4.40E-03
Heptachlorobiphenyl	6.60E-11	395.32322	12	2.61E-08	7.92E-10
Hexachlorobiphenyl	5.50E-10	360.87816	12	1.98E-07	6.60E-09
Hexanal	7.00E-06	100.15888	6	7.01E-04	4.20E-05
Heptachlorodibenzo-p-dioxins	2.00E-09	425.30614	12	8.51E-07	2.40E-08
Heptachlorodibenzo-p-furans	2.40E-10	409.30674	12	9.82E-08	2.88E-09
Hexachlorodibenzo-p-dioxins	1.60E-06	390.82	12	6.25E-04	1.92E-05
Hexachlorodibenzo-p-furans	2.80E-10	374.86168	12	1.05E-07	3.36E-09
Indeno(1,2,3-cd)pyrene	8.70E-08	326.34	22	2.84E-05	1.91E-06
Isobutyraldehyde	1.20E-05	72.10572	4	8.65E-04	4.80E-05

2-Methylnaphthalene	1.60E-07	142.20	11	2.28E-05	1.76E-06
Monochlorobiphenyl	2.20E-10	187.64492	12	4.13E-08	2.64E-09
Naphthalene	9.70E-05	128.17	10	1.24E-02	9.70E-04
2-Nitrophenol	2.40E-07	139.11	6	3.34E-05	1.44E-06
4-Nitrophenol	1.10E-07	139.11	6	1.53E-05	6.60E-07
Octachlorodibenzo-p-dioxins	6.60E-08	459.7512	12	3.03E-05	7.92E-07
Octachlorodibenzo-p-furans	8.80E-11	443.7518	12	3.91E-08	1.06E-09
Pentachlorodibenzo-p-dioxins	1.50E-09	356.41602	12	5.35E-07	1.80E-08
Pentachlorodibenzo-p-furans	4.20E-10	340.41662	12	1.43E-07	5.04E-09
Pentachlorobiphenyl	1.20E-09	326.4331	12	3.92E-07	1.44E-08
Pentachlorophenol	5.10E-08	266.34	6	1.36E-05	3.06E-07
Perylene	5.20E-10	252.31	20	1.31E-07	1.04E-08
Phenanthrene	7.00E-06	178.23	14	1.25E-03	9.80E-05
Phenol	5.10E-05	94.11	6	4.80E-03	3.06E-04
Propanal	3.20E-06	58.08	3	1.86E-04	9.60E-06
Propionaldehyde	6.10E-05	58.08	3	3.54E-03	1.83E-04
Pyrene	3.70E-06	202.25	16	7.48E-04	5.92E-05
Styrene	1.90E-03	104.15	8	1.98E-01	1.52E-02
2,3,7,8-Tetrachlorodibenzo-p-dioxins	8.60E-12	321.97096	12	2.77E-09	1.03E-10
Tetrachlorodibenzo-p-dioxins	4.70E-10	321.97096	12	1.51E-07	5.64E-09
2,3,7,8-Tetrachlorodibenzo-p-furans	9.00E-11	305.97156	12	2.75E-08	1.08E-09
Tetrachlorodibenzo-p-furans	7.50E-10	305.97156	12	2.29E-07	9.00E-09
Tetrachlorobiphenyl	2.50E-09	291.98804	12	7.30E-07	3.00E-08
Tetrachloroethene (Tetrachloroethylene)	3.80E-05	165.83	2	6.30E-03	7.60E-05
o-Tolualdehyde	7.20E-06	120.15	8	8.65E-04	5.76E-05
p-Tolualdehyde	1.10E-05	120.15	8	1.32E-03	8.80E-05
Toluene	9.20E-04	92.14	7	8.48E-02	6.44E-03
Trichlorobiphenyl	2.60E-09	257.54298	12	6.70E-07	3.12E-08
1,1,1-trichloroethane (Methyl chloroform)	3.10E-05	133.40	2	4.14E-03	6.20E-05
Trichloroethene (Trichloroethylene)	3.00E-05	131.39	2	3.94E-03	6.00E-05
Trichlorofluoromethane	4.10E-05	137.37	1	5.63E-03	4.10E-05
2,4,6-Trichlorophenol	2.20E-08	197.45	6	4.34E-06	1.32E-07
Vinyl chloride	1.80E-05	62.50	2	1.13E-03	3.60E-05
o-Xylene	2.50E-05	106.16	8	2.65E-03	2.00E-04
TOTAL	1.75E-02			1.13E+00	6.96E-02
				64.689	3.975

weighted-average molecular weight of VOC (64.689)

weighted-average number of carbon atoms comprising VOC (3.975)

SMC Non-HAP Potential to Emit

Emission Unit:	**LK-5 - Lumber Drying Kiln 5**
Description:	One lumber drying kiln
Manufacturer:	Wellons
Model:	DT104-HPW
Installed:	February 2006
Heat Source:	Indirect steam provided by emission unist PB-1 and PB-2
Control Device:	None
Work Practice:	None
Fuel:	None
Potential Species Dried:	Douglas fir, western red cedar, grand fir, hemlock, lodgepole pine, subalpine fir, elgelmann spruce, ponderosa pine and western white pine
Annual Capacity:	158 MMbf/yr assuming exclusive drying of either Douglas Fir or ESLP (Engelmann Spruce, Lodgepole Pine, Subalpine Fir)

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Pollutant Emissions	EF (lb/Mbf)	PTE (tpy)	EF Reference
Carbon Monoxide (CO)	0	0	
Lead (Pb)	0	0	
Nitrogen Oxides (NO_X)	0	0	
Particulate (PM)	0.002	0.2	1 - PM emissions testing conducted in 2013 at Chemco in Ferndale, Washington. Same emission factor applies for all species and at all drying temperatures. Based upon information presented by Potlatch in its February 1, 2018 submittal to EPA Region 10, PM emissions testing conducted by Horizon Engineering at Oregon State University pilot-scale kiln in 1998 is invalid.
Inhalable Coarse Particulate (PM_{10})	0.020	1.6	1 - PM emissions testing conducted in 2013 at Chemco in Ferndale, Washington. Same emission factor applies for all species and at all drying temperatures. Based upon information presented by Potlatch in its February 1, 2018 submittal to EPA Region 10, PM emissions testing conducted by Horizon Engineering at Oregon State University pilot-scale kiln in 1998 is invalid.
Fine Particulate ($PM_{2.5}$)	0.020	1.6	1 - PM emissions testing conducted in 2013 at Chemco in Ferndale, Washington. Same emission factor applies for all species and at all drying temperatures. Based upon information presented by Potlatch in its February 1, 2018 submittal to EPA Region 10, PM emissions testing conducted by Horizon Engineering at Oregon State University pilot-scale kiln in 1998 is invalid.
Sulfur Dioxide (SO_2)	0	0	
Volatile Organic Compounds (VOC)	species specific	112.5	2 - Because the facility has the ability to dry resinous and non-resinous softwood species at temperatures in excess of 200ºF, employ emission factors representative of drying lumber at maximum temperatures in excess of 200°F. Based upon calculations presented below, drying Ponderosa Pine results in highest emissions. Thus, PTE is based upon drying Ponderosa Pine.
Sulfuric Acid Mist (H_2SO_4)	0	0	

Greenhouse Gas Emissions (CO_2 Equivalent)	EF (lb/Mbf)	PTE (tpy)	EF Reference
Carbon Dioxide (CO_2)	0	0	
Methane (CH_4)	0	0	
Nitrous Oxide (N_2O)	0	0	
TOTAL		0	

EF Reference	Description
1	February & May/June 2013 emissions testing of Hemlock lumber drying at less than 180°F within a pilot-scale kiln at Chemco in Ferndale, Washington. Testing was performed by Emission Technologies, Inc. on behalf of Sierra Pacific Industries and consisted of RM5 and 202. http://www.swcleanair.org/docs/Dry%20Kilns/SourceTests/2013-02-21%20Sierra%20Pacific%20-%20Chemco%20-%20Ferndale%20-%20Dry%20Kiln%20PM%20Test%20Report.pdf & http://www.swcleanair.org/docs/Dry%20Kilns/SourceTests/2013-05-29%20Sierra%20Pacific%20-%20Mt%20Vernon%20-%20Pilot%20Dry%20Kiln%20Filterable%20and%20Condensable%20PM%20Test%20Report.pdf
2	EPA Region 10 HAP and VOC Emission Factors for Lumber Drying, December 2012. https://www.epa.gov/sites/production/files/2016-09/documents/ldkhapvocpteef_memo.pdf

Species-Specific VOC Emissions Calculations

Species	Drying Time (hr/charge)	Maximum Annual Charges (charges/yr)	Average Volume per Charge (bf/charge)	Maximum Throughput (MMbf/yr)	VOC Emission Factor (lb/Mbf)	VOC PTE (tpy)
HemFir (Hemlock/Grand Fir)	37	237	290,000	69	1.09	37.4
Douglas Fir	21	417	290,000	121	1.70	102.8
Larch	37	237	290,000	69	1.70	58.4
ESLP (Engelmann Spruce, Lodgepole Pine, Subalpine Fir)	21	417	290,000	121	1.53	92.5
Ponderosa Pine	43	204	290,000	59	3.81	112.5
Cedar	16	545	290,000	158	1.15	90.9

SMC Non-HAP Potential to Emit

Emission Units: **VDHS-1, VDHS-2, VDHS-3 and VDHS-4**

Description: Heating sections of four steam-heated veneer dryers. Steam provided by PB-1 and PB-2.

	VD-1	VD-2	VD-3	VD-4
Make:	Moore	Moore	E.V. Preutire	Moore
Dryer Technology:	Longitudinal	Longitudinal	Prentice	Longitudinal
Number of Heated Sections:	2	4	1	4
Installation Date:	February 1964	February 1964	July 1967	September 1980
Classification of Veneer Dried:	Re-dry	Strips	Full Sheets	Full Sheets
Observed Operating Rate during September 24, 2008 PCWP MACT Testing (msf 3/8"/hr):	7.48	7.19	16.19	15.76
Operation (hr/yr):	8760	8760	8760	8760
Heated Section Control Technology:	Exhaust from heated sections of four veneer dryers is collected and routed to a two-chamber Geoenergy GeoCat regenerative catalytic oxidizer (RCO) employing two 4 MMBtu/hr Maxon Kinemax burners.			
Observed RCO Exhaust Flow Rate during September 24, 2008 PCWP MACT Testing:	45,300	dscf/min		
RCO Heat Input:	8	MMBtu/hr		
RCO Operation:	8760	hr/yr		

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Criteria Pollutant Emissions	EF (lb/msf 3/8")	EF (lb/MMBtu)	VDHS-1 PTE (tpy)	VDHS-2 PTE (tpy)	VDHS-3 PTE (tpy)	VDHS-4 PTE (tpy)	Total PTE (tpy)	EF Reference
Carbon Monoxide (CO)	0.0035		0.11	0.11	0.25	0.24	0.7	1
Lead (Pb)	-							
Nitrogen Oxides (NO_X)	0.0029		0.10	0.09	0.21	0.20	0.6	1
Particulate (PM)	0.014		0.46	0.44	0.99	0.97	2.9	1
Inhalable Coarse Particulate (PM_{10})	0.029		0.95	0.91	2.06	2.00	5.9	1
Fine Particulate ($PM_{2.5}$)	0.029		0.95	0.91	2.06	2.00	5.9	1
Sulfur Dioxide (SO_2)		0.0173					0.6	2
Volatile Organic Compounds (VOC)	0.089		2.91	2.80	6.31	6.14	18.2	3
Sulfuric Acid Mist (H_2SO_4)								

Greenhouse Gas Emissions (CO_2 Equivalent)	EF (lb/msf 3/8")	EF (lb/MMBtu)	PTE (tpy)	EF Reference
Carbon Dioxide (CO_2)		138.6	4,857	4
Methane (CH_4)		0.165	6	
Nitrous Oxide (N_2O)		0.394	14	
TOTAL			4,876	

EF Reference	Description

EF Reference 1

Horizon Engineering. Project No. 3086-2. Source Evaluation Report prepared for Potlatch Forest Products Corporation. Veneer Dryers Nos. 1, 2, 3, 4 - Regenerative Catalytic Oxidizer Outlet - Particulate Matter, Carbon Monoxide, Nitrogen Oxide, and Opacity Emission Factors. September 24, 2008. Table 1 of the report documents filterable and condensable particulate matter emission measurements downstream of the regenerative catalytic oxidizer.

For PM, PM_{10} and $PM_{2.5}$, neither the FARR's combustion source stack PM emission limit of 0.1 gr/dscf corrected to 7% O_2 at 40 CFR 49.125(d)(1) nor the FARR's process source stack PM emission limit of 0.1 gr/dscf at 40 CFR 49.125(d)(3) are employed to determine PTE for VDHS. Because the PCWP MACT requires that VDHS emissions be controlled, emission test results are employed to determine PTE. Employing the FARR PM limits 40 CFR 49.125(d)(1) and (3) would result in higher PTE values that are unrealistic given that the PCWP MACT requires the emissions be controlled. Note that a three-run average PM emission rate of 0.0015 gr/dscf was measured during September 2008 testing. The FARR PM PTE calculations are presented below for informational purposes:

A. The FARR process source stack PM emission limit of 0.1 gr/dscf at 40 CFR 49.125(d)(3) corresponds to a PTE of 170 tpy assuming September 2008 observed flow rate reflects capacity of system.

FARR PM Calculated PTE (tpy)	FARR PM Emission Limit (gr/dscf)	September 2008 Observed Flow Rate (dscf/min)	$CF_{gr\rightarrow lb}$ (gr/lb)	$CF_{min\rightarrow hr}$ (min/hr)	$CF_{min\rightarrow hr}$ (hr/yr)	$CF_{lb\rightarrow ton}$ (lb/ton)
170.1	0.1	45,300	7,000	60	8760	2000

B. The FARR combustion source stack PM emission limit of 0.1 gr/dscf corrected to 7% O_2 at 40 CFR 49.125(d)(1) corresponds to an emission factor of 0.1871 lb/MMBtu and a corresponding PTE of 6.6 tpy assuming only combustion of propane with heat input of 8 MMBtu/hr. This calculation neglects combustion of veneer dryer heating zone exhaust, which if considered would increase PTE. The application does not provide a value for the heat input corresponding to combustion of the veneer dryer heating zone exhaust.

EF (lb/MMBtu) = FARR PM Limit (gr/dscf@7%O_2) X $CF_{7\rightarrow 0\%O2}$ X F_d (dscf/MMBtu) / $CF_{gr\rightarrow lb}$ (gr/lb)

• $CF_{7\rightarrow 0\%O2}$ = (20.9 - X_{O2Fd}) / (20.9 - X_{O2FARR}). To create a correction factor that adjusts the basis of the FARR emission limit from 7% O_2 to 0% O_2 (the basis for F_d), X_{O2Fd} = 0 and X_{O2FARR} = 7. The value 20.9 is the percent by volume of the ambient air that is O_2. Decreasing the O_2 from the FARR baseline increases the pollutant concentration. See Equation 19-1 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60.

• F_d = 8,710 dscf/MMBtu for combustion of propane. See Table 19-2 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60.

FARR PM Calculated EF (lb/MMBtu)	FARR PM Emission Limit (gr/dscf @7%O_2)	$CF_{7\rightarrow 0\%O2}$ (unitless)	F_d (dscf/MMBtu)	$CF_{gr\rightarrow lb}$ (gr/lb)
0.1871	0.1	1.504	8,710	7,000

EF Reference 2

<u>Option 1</u>: 0.0173 lb/MMBtu. This emission factor is employed to determine PTE as it limits emissions to less than Options 2 and 3 below.

Basis: Pursuant to ASTM D1835-16 and Gas Processors Association (GPA) Standard 2140, the sulfur content of commerical propane must not exceed 185 ppm by mass.

EF (lb/MMBtu) = [ASTM & GPA Fuel S Limit (ppm) / $1x10^6$] X $CF_{S\rightarrow SO2}$ X $CF_{lb\rightarrow gal}$ (lb/gal) X $CF_{Btu\rightarrow MMBtu}$ (Btu/MMBtu) / $CF_{gal\rightarrow Btu}$ (Btu/gal)

• $CF_{S\rightarrow SO2}$ = 2 lb SO_2/lb S. S + O_2 → SO_2. For every 1 mol S (16 lb/lb-mol) reactant, there is 1 mol SO_2 (32 lb/lb-mol) product. 32 / 16 = 2.

• $CF_{lb\rightarrow gal}$ = 4.24 lb/gal fuel at 60°F. See weight of liquid propane on page A-6 of Appendix A to AP-42, September 1985.

• $CF_{gal\rightarrow Btu}$ = 90,500 Btu/gal fuel. See heating value of liquid propane on page A-6 of Appendix A to AP-42, September 1985.

ASTM D1835-16 & GPA Standard 2140 Fuel Sulfur Calculated SO_2 EF (lb/MMBtu)	ASTM D1835-16 & GPA Standard 2140 Fuel Sulfur Limit for Commercial Propane (ppm by mass)	$CF_{S\rightarrow SO2}$ (lb SO_2/lb S)	$CF_{lb\rightarrow gal}$ (lb/gal fuel)	$CF_{gal\rightarrow Btu}$ (Btu/gal fuel)	$CF_{Btu\rightarrow MMBtu}$ (Btu/MMBtu)
0.0173	185	2	4.24	90,500	1.E+06

<u>Option 2</u>: 0.0539 lb/MMBtu.

Basis: FARR gaseous fuel sulfur limit of 1.1 g/dry standard cubic meter at 40 CFR 49.130(d)(8)

EF (lb/MMBtu) = FARR Fuel S Limit (g/m^3) / $CF_{m3\rightarrow ft3}$ / $CF_{ft3\rightarrow Btu}$ X $CF_{Btu\rightarrow MMBtu}$ / $CF_{g\rightarrow lb}$ X $CF_{S\rightarrow SO2}$

• $CF_{S\rightarrow SO2}$ = 2 lb SO_2/lb S. S + O_2 → SO_2. For every 1 mol S (16 lb/lb-mol) reactant, there is 1 mol SO_2 (32 lb/lb-mol) product. 32 / 16 = 2.

• $CF_{ft3\rightarrow Btu}$ = 2550 Btu/ft^3 fuel. See heating value of propane gas at 60°F at http://www.engineeringtoolbox.com/energy-content-d_868.html

FARR Fuel S Calculated SO_2 EF (lb/MMBtu)	FARR Fuel Sulfur Limit (g/m^3)	$CF_{m3\rightarrow ft3}$ (ft^3/m^3)	$CF_{ft3\rightarrow Btu}$ (Btu/ft^3)	$CF_{Btu\rightarrow MMBtu}$ (Btu/MMBtu)	$CF_{g\rightarrow lb}$ (g/lb)	$CF_{S\rightarrow SO2}$ (lb SO_2/lb S)
0.0539	1.1	35.3147	2550	1.E+06	453.592	2

<u>Option 3</u>: 1.087 lb/MMBtu.

Basis: FARR combustion source stack SO_2 emission limit of 500 parts per million by volume dry basis (ppmvd) corrected to 7% O_2 at 40 CFR 49.129(d)(1)

EF (lb/MMBtu) = FARR SO_2 Limit (ppmvd@7%O_2) X $CF_{7\rightarrow 0\%O2}$ X $CF_{ppm\rightarrow lb/dscfSO2}$ X F_d (dscf/MMBtu)

• $CF_{7\rightarrow 0\%O2}$ = (20.9 - X_{O2Fd}) / (20.9 - X_{O2FARR}). To create a correction factor that adjusts the basis of the FARR emission limit from 7% O_2 to 0% O_2 (the basis for F_d), X_{O2Fd} = 0 and X_{O2FARR} = 7. The value 20.9 is the percent by volume of the ambient air that is O_2. Decreasing the O_2 from the FARR baseline increases the pollutant concentration. See Equation 19-1 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60.

• $CF_{ppm\rightarrow lb/dscfSO2}$ = 1.660 X 10^{-7} lb SO_2/dscf / ppm SO_2. See Table 19-1 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60.

• F_d = 8,710 dscf/MMBtu for combustion of propane. See Table 19-2 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60.

FARR 500 ppm Calculate SO_2 EF	FARR SO_2 Emission Limit	$CF_{7\rightarrow 0\%O2}$	$CF_{ppm\rightarrow lb/dscfSO2}$	F_d

(lb/MMBtu)	(ppmvd@7%O_2)	(unitless)	(lb/dscf / ppm)	(dscf/MMBtu)
1.087	500	1.504	1.66E-07	8710

3

Horizon Engineering. Project No. 3086-1. Source Evaluation Report prepared for Potlatch Forest Products Corporation. Veneer Dryers Nos. 1, 2, 3, 4 - Regenerative Catalytic Oxidizer Inlet and Outlet - Total Hazardous Air Pollutant Measured as Total Hydrocarbon - Plywood and Composite Wood Products MACT. September 24, 2008. Table 1 of the report documents three-run average total gaseous organic carbon pre-control emission rate of 29.6 lb/hr. Because individual HAPs were not measured, we cannot take them into consideration with respect to a WPP1 VOC calculation. Although a 94.2 percent RM25A destruction removal efficiency (DRE) was measured, PCWP MACT requires only 90 percent DRE across the regenerative catalytic oxidizer. The enforceable 90 percent DRE is employed to calculate PTE.

VOC_{carbon} Emission Factor Calculation

VOC_{carbon} EF = [(100 - PCWP MACT DRE) / 100] X (VOC_{carbon} Uncontrolled Emission Rate) / (Veneer Dryer Production Rate)

VOC_{carbon} EF (lb/msf 3/8")	PCWP MACT Control Device Limit (% DRE)	VOC_{carbon} Uncontrolled Emission Rate (lb/hr)	Veneer Dryer Production Rate (msf 3/8"/hr)
0.073	90	29.6	40.720

$VOC_{propane}$ Emission Factor Calculation

VOC expressed as propane = (VOC_{carbon}) X [($MW_{propane}$) / (MW_{carbon})] X [($\#C_{carbon}$) / ($\#C_{propane}$)]

where: $Compound_X$ represents mass emission rate of $Compound_X$

$MW_{propane}$ equals "44.0962" and represents the molecular weight for propane; the compound that is the "basis" for expressing mass of VOC per WPP1 VOC

$MW_{Compound\ X}$ represents the molecular weight for $Compound_X$

$\#C_{compound\ X}$ equals number of carbon atoms in $Compound_X$

$\#C_{propane}$ equals "3" as three carbon atoms are present within propane; the compound that is the "basis" for expressing mass of VOC per WPP1 VOC

$VOC_{propane}$ = 0.089 lb/msf 3/8"

Reference Information

Element and Compound Information

Element / Compound	MW (lb/lb-mol)	Formula	Carbon Atoms	Hydrogen Atoms	Oxygen Atoms
Propane	44.0962	C_3H_8	3	8	0
Carbon	12.0110	C	1	-	-
Hydrogen	1.0079	H	-	1	-
Oxygen	15.9994	O	-	-	1

4

EPA's March 2011 guidance document "PSD and Title V Permitting Guidance for Greenhouse Gases" states that the GHG Report Rule (40 CFR 98), "should be considered a primary reference for sources and permitting authorities in estimating GHG emissions and establishing measurement techniques when preparing or processing permit applications." Therefore, GHG Reporting Rule emission factors will be employed to determine GHG PTE for propane combustion.

Carbon Dioxide (CO_2)

EF (lb CO_2e/MMBtu) = EF (kg CO_2/MMBtu) X $CF_{kg\rightarrow lb}$ (lb/kg) X GWP_{CO2} (lb CO_2e/lb CO_2)

Calculated CO_2e EF for CO_2 (lb CO_2e/MMBtu)	40 CFR 98 Table C-1 EF (kg CO_2/MMBtu)	$CF_{kg\rightarrow lb}$ (lb/kg)	40 CFR 98 Table A-1 GWP_{CO2} (lb CO_2e/lb CO_2)
138.605	62.87	2.20462262	1

Methane (CH_4)

EF (lb CO_2e/MMBtu) = EF (kg CH_4/MMBtu) X $CF_{kg\rightarrow lb}$ (lb/kg) X GWP_{CH4} (lb CO_2e/lb CH_4)

Calculated CO_2e EF for CH_4 (lb CO_2e/MMBtu)	40 CFR 98 Table C-2 EF (kg CH_4/MMBtu)	$CF_{kg\rightarrow lb}$ (lb/kg)	40 CFR 98 Table A-1 GWP_{CH4} (lb CO_2e/lb CH_4)
0.165	0.003	2.20462262	25

Nitrous Oxide (N_2O)

EF (lb CO_2e/MMBtu) = EF (kg N_2O/MMBtu) X $CF_{kg\rightarrow lb}$ (lb/kg) X GWP_{N2O} (lb CO_2e/lb N_2O)

Calculated CO_2e EF for N_2O (lb CO_2e/MMBtu)	40 CFR 98 Table C-2 EF (kg N_2O/MMBtu)	$CF_{kg\rightarrow lb}$ (lb/kg)	40 CFR 98 Table A-1 GWP_{N2O} (lb CO_2e/lb N_2O)
0.394	0.0006	2.20462262	298

SMC Non-HAP Potential to Emit

Emission Units: **VDL-1, VDL-2, VDL-3 and VDL-4**

Description: Leaks from four steam-heated veneer dryers. Steam provided by PB-1 and PB-2.

	VD-1	VD-2	VD-3	VD-4
Make:	Moore	Moore	E.V. Preutire	Moore
Dryer Technology:	Longitudinal	Longitudinal	Prentice	Longitudinal
Number of Heated Sections:	2	4	1	4
Installation Date:	February 1964	February 1964	July 1967	September 1980
Classification of Veneer Dried:	Re-dry	Strips	Full Sheets	Full Sheets
Maximum Observed Operating Rate during September 24, 2008 PCWP MACT Testing (msf 3/8"/hr):	7.48	7.19	16.19	15.76
Operation:	8760	8760	8760	8760
Heated Section Control Technology:	Exhaust from heated sections of four veneer dryers is collected and routed to a two-chamber Geoenergy GeoCat regenerative catalytic oxidizer (RCO) employing two 4 MMBtu/hr Maxon Kinemax burners.			
Observed RCO Exhaust Flow Rate during September 24, 2008 PCWP MACT Testing:	45,300	dscf/min		
RCO Heat Input:	8	MMBtu/hr		
RCO Operation:	8760	hr/yr		

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Criteria Pollutant Emissions	EF (lb/msf 3/8")	VDL-1 PTE (tpy)	VDL-2 PTE (tpy)	VDL-3 PTE (tpy)	VDL-4 PTE (tpy)	Total PTE (tpy)	EF Reference
Particulate (PM)	0.0200	0.66	0.63	1.42	1.38	4.1	1, 2 & 3 - see calculation below for estimating EF for processing douglas fir
Inhalable Coarse Particulate (PM_{10})	0.04152	1.36	1.31	2.94	2.87	8.5	
Fine Particulate ($PM_{2.5}$)	0.04152	1.36	1.31	2.94	2.87	8.5	
Wood Products Protocol 1 (WPP1) Volatile Organic Compounds (VOC)	0.0039	0.13	0.12	0.28	0.27	0.8	3

Hazardous Air Pollutants	EF (lb/msf 3/8")	VDL-1 PTE (tpy)	VDL-2 PTE (tpy)	VDL-3 PTE (tpy)	VDL-4 PTE (tpy)	Total PTE (tpy)	EF Reference
Methanol	0.0039	0.13	0.12	0.28	0.27	0.8	3
TOTAL		0.13	0.12	0.28	0.27	0.8	

EF Reference	Description
1	Horizon Engineering. Project No. 3086-1. Source Evaluation Report prepared for Potlatch Forest Products Corporation. Veneer Dryers Nos. 1, 2, 3, 4 - Regenerative Catalytic Oxidizer Inlet and Outlet - Total Hazardous Air Pollutant Measured as Total Hydrocarbon - Plywood and Composite Wood Products MACT. September 24, 2008. Table 1 of the report documents total gaseous organic carbon destruction efficiency of 94.2 percent across the regenerative catalytic oxidizer.
2	Horizon Engineering. Project No. 3086-2. Source Evaluation Report prepared for Potlatch Forest Products Corporation. Veneer Dryers Nos. 1, 2, 3, 4 - Regenerative Catalytic Oxidizer Outlet - Particulate Matter, Carbon Monoxide, Nitrogen Oxide, and Opacity Emission Factors. September 24, 2008. Table 1 of the report documents filterable and condensable particulate matter emission measurements downstream of the regenerative catalytic oxidizer.
3	EPA Region 10 HAP and VOC Emission Factors for Veneer Dryer Employing Indirect Steam Heat without Air Pollution Controls, February 2016. See https://www.epa.gov/sites/production/files/2016-03/documents/veneer-dryer-hap-voc-emissionfactors.pdf

PM/PM_{10}/$PM_{2.5}$ Emission Factor Calculation

EPA Region 10 is not aware of any emissions testing to measure PM, PM_{10} or $PM_{2.5}$ emissions resulting from veneer dryer leaks. EPA Region 10 has estimated what these emissions might be based upon (1) measurement of post-control (regenerative catalytic oxidizer) filterable and condensable PM emissions generated by Potlatch veneer dryer heating section while processing resinous softwood non-pine family wood species, (2) assumption that filterable and condensable PM control efficiency across the regenerative catalytic oxidizer is approximately equal to measured VOC control efficiency of 94.2 percent, (3) measurement of methanol emissions generated by veneer dryer heating section and veneer dryer leaks at similar source to Potlatch while processing resinous softwood non-pine family wood species, and (4) assumption that PM/PM_{10}/$PM_{2.5}$ emissions across the two emission generating activities (veneer dryer heating section and veneer dryer leaks) are proportional to methanol emissions. The degree of uncertainty surrounding assumptions associated with items (2) and (4) is unknown. For further information with respect to item (3), see EPA Region 10 HAP and VOC Emission Factors for Veneer Dryer Employing Indirect Steam Heat without Air Pollution Controls, February 2016, at http://www.epa.gov/sites/production/files/2016-03/documents/veneer-dryer-hap-voc-emissionfactors.pdf

VDHS-1 to 4 PM Uncontrolled EF = (VDHS-1 to 4 Filterable PM Controlled EF) / (1 - VOC control efficiency)
= (0.014 lb/msf 3/8") / (1 - 0.942); Potlatch St. Maries September 2008 VDHS post-control (RCO) test measurements while processing "larch and red fir"
= 0.2414 lb/msf 3/8"

VDL-1 to 4 PM EF estimation: VDL-1 to 4 PM EF = (VDHS-1 to 4 PM EF) X (VDL-1 to 4 Methanol EF) / (VDHS-1 to 4 Methanol EF)

Average Uncontrolled VDL-1 to 4 Methanol EF (estimated based on NCASI TB No. 768 - douglas fir measurement):	2.40E-03	VDL-1 to 4 PM EF (calculated):	2.00E-02
Average Uncontrolled VDHS-1 to 4 Methanol EF (estimated based on NCASI No. 768 - douglas fir measurement):	2.89E-02	Uncontrolled VDHS-1 to 4 PM EF:	2.41E-01

VDHS-1 to 4 $PM_{10}/PM_{2.5}$ Uncontrolled EF = (VDHS-1 to 4 Filterable + Condensable PM Controlled EF) / (1 - VOC control efficiency)
= (0.029 lb/msf 3/8") / (1 - 0.942); Potlatch St. Maries September 2008 VDHS post-control (RCO) test measurements while processing "larch and red fir"
= 0.5 lb/msf 3/8"

VDCS-1 to 4 $PM_{10}/PM_{2.5}$ EF estimation: VDCS-1 to 4 $PM_{10}/PM_{2.5}$ EF = (VDHS-1 to 4 $PM_{10}/PM_{2.5}$ EF) X (VDCS-1 to 4 WPP1 VOC EF) / (VDHS-1 to 4 WPP1 VOC EF)

Average Uncontrolled VDL-1 to 4 Methanol EF (estimated based on NCASI TB No. 768 - douglas fir measurement):	2.40E-03	VDL-1 to 4 $PM_{10}/PM_{2.5}$ EF (calculated):	4.15E-02
Average Uncontrolled VDHS-1 to 4 Methanol EF (estimated based on NCASI No. 768 - douglas fir measurement):	2.89E-02	Uncontrolled VDHS-1 to 4 $PM_{10}/PM_{2.5}$ EF:	5.00E-01

SMC Non-HAP Potential to Emit

Emission Units: **VDCS-1, VDCS-2, VDCS-3 and VDCS-4**

Description: Cooling sections of four steam-heated veneer dryers. Steam provided by PB-1 and PB-2.

	VD-1	VD-2	VD-3	VD-4
Make:	Moore	Moore	E.V. Preutire	Moore
Dryer Technology:	Longitudinal	Longitudinal	Prentice	Longitudinal
Number of Heated Sections:	2	4	1	4
Installation Date:	February 1964	February 1964	July 1967	September 1980
Classification of Veneer Dried:	Re-dry	Strips	Full Sheets	Full Sheets
Maximum Observed Operating Rate during September 24, 2008 PCWP MACT Testing (msf 3/8"/hr):	7.48	7.19	16.19	15.76
Operation:	8760	8760	8760	8760
Heated Section Control Technology:	Exhaust from heated sections of four veneer dryers is collected and routed to a two-chamber Geoenergy GeoCat regenerative catalytic oxidizer (RCO) employing two 4 MMBtu/hr Maxon Kinemax burners.			
Observed RCO Exhaust Flow Rate during September 24, 2008 PCWP MACT Testing:	45,300	dscf/min		
RCO Heat Input:	8	MMBtu/hr		
RCO Operation:	8760	hr/yr		

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Criteria Pollutant Emissions	EF (lb/msf 3/8")	VDCS-1 PTE (tpy)	VDCS-2 PTE (tpy)	VDCS-3 PTE (tpy)	VDCS-4 PTE (tpy)	Total PTE (tpy)	EF Reference
Particulate (PM)	0.0075	0.25	0.24	0.53	0.52	1.5	1, 2 & 3 - see calculation below for estimating EF for processing douglas fir
Inhalable Coarse Particulate (PM_{10})	0.01562	0.51	0.49	1.11	1.08	3.2	
Fine Particulate ($PM_{2.5}$)	0.01562	0.51	0.49	1.11	1.08	3.2	
Wood Products Protocol 1 (WPP1) Volatile Organic Compounds (VOC)	0.0295	0.97	0.93	2.09	2.04	6.0	3

EF Reference	Description
1	Horizon Engineering. Project No. 3086-1. Source Evaluation Report prepared for Potlatch Forest Products Corporation. Veneer Dryers Nos. 1, 2, 3, 4 - Regenerative Catalytic Oxidizer Inlet and Outlet - Total Hazardous Air Pollutant Measured as Total Hydrocarbon - Plywood and Composite Wood Products MACT. September 24, 2008. Table 1 of the report documents total gaseous organic carbon destruction efficiency of 94.2 percent across the regenerative catalytic oxidizer.
2	Horizon Engineering. Project No. 3086-2. Source Evaluation Report prepared for Potlatch Forest Products Corporation. Veneer Dryers Nos. 1, 2, 3, 4 - Regenerative Catalytic Oxidizer Outlet - Particulate Matter, Carbon Monoxide, Nitrogen Oxide, and Opacity Emission Factors. September 24, 2008. Table 1 of the report documents filterable and condensable particulate matter emission measurements downstream of the regenerative catalytic oxidizer.
3	EPA Region 10 HAP and VOC Emission Factors for Veneer Dryer Employing Indirect Steam Heat without Air Pollution Controls, February 2016. See https://www.epa.gov/sites/production/files/2016-03/documents/veneer-dryer-hap-voc-emissionfactors.pdf

4	Interpoll Laboratories, Inc. Results of the May 2005 Air Emission Testing Conducted for The Potlatch Corporation Plywood Facility Located in St. Maries, Idaho. July 1, 2005. Potlatch Land and Lumber, LLC's March 2015 Consolidated Title V Operating Permit Application - Appendix C (Detailed Emission Calculations). The report does not indicate which species of wood was being dried while emissions testing was being conducted.

Emission Unit	Run No.	Acetaldehyde	Acrolein	Benzene	Formaldehyde	Methanol	Phenol	Propionaldehyde
VDCS-1	1	0.0017	0.0018	0.0017	0.0017	0.001	0.001	0.0017
	2	0.0017	0.0018	0.0017	0.0017	0.001	0.001	0.0017
	3	0.0017	0.0018	0.0017	0.0017	0.003	0.007	0.0017
VDCS-2	1	0.0018	0.0018	0.0018	0.0018	0.001	0.0018	0.0018
	2	0.0018	0.0018	0.0018	0.0018	0.004	0.0018	0.0018
	3	0.0018	0.0018	0.0018	0.0018	0.004	0.0018	0.0018
VDCS-3	1	0.003	0.0017	0.0023	0.002	0.004	0.0028	0.0017
	2	0.0005	0.0017	0.0023	0.0001	0.0015	0.0028	0.0017
	3	0.006	0.0017	0.0023	0.004	0.006	0.0028	0.0017
VDCS-4	1	0.002	0.002	0.002	0.002	0.002	0.002	0.002
	2	0.002	0.002	0.002	0.002	0.002	0.002	0.002
	3	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Average Emission Factor:		0.0022	0	0	0.0019	0.0026	0.0024	0

The appearance of thin diagonal stripes indicates that the concentration of the HAP was less than the method detection limit. Values appearing with thin diagonal stripes in the background reflect the method detection limit for that run. For those instances when none of the 12 runs resulted in the detection of the HAP at a concentration equal to or greater than the method detection limit, the concentration of the HAP was assumed to be zero in all instances. When at least one of the 12 runs resulted in the detection of the HAP at a concentration equal to or greater than the method detection limit, the concentration of the HAP was assumed equal to the method detection limit in those instances when the HAP was not detected.

PM/PM_{10}/$PM_{2.5}$ Emission Factor Calculation

EPA Region 10 is not aware of any emissions testing to measure PM, PM_{10} or $PM_{2.5}$ emissions resulting from veneer dryer cooling section. EPA Region 10 has estimated what these emissions might be based upon (1) measurement of post-control (regenerative catalytic oxidizer) filterable and condensable PM emissions generated by Potlatch veneer dryer heating section while processing resinous softwood non-pine family wood species, (2) assumption that filterable and condensable PM control efficiency across the regenerative catalytic oxidizer is approximately equal to measured VOC control efficiency of 94.2 percent, (3) measurement of WPP1 VOC emissions generated by veneer dryer heating section and veneer dryer cooling section at similar source to Potlatch while processing resinous softwood non-pine family wood species, and (4) assumption that PM/PM_{10}/$PM_{2.5}$ emissions across the two emission generating activities (veneer dryer heating section and veneer dryer cooling section) are proportional to WPP1 VOC emissions. The degree of uncertainty surrounding assumptions associated with items (2) and (4) is unknown. For further information with respect to item (3), see EPA Region 10 HAP and VOC Emission Factors for Veneer Dryer Employing Indirect Steam Heat without Air Pollution Controls, February 2016, at http://www.epa.gov/sites/production/files/2016-03/documents/veneer-dryer-hap-voc-emissionfactors.pdf

VDHS-1 to 4 PM Uncontrolled EF = (VDHS-1 to 4 Filterable PM Controlled EF) / (1 - VOC control efficiency)
= (0.014 lb/msf 3/8") / (1 - 0.942); Potlatch St. Maries September 2008 VDHS post-control (RCO) test measurements while processing "larch and red fir"
= 0.2414 lb/msf 3/8"

VDCS-1 to 4 PM EF estimation: VDCS-1 to 4 PM EF = (VDHS-1 to 4 PM EF) X (VDCS-1 to 4 WPP1 VOC EF) / (VDHS-1 to 4 WPP1 VOC EF)

Average Uncontrolled VDCS-1 to 4 WPP1 VOC EF (estimated based on NCASI TB No. 768 - douglas fir measurement):	1.96E-02	VDCS-1 to 4 PM EF (calculated):	7.54E-03
Average Uncontrolled VDHS-1 to 4 WPP1 VOC EF (estimated based on NCASI No. 768 - douglas fir measurement):	6.27E-01	Uncontrolled VDHS-1 to 4 PM EF:	2.41E-01

VDHS-1 to 4 PM_{10}/$PM_{2.5}$ Uncontrolled EF = (VDHS-1 to 4 Filterable + Condensable PM Controlled EF) / (1 - VOC control efficiency)
= (0.029 lb/msf 3/8") / (1 - 0.942); Potlatch St. Maries September 2008 VDHS post-control (RCO) test measurements while processing "larch and red fir"
= 0.5 lb/msf 3/8"

VDCS-1 to 4 PM_{10}/$PM_{2.5}$ EF estimation: VDCS-1 to 4 PM_{10}/$PM_{2.5}$ EF = (VDHS-1 to 4 PM_{10}/$PM_{2.5}$ EF) X (VDCS-1 to 4 WPP1 VOC EF) / (VDHS-1 to 4 WPP1 VOC EF)

Average Uncontrolled VDCS-1 to 4 WPP1 VOC EF (estimated based on NCASI TB No. 768 - douglas fir measurement):	1.96E-02	VDCS-1 to 4 PM_{10}/$PM_{2.5}$ EF (calculated):	1.56E-02
Average Uncontrolled VDHS-1 to 4 WPP1 VOC EF (estimated based on NCASI No. 768 - douglas fir measurement):	6.27E-01	Uncontrolled VDHS-1 to 4 PM_{10}/$PM_{2.5}$ EF:	5.00E-01

SMC Non-HAP Potential to Emit

Emission Unit: **PV-1**

Description: Heated pressing of pre-pressed dried veneer sheets into panels employing urea-formaldehyde resin

Control Device: none

Wood Species: Hemlock, douglas fir, grand fir and western red cedar. Smaller amounts of lodgepole pine, subalpine fir, engelmann spruce, ponderosa pine and white pine

Installation Date: February 1964

Capacity: 20 msf 3/8"/hr

Operation: 8760 hours per year

Emission Unit: **PV-2**

Description: Heated pressing of pre-pressed dried veneer sheets into panels employing urea-formaldehyde resin

Control Device: none

Wood Species: Hemlock, douglas fir, grand fir and western red cedar. Smaller amounts of lodgepole pine, subalpine fir, engelmann spruce, ponderosa pine and white pine

Installation Date: February 1974

Design Maximum Capacity: 20 msf 3/8"/hr

Operation: 8760 hours per year

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Criteria Air Pollutants	EF (lb/msf)	PV-1 PTE (tpy)	PV-2 PTE (tpy)	Total PTE (tpy)	EF Reference
Particulate (PM)	1.20E-01	10.5	10.5	21.0	1
Inhalable Coarse Particulate (PM_{10})	2.03E-01	17.8	17.8	35.6	
Fine Particulate ($PM_{2.5}$)	2.03E-01	17.8	17.8	35.6	
Wood Products Protocol 1 (WPP1) Volatile Organic Compounds (VOC)	1.03E-01	9.0	9.0	18.0	2

EF Reference	Description
1	AP-42, Table 10.5-4, January 2002. In the absence of any $PM_{2.5}$ EF, assume PM_{10} EF representative of $PM_{2.5}$ EF.
2	Derivation of emission factor presented at the conclusion of this emissions inventory.

SMC Non-HAP Potential to Emit

Emission Unit:	**LS-1**	
Description:	Three steam-heated log steaming vault	
Control Device:	None	
Wood Species:	Hemlock, douglas fir, grand fir and western red cedar. Smaller amounts of lodgepole pine, subalpine fir, engelmann spruce, ponderosa pine and white pine	
Installation Date:	1964	
Capacity:	40	msf (3/8")/hr
Operation:	8760	hr/yr

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Criteria Air Pollutants	EF (lb/msf)	PTE (tpy)
Wood Products Protocol 1 (WPP1) Volatile Organic Compounds (VOC)	8.72E-02	15.3

Derivation of emission factor presented at the conclusion of this emissions inventory.

SMC Non-HAP Potential to Emit

Emission Unit: **PCWR-SM**
Description: Pneumatic conveyance of wood residue related to sawmill operations, including planer
Wood Species: Hemlock, douglas fir, grand fir and western red cedar. Smaller amounts of lodgepole pine, subalpine fir, engelmann spruce, ponderosa pine and white pine
Operation: 8760 hr/yr
Maximum Dry Lumber Production: 307 MMbf/yr SMC's LK-5 + LDD's LK-1, LK-2, LK-3 and LK-4

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Emissions Generating Activity	Emission Unit ID	Process Unit / Control Device ID	Maximum Airflow (mcf/hr) (1 mcf = 1000 cf)	Highest Annual Ratio of Residue to Dry Lumber Production for Years '11 to '16 (bdt/MMbf)	Criteria Air Pollutants							
					Particulate PM		Inhalable Coarse Particulate PM10		Fine Particulate PM2.5		Volatile Organic Compounds (VOC)	
					EF (gr/dscf)	PTE (tpy)	EF (gr/dscf)	PTE (tpy)	EF (gr/dscf)	PTE (tpy)	EF (lb/bdt)	PTE (tpy)
Pneumatic conveyance of green wood chips from Screener to Chip Bin via Cyclone CY-2. Screener receives chips generated by CNS, Edger and Chipper. Exhaust from CY-2 is discharged to atmosphere.	S-CH	CY-2	510	540.1	0.1	31.9	0.085	7.0	0.05	4.1	0.5017	41.6
Pneumatic conveyance of metal filings (not a wood residue) to Cyclone CY-9		CY-9	Information not provided by applicant.									
Pneumatic conveyance of unknown material to Carpenter Shop Baghouse BH-1		BH-1	180		0.01	1.1	0.01	1.1	0.01	1.1		
Pneumatic conveyance of planer shavings (green or dry) from Planer to Planer Shavings Truck Bin via Baghouse BH-2	P-SH	BH-2	1,800	113.5	0.01	11.3	0.01	11.3	0.01	11.3	0.5017	8.7
Pneumatic conveyance of Trimmer (green or dry) sawdust and Chipper residue (green or dry) to Planer Shavings Truck Bin via Baghouse BH-3	P-SD	BH-3	1,620		0.01	10.1	0.01	10.1	0.01	10.1	0.5017	?
Control of Ply Trim Bin vent with Baghouse BH-4. Sawmill chipped dry trim ends and plywood mill dry waste are pneumatically conveyed to Ply Trim Bin. See sheet "PCWR-PM" for emission calculations.	P-PTB	BH-4	360		0.01	2.3	0.01	2.3	0.01	2.3	0.5017	?
Control of Planer Shavings Truck Bin vent with BH-5. Material in bin can be green or dry.	P-PSB	BH-5	360	113.5	0.01	2.3	0.01	2.3	0.01	2.3	0.5017	8.7
Pneumatic conveyance of green sawdust from Quad Band Mill, Chipping Edger, Vertical Arbor Gand Saw, and Trimmer to Hog Fuel Truck Bin via Baghouse BH-10. Exhaust from BH-10 is discharged to atmosphere.	S-SD	BH-10	2,905	124.7	0.01	18.2	0.01	18.2	0.01	18.2	0.5017	9.6
Control of Sawmill Sawdust Truck Bin vent with BH-11. Material in bin is green.	S-SDB	BH-11	636		0.01	4.0	0.01	4.0	0.01	4.0	0.5017	?
TOTAL (tpy):						81.1		56.2		53.3		68.7

PM, PM10 and PM2.5 Emission Factors for Pneumatic Conveyance of Wood Residue

Process Unit/Control Device Receiving Wood Residue	PM EF (gr/dscf)	PM10 EF (gr/dscf)	PM2.5 EF (gr/dscf)	Basis
Cyclone	0.1	0.085	0.05	PM emission factor based on 0.1 gr/dscf emission limit at 40 CFR 49.125(d)(3) for process source stacks. Note that 0.03 gr/dscf PM EF in Table 10.4.1 of AP-42, February 1980 represents average EF for large diameter cyclones in “woodworking waste collection systems.” Range of PM EF is 0.001 to 0.16 gr/dscf and has an emission factor rating of “D.” Based on Oregon DEQ's AQ-EF03, assume PM10 is 85% of PM and PM2.5 is 50% of PM.

Baghouse	0.01	0.01	0.01	See EPA's document entitled, Fabric Filter Bag Leak Detection Guidance, EPA-454/R-98-015, September 1997 at https://www3.epa.gov/ttnemc01/cem/tribo.pdf. On page 2 of the document, EPA states, "Fabric filters are capable of extremely high control efficiencies of both coarse and fine particles; outlet concentrations as low as 20 mg/dscm (0.01 gr/dscf) can be achieved with most fabric filter systems. Conservatively assume PM2.5 and PM10 equivalent to EPA Reference Method 5 PM. Testing of two Potlatch baghouses in May 1996 measured three-run average RM5 PM emissions of 0.0059 and 0.0069 gr/dscf, respectively. The applicable FARR process source stack PM emission limit of 0.1 gr/dscf at 40 CFR § 49.125(d)(3) is not being employed to calculate PTE as its use would overstate PTE by an order of magnitude.

Oregon Department of Environmental Quality's AQ-EF03 entitled, "Emission Factors - Wood Products - PM10/PM2.5 Fraction." August 1, 2011 at https://www.oregon.gov/deq/FilterPermitsDocs/AQ-EF03.

Type of Control	PM10 Fraction of PM	PM2.5 Fraction of PM
Cyclone - high efficiency	95	80
Cyclone - medium efficiency	85	50

VOC Emission Factors for Pneumatic Conveyance of Green Wood Residue

Green Wood Residue Type	VOC as propane (lb/bdt)
Species: Non-Resinous Softwood (e.g. white fir[2], western hemlock and western red cedar)	
Sawdust	0.2386
Planer Shavings	0.2692
Chips	0.0734
Species: Resinous Softwood Non-Pine Family (e.g. douglas fir, engelman spruce and larch)	
Sawdust	0.2386
Planer Shavings	0.2692
Chips	0.0734
Species: Resinous Softwood Pine Family (e.g. lodgepole pine, ponderosa pine and western white pine)	
Sawdust	0.5017
Planer Shavings	0.5017
Chips	0.5017

Derivation of emission factors presented at the conclusion of this emissions inventory.

SMC Non-HAP Potential to Emit

Emission Unit: **PCWR-PM**
Description: Pneumatic conveyance of wood residue related to plywood mill operations
Wood Species: Hemlock, douglas fir, grand fir and western red cedar. Smaller amounts of lodgepole pine, subalpine fir, engelmann spruce, ponderosa pine and white pine
Operation: 8760 hr/yr

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Emissions Generating Activity	Emission Unit ID	NCASI TB No. 768 Facility and Activity ID	Maximum Airflow (mcf/hr) (1 mcf = 1000 cf)	2012 Operating Hours (hr/yr)	2012 Wood Residue Generation (bdt/yr)	Plywood Throughput (msf 3/8"/hr)	Criteria Air Pollutants: Particulate (PM) EF (gr/dscf)	Particulate (PM) PTE (tpy)	Inhalable Coarse Particulate (PM10) EF (gr/dscf)	Inhalable Coarse Particulate (PM10) PTE (tpy)	Fine Particulate (PM2.5) EF (gr/dscf)	Fine Particulate (PM2.5) PTE (tpy)	Volatile Organic Compounds (VOC) EF (lb/bdt or lb/msf 3/8")	Volatile Organic Compounds (VOC) PTE (tpy)
Pneumatic conveyance of green fines from Veneer Clipper to cyclone CY-1. CY-1 exhaust is discharged to air inside plywood mill building, and thereafter to atmosphere via plywood mill building vents. Green fines collected by CY-1 are ultimately delivered to one of two truck bins.	CY-1	N/A	Information not provided by applicant				0.1		0.085		0.05		0.5017	
Pneumatic conveyance of green chips and fines from VD-3 infeed to hopper via cyclone CY-5. Exhaust from CY-5 is discharged to atmosphere.	CY-5	N/A	480	4,494	Information not provided by applicant		0.1	30.0	0.085	25.5	0.05	15.0	0.5017	
Control of Ply Trim Bin vent with Baghouse BH-4. Sawmill chipped trim ends and plywood mill dry waste are pneumatically conveyed to Ply Trim Bin.	BH-4	165-1WD1	360	3,658		40	0.01	2.3	0.01	2.3	0.01	2.3	0.0793	13.9
Control of Cyclone CY-3 exhaust with Baghouse BH-6. Sanderdust from Kimwood Sander is pneumatically conveyed to CY-3 for recovery. BH-6 exhausts to atmosphere. Residue collected by BH-6 is pneumatically conveyed to either CY-7 or CY-8.	BH-6	170-1SD1	3,900	4,494		40	0.01	24.4	0.01	24.4	0.01	24.4	0.2614	45.8
Control of Cyclone CY-7 exhaust by Baghouse BH-7. Sanderdust collected from CY-3 and BH-6 is pneumatically conveyed to CY-7 for recovery into Plywood Sanderdust Truck Bin. BH-7 exhausts to atmosphere. Residue collected by BH-7 is also deposited into Plywood Sanderdust Truck Bin. BH-7 also controls Plywood Sanderdust Truck Bin vent.	BH-7	170-1SD1	240	4,494		Information not provided by applicant	0.01	1.5	0.01	1.5	0.01	1.5	0.2614	
Control of Cyclone CY-8 exhaust by Baghouse BH-8. Sanderdust collected from CY-3 and BH-6 is pneumatically conveyed to CY-8 for recovery ultimately into Surge Bin serving PB-2. CY-8 also pneumatically receives fines and dust from Raimann Patchline waste veneer Hog and Specialty Machine Center. BH-8 exhausts to atmosphere. Residue collected by BH-8 is pneumatically conveyed back to CY-8.	BH-8	170-1SD1	1,860	4,494		Information not provided by applicant	0.01	11.6	0.01	11.6	0.01	11.6	0.2614	
Dust pickups from dry veneer stacker, core composers, pre-press bandsaws, synthetic patch lines, trim saw line and exhaust from CY-4 are routed to baghouse BH-9. Fines collected by BH-9 are directed to the intermediate storage bin.	BH-9	170-XMW1	2,550	4,494		40	0.01	16.0	0.01	16.0	0.01	16.0	0.0883	15.5
						TOTAL (tpy):		85.8		81.3		70.8		75.1

PM, PM10 and PM2.5 Emission Factors for Pneumatic Conveyance of Wood Residue

Process Unit/Control Device Receiving Wood Residue	PM EF (gr/dscf)	PM10 EF (gr/dscf)	PM2.5 EF (gr/dscf)	Basis
Cyclone	0.1	0.085	0.05	PM emission factor based on 0.1 gr/dscf emission limit at 40 CFR 49.125(d)(3) for process source stacks. Note that 0.03 gr/dscf PM EF in Table 10.4.1 of AP-42, February 1980 represents average EF for large diameter cyclones in "woodworking waste collection systems." Range of PM EF is 0.001 to 0.16 gr/dscf and has an emission factor rating of "D." Based on Oregon DEQ's AQ-EF03, assume PM10 is 85% of PM and PM2.5 is 50% of PM.
Baghouse	0.01	0.01	0.01	See EPA's document entitled, Fabric Filter Bag Leak Detection Guidance, EPA-454/R-98-015, September 1997 at https://www3.epa.gov/ttnemc01/cem/tribo.pdf. On page 2 of the document, EPA states, "Fabric filters are capable of extremely high control efficiencies of both coarse and fine particles; outlet concentrations as low as 20 mg/dscm (0.01 gr/dscf) can be achieved with most fabric filter systems. Conservatively assume PM2.5 and PM10 equivalent to EPA Reference Method 5 PM. Testing of two Potlatch baghouses in May 1996 measured three-run average RM5 PM emissions of 0.0059 and 0.0069 gr/dscf, respectively. The applicable FARR process source stack PM emission limit of 0.1 gr/dscf at 40 CFR § 49.125(d)(3) is not being employed to calculate PTE as its use would overstate PTE by an order of magnitude.

Oregon Department of Environmental Quality's AQ-EF03 entitled, "Emission Factors - Wood Products - PM10/PM2.5 Fraction." August 1, 2011 at https://www.oregon.gov/deq/FilterPermitsDocs/AQ-EF03.

Type of Control	PM10 Fraction of PM	PM2.5 Fraction of PM
Cyclone - high efficiency	95	80
Cyclone - medium efficiency	85	50

Oregon Department of Environmental Quality's AQ-EF03 entitled, "Emission Factors - Wood Products - PM10/PM2.5 Fraction." August 1, 2011 at https://www.oregon.gov/deq/FilterPermitsDocs/AQ-EF03.

Type of Control	PM10 Fraction of PM	PM2.5 Fraction of PM
	Cyclones & Process Equipment	
Uncontrolled		
Bag filter system	99.5	99
Cyclone - high efficiency	95	80
Cyclone - medium efficiency	85	50

VOC Emission Factors for Pneumatic Conveyance of Green Wood Residue

Green Wood Residue Type	VOC as propane (lb/bdt)
Species: Non-Resinous Softwood (e.g. white fir[2], western hemlock and western red cedar)	
Sawdust	0.2386
Planer Shavings	0.2692
Chips	0.0734
Species: Resinous Softwood Non-Pine Family (e.g. douglas fir, engelman spruce and larch)	
Sawdust	0.2386
Planer Shavings	0.2692
Chips	0.0734
Species: Resinous Softwood Pine Family (e.g. lodgepole pine, ponderosa pine and western white pine)	
Sawdust	0.5017
Planer Shavings	0.5017
Chips	0.5017

Derivation of emission factors presented at the conclusion of this emissions inventory.

VOC and HAP Emission Factors for Pneumatic Conveyance of Resinated Wood Residue

Species	Activity	NCASI TB768 Facility & Activity ID	WPP1 VOC (lb/msf 3/8")	Total HAP (lb/msf 3/8")
All Pacific Northwest Softwood Species	Pneumatic Conveyance of Layup Trim Chipping Exhaust	165-1WD1	0.0793	0.0134
	Pneumatic Conveyance of Plywood Trim Chipping Exhaust & Plywood Sanderdust	165-1WR1	0.0664	0.0135
	Pneumatic Conveyance of Plywood Course Residue Streams	170-XMW1	0.0883	0.0185
	Pneumatic Conveyance of Plywood Sanderdust	170-1SD1	0.2614	0.0220

Derivation of emission factors presented at the conclusion of this emissions inventory.

SMC Non-HAP Potential to Emit

Emission Unit: **IC-1 - Internal Combustion Engine 1**
Description: Detroit Diesel PTA-1SD-50 compression ignition (CI) diesel fired engine. Installed 1964.
Two-stroke engine supplies mechanical work to water pump for fire suppression in the event facility loses electricity in an emergency.
Control Device: none
Fuel: No. 2 distillate oil
Design Maximum Power Output: 265 horsepower
Design Maximum Heat Input Capcity: 1.86 MMBtu/hr[1]
Operation: 100 hours per year[2]

Emission Unit: **IC-2 - Internal Combustion Engine 2**
Description: Detroit Diesel PTA-1SD-50 compression ignition (CI) diesel fired engine. Installed 1967.
Two-stroke engine supplies mechanical work to water pump for fire suppression in the event facility loses electricity in an emergency.
Control Device: none
Fuel: No. 2 distillate oil
Design Maximum Power Output: 265 horsepower
Design Maximum Heat Input Capcity: 1.86 MMBtu/hr[1]
Operation: 100 hours per year[2]

NON-FUGITIVE EMISSIONS
Potential to Emit, (tons per year)

Criteria Pollutant Emissions	EF (lb/MMBtu)	IC-1 PTE (tpy)	IC-2 PTE (tpy)	Total PTE (tpy)	EF Reference
Carbon Monoxide (CO)	0.95	0.1	0.1	0.2	1
Lead (Pb)	-	0	0	0	1
Nitrogen Oxides (NO_X)	4.41	0.4	0.4	0.8	1
Particulate (PM)	0.1974	0.02	0.02	0.04	2
Inhalable Coarse Particulate (PM_{10})	0.1974	0.02	0.02	0.04	2
Fine Particulate ($PM_{2.5}$)	0.1974	0.02	0.02	0.04	2
Sulfur Dioxide (SO_2)	0.5036	0.0467	0.0467	0.0934	3
Volatile Organic Compounds (VOC)	0.36	0.03	0.03	0.1	1
Sulfuric Acid Mist (H_2SO_4)					

Greenhouse Gas Emissions (CO_2 Equivalent)	EF (lb/MMBtu)	IC-1 PTE (tpy)	IC-2 PTE (tpy)	Total PTE (tpy)	EF Reference
Carbon Dioxide (CO_2)	163.054	15.1	15.1	30.2	4
Methane (CH_4)	0.165	0.02	0.02	0.03	4
Nitrous Oxide (N_2O)	0.394	0.04	0.04	0.1	4
TOTAL (tpy):		15	15	30	

[1] Heat Input = Power Output (MMBtu/hr) X Average BSFC (Btu/hp-hr) X (MMBtu/1x10^6 Btu), where BSFC stands for brake-specific fuel consumption. See footnote A of Table 3.3-1 of AP-42, October 1996. 1.86 MMBtu/hr = (265 hp-hr) X (7,000 Btu/hp-hr) X (MMBtu/1x10^6 Btu)

[2] The engines are emergency stationary reciprocating internal combustion engines subject to NESHAP subpart ZZZZ, and the proposed Title V permit prohibits the permittee from operating them in non-emergency situations for more than 100 hours per calendar year pursuant to 40 CFR 63.6640(f).

EF Reference	Description
1	Table 3.3-1 of AP-42, October 1996.
2	Basis: FARR combustion source stack PM emission limit of 0.1 gr/dscf corrected to 7% O_2 at 40 CFR 49.125(d)(1) EF (lb/MMBtu) = FARR PM Limit (gr/dscf@7%O_2) X $CF_{7\rightarrow0\%O2}$ X F_d (dscf/MMBtu) / $CF_{gr\rightarrow lb}$ (gr/lb) • $CF_{7\rightarrow0\%O2}$ = (20.9 - X_{O2Fd}) / (20.9 - X_{O2FARR}). To create a correction factor that adjusts the basis of the FARR emission limit from 7% O_2 to 0% O_2 (the basis for F_d), X_{O2Fd} = 0 and X_{O2FARR} = 7. The value 20.9 is the percent by volume of the ambient air that is O_2. Decreasing the O_2 from the FARR baseline increases the pollutant concentration. See Equation 19-1 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60. • F_d = 9,190 dscf/MMBtu for combustion of oil. See Table 19-2 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60. FARR PM Calculated EF (lb/MMBtu): 0.1974; FARR PM Emission Limit (gr/dscf @7%O_2): 0.1; $CF_{7\rightarrow0\%O2}$ (unitless): 1.504; F_d (dscf/MMBtu): 9,190; $CF_{gr\rightarrow lb}$ (gr/lb): 7,000 • Assume $PM_{2.5}$ = PM_{10} = PM

3

Option 1: 0.50357 lb/MMBtu. This emission factor is employed to determine PTE as it limits emissions to less than Options 2 below.

Basis: FARR distillate fuel oil No. 2 sulfur limit of 0.5% by weight at 40 CFR 49.130(d)(2)

EF (lb/MMBtu) = [FARR Fuel S Limit (%S) / 100] X $CF_{S \rightarrow SO2}$ X $CF_{lb \rightarrow gal}$ (lb/gal) X $CF_{Btu \rightarrow MMBtu}$ (Btu/MMBtu) / $CF_{gal \rightarrow Btu}$ (Btu/gal)

• $CF_{S \rightarrow SO2}$ = 2 lb SO_2/lb S. S + $O_2 \rightarrow SO_2$. For every 1 mol S (16 lb/lb-mol) reactant, there is 1 mol SO_2 (32 lb/lb-mol) product. 32 / 16 = 2.

• $CF_{lb \rightarrow gal}$ = 7.05 lb/gal fuel. See weight of distillate oil on page A-6 of Appendix A to AP-42, September 1985.

• $CF_{gal \rightarrow Btu}$ = 140,000 Btu/gal fuel. See heating value of distillate oil on page A-5 of Appendix A to AP-42, September 1985.

FARR Fuel S Calculated SO_2 EF (lb/MMBtu)	FARR Fuel Sulfur Limit (% by weight)	$CF_{S \rightarrow SO2}$ (lb SO_2/lb S)	$CF_{lb \rightarrow gal}$ (lb/gal fuel)	$CF_{gal \rightarrow Btu}$ (Btu/gal fuel)	$CF_{Btu \rightarrow MMBtu}$ (Btu/MMBtu)
0.50357	0.5	2	7.05	140,000	1.E+06

Option 2: 1.147 lb/MMBtu.

Basis: FARR combustion source stack SO_2 emission limit of 500 parts per million by volume dry basis (ppmvd) corrected to 7% O_2 at 40 CFR 49.129(d)(1)

EF (lb/MMBtu) = FARR SO_2 Limit (ppmvd@7%O_2) X $CF_{7 \rightarrow 0\%O2}$ X $CF_{ppm \rightarrow lb/dscfSO2}$ X F_d (dscf/MMBtu)

• $CF_{7 \rightarrow 0\%O2}$ = (20.9 - X_{O2Fd}) / (20.9 - X_{O2FARR}). To create a correction factor that adjusts the basis of the FARR emission limit from 7% O_2 to 0% O_2 (the basis for F_d), X_{O2Fd} = 0 and X_{O2FARR} = 7. The value 20.9 is the percent by volume of the ambient air that is O_2. Decreasing the O_2 from the FARR baseline increases the pollutant concentration. See Equation 19-1 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60.

• $CF_{ppm \rightarrow lb/dscfSO2}$ = 1.660 X 10^{-7} lb SO_2/dscf / ppm SO_2. See Table 19-1 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60.

• F_d = 9,190 dscf/MMBtu for combustion of oil. See Table 19-2 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60.

FARR 500 ppm Calculated SO_2 EF (lb/MMBtu)	FARR SO_2 Emission Limit (ppmvd@7%O_2)	$CF_{7 \rightarrow 0\%O2}$ (unitless)	$CF_{ppm \rightarrow lb/dscfSO2}$ (lb/dscf / ppm)	F_d (dscf/MMBtu)
1.147	500	1.504	1.66E-07	9190

4

EPA's March 2011 guidance document "PSD and Title V Permitting Guidance for Greenhouse Gases" states that the GHG Report Rule (40 CFR 98), "should be considered a primary reference for sources and permitting authorities in estimating GHG emissions and establishing measurement techniques when preparing or processing permit applications." Therefore, GHG Reporting Rule emission factors will be employed to determine GHG PTE.

Carbon Dioxide (CO_2)

EF (lb CO_2e/MMBtu) = EF (kg CO_2/MMBtu) X $CF_{kg \rightarrow lb}$ (lb/kg) X GWP_{CO2} (lb CO_2e/lb CO_2)

Calculated CO_2e EF for CO_2 (lb CO_2e/MMBtu)	40 CFR 98 Table C-1 EF (kg CO_2/MMBtu)	$CF_{kg \rightarrow lb}$ (lb/kg)	40 CFR 98 Table A-1 GWP_{CO2} (lb CO_2e/lb CO_2)
163.054	73.96	2.20462262	1

Methane (CH_4)

EF (lb CO_2e/MMBtu) = EF (kg CH_4/MMBtu) X $CF_{kg \rightarrow lb}$ (lb/kg) X GWP_{CH4} (lb CO_2e/lb CH_4)

Calculated CO_2e EF for CH_4 (lb CO_2e/MMBtu)	40 CFR 98 Table C-2 EF (kg CH_4/MMBtu)	$CF_{kg \rightarrow lb}$ (lb/kg)	40 CFR 98 Table A-1 GWP_{CO2} (lb CO_2e/lb CH_4)
0.165	0.003	2.20462262	25

Nitrous Oxide (N_2O)

EF (lb CO_2e/MMBtu) = EF (kg N_2O/MMBtu) X $CF_{kg \rightarrow lb}$ (lb/kg) X GWP_{N2O} (lb CO_2e/lb N_2O)

Calculated CO_2e EF for N_2O (lb CO_2e/MMBtu)	40 CFR 98 Table C-2 EF (kg N_2O/MMBtu)	$CF_{kg \rightarrow lb}$ (lb/kg)	40 CFR 98 Table A-1 GWP_{CO2} (lb CO_2e/lb N_2O)
0.394	0.0006	2.20462262	298

SMC Non-HAP Potential to Emit

Emission Units: **Internal Combustion Engines IC-3 to IC-10**

Description: Nonhandheld rich-burn four-stroke spark ignition propane-fired generator sets supplying electricity in the event facility loses grid-supplied electricity in an emergency. Engine displacement ≥ 225 cubic centimeters. No control devices employed.

	IC-3	IC-4	IC-5	IC-6	IC-7	IC-8	IC-9	IC-10
Make:	Kohler	Generac	Briggs & Stratton	Briggs & Stratton	Kohler	Kohler	Kohler	Generac
Generator Model:	14RESA-Q54	0058821	040243A	040220	14RESA-Q52	14RESA-QS9	20RESA-QS	0058822
Generator Serial Number:	SGV322CT9	7706022	1019656470	1013904961	SGM328KB5	SGV3235F5	SGV323VVJ	7981011
Year of Manufacture:							2016	
Installation Year:	2015	2013	2014	2014	2013	2015	2017	2013
In an emergency, provides electricity to:	Front Office	Scale House	Log Yard	Sawmill	Warehouse	Firehouse	Boilerhouse	Shipping
Generator Output Rating (kW):	14	8	11	7	14	14	20	8
Engine Output Rating (kW)[1]:	18	10	14	9	18	18	25	10
Engine Output Rating (hp)[2]:	23	13	18	12	23	23	34	13
Design Maximum Heat Input Capcity (MMBtu/hr)[3]:	0.16	0.09	0.13	0.08	0.16	0.16	0.23	0.09
Operation (hr/yr)[4]:	100	100	100	100	100	100	100	100

[1] Assume system is 80% efficient in converting mechanical energy to electricity.

[2] 1 hp = 0.7457 kW

[3] Heat Input = Power Output (MMBtu/hr) X Average BSFC (Btu/hp-hr) X (MMBtu/1x10^6 Btu), where BSFC stands for brake-specific fuel consumption. See footnote A of Table 3.3-1 of AP-42, October 1996. 1.86 MMBtu/hr = (265 hp-hr) X (7,000 Btu/hp-hr) X (MMBtu/1x10^6 Btu)

[4] The engines are emergency stationary reciprocating internal combustion engines. IC-9 is subject to NESHAP subpart ZZZZ, and the rest are subject to NSPS subpart JJJJ. The proposed Title V permit prohibits the permittee from operating the engines in non-emergency situations for more than 100 hours per calendar year pursuant to 40 CFR 63.6640(f) and 60.4243(d).

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Criteria Pollutant Emissions	EF (g/kW-hr)	EF (lb/MMBtu)	EF Reference	IC-3 PTE (tpy)	IC-4 PTE (tpy)	IC-5 PTE (tpy)	IC-6 PTE (tpy)	IC-7 PTE (tpy)	IC-8 PTE (tpy)	IC-9 PTE (tpy)	IC-10 PTE (tpy)	Total PTE (tpy)
Carbon Monoxide (CO)	610		1	1.2	0.7	0.9	0.6	1.2	1.2	N/A	0.7	7.8
	519		2	N/A	N/A	N/A	N/A	N/A	N/A	1.4	N/A	
Lead (Pb)	-	-	3	0	0	0	0	0	0	0	0	0
Nitrogen Oxides (NO_X)	8		1	0.02	0.01	0.01	0.01	0.02	0.02	N/A	0.01	0.1
	13.4		2	N/A	N/A	N/A	N/A	N/A	N/A	0.04	N/A	
Particulate (PM)		0.1871	4	0.0015	0.0009	0.0012	0.0008	0.0015	0.0015	0.0022	0.0009	0.01
Inhalable Coarse Particulate (PM_{10})		0.19701	5	0.0016	0.0009	0.0013	0.0008	0.0016	0.0016	0.0023	0.0009	0.01
Fine Particulate ($PM_{2.5}$)		0.19701	5	0.0016	0.0009	0.0013	0.0008	0.0016	0.0016	0.0023	0.0009	0.01
Sulfur Dioxide (SO_2)		0.0115	6	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0.001
Volatile Organic Compounds (VOC)		0.0296	3	0.0002	0.0001	0.0002	0.0001	0.0002	0.0002	0.0003	0.0001	0.002
Sulfuric Acid Mist (H_2SO_4)												

Greenhouse Gas Emissions (CO_2 Equivalent)	EF (g/kW-hr)	EF (lb/MMBtu)	EF Reference	IC-3 PTE (tpy)	IC-4 PTE (tpy)	IC-5 PTE (tpy)	IC-6 PTE (tpy)	IC-7 PTE (tpy)	IC-8 PTE (tpy)	IC-9 PTE (tpy)	IC-10 PTE (tpy)	Total PTE (tpy)
Carbon Dioxide (CO_2)		138.605	7	1.1385	0.6506	0.8945	0.5692	1.1385	1.1385	1.6264	0.6506	7.8
Methane (CH_4)		0.165	7	0.0014	0.0008	0.0011	0.0007	0.0014	0.0014	0.0019	0.0008	0.01
Nitrous Oxide (N_2O)		0.394	7	0.0032	0.0019	0.0025	0.0016	0.0032	0.0032	0.0046	0.0019	0.02
TOTAL				1.14	0.65	0.90	0.57	1.14	1.14	1.63	0.65	7.8

EF Reference	Description
1	NSPS subpart JJJJ. SI engines with maximum power less than 19 kW manufactured on or after July 1, 2008 are subject to emission standards in 40 CFR 60.4231(a) pursuant to 40 CFR 60.4233(a). 40 CFR 60.4231(a) makes the emission standards of 40 CFR part 1054 applicable. Class II engines are those with total displacement at or above 225 cubic centimeters. Pursuant to Table 1 to 40 CFR 1054.105, the Phase 3 Class II engine emission standards are as follows: HC + NO_X: 8 g/kW-hr, CO: 610 g/kW-hr.
2	Pursuant to Table 1 to 40 CFR 90.103(a), the Phase 1, Class II engine emission standards are as follows: HC + NO_X: 13.4 g/kW-hr, CO: 519 g/kW-hr.
3	Table 3.2-3 of AP-42, July 2000.
4	Basis: FARR combustion source stack PM emission limit of 0.1 gr/dscf corrected to 7% O_2 at 40 CFR 49.125(d)(1) EF (lb/MMBtu) = FARR PM Limit (gr/dscf@7%O_2) X $CF_{7\rightarrow0\%O2}$ X F_d (dscf/MMBtu) / $CF_{gr\rightarrow lb}$ (gr/lb) • $CF_{7\rightarrow0\%O2}$ = (20.9 - X_{O2Fd}) / (20.9 - X_{O2FARR}). To create a correction factor that adjusts the basis of the FARR emission limit from 7% O_2 to 0% O_2 (the basis for F_d), X_{O2Fd} = 0 and X_{O2FARR} = 7. The value 20.9 is the percent by volume of the ambient air that is O_2. Decreasing the O_2 from the FARR baseline increases the pollutant concentration. See Equation 19-1 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60. • F_d = 8,710 dscf/MMBtu for combustion of propane. See Table 19-2 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60. [FARR PM Calculated EF (lb/MMBtu): 0.1871; FARR PM Emission Limit (gr/dscf @7%O_2): 0.1; $CF_{7\rightarrow0\%O2}$ (unitless): 1.504; F_d (dscf/MMBtu): 8,710; $CF_{gr\rightarrow lb}$ (gr/lb): 7,000] • Assume $PM_{2.5}$ = PM_{10} = PM

FARR PM Calculated EF (lb/MMBtu)	FARR PM Emission Limit (gr/dscf @7%O_2)	$CF_{7\rightarrow0\%O2}$ (unitless)	F_d (dscf/MMBtu)	$CF_{gr\rightarrow lb}$ (gr/lb)
0.1871	0.1	1.504	8,710	7,000

5

Basis: FARR PM limit for filterable portion and AP-42's Table 3.2-3, July 2000 for condensible portion of 0.00991 lb/MMBtu. Assume all PM is also PM_{10} and $PM_{2.5}$. 0.1871 lb/MMBtu (filterable) + 0.00991 lb/MMBtu (condensible) = 0.19701 lb/MMBtu.

6

Option 1: 0.0173 lb/MMBtu. This emission factor is employed to determine PTE as it limits emissions to less than Options 2 and 3 below.

Basis: Pursuant to ASTM D1835-16 and Gas Processors Association (GPA) Standard 2140, the sulfur content of commerical propane must not exceed 185 ppm by mass.

EF (lb/MMBtu) = [ASTM & GPA Fuel S Limit (ppm) / $1x10^6$] X $CF_{S \to SO2}$ X $CF_{lb \to gal}$ (lb/gal) X $CF_{Btu \to MMBtu}$ (Btu/MMBtu) / $CF_{gal \to Btu}$ (Btu/gal)

- $CF_{S \to SO2}$ = 2 lb SO_2/lb S. S + O_2 → SO_2. For every 1 mol S (16 lb/lb-mol) reactant, there is 1 mol SO_2 (32 lb/lb-mol) product. 32 / 16 = 2.
- $CF_{lb \to gal}$ = 4.24 lb/gal fuel at 60°F. See weight of liquid propane on page A-6 of Appendix A to AP-42, September 1985.
- $CF_{gal \to Btu}$ = 90,500 Btu/gal fuel. See heating value of liquid propane on page A-6 of Appendix A to AP-42, September 1985.

ASTM D1835-16 & GPA Standard 2140 Fuel Sulfur Calculated SO_2 EF (lb/MMBtu)	ASTM D1835-16 & GPA Standard 2140 Fuel Sulfur Limit for HD-5 Grade Propane (ppm by mass)	$CF_{S \to SO2}$ (lb SO_2/lb S)	$CF_{lb \to gal}$ (lb/gal fuel)	$CF_{gal \to Btu}$ (Btu/gal fuel)	$CF_{Btu \to MMBtu}$ (Btu/MMBtu)
0.0115	123	2	4.24	90,500	1.E+06

Option 2: 0.0539 lb/MMBtu.

Basis: FARR gaseous fuel sulfur limit of 1.1 g/dry standard cubic meter at 40 CFR 49.130(d)(8)

EF (lb/MMBtu) = FARR Fuel S Limit (g/m^3) / $CF_{m3 \to ft3}$ / $CF_{ft3 \to Btu}$ X $CF_{Btu \to MMBtu}$ / $CF_{g \to lb}$ X $CF_{S \to SO2}$

- $CF_{S \to SO2}$ = 2 lb SO_2/lb S. S + O_2 → SO_2. For every 1 mol S (16 lb/lb-mol) reactant, there is 1 mol SO_2 (32 lb/lb-mol) product. 32 / 16 = 2.
- $CF_{ft3 \to Btu}$ = 2550 Btu/ft^3 fuel. See heating value of propane gas at 60°F at http://www.engineeringtoolbox.com/energy-content-d_868.html

FARR Fuel S Calculated SO_2 EF (lb/MMBtu)	FARR Fuel Sulfur Limit (g/m^3)	$CF_{m3 \to ft3}$ (ft^3/m^3)	$CF_{ft3 \to Btu}$ (Btu/ft^3)	$CF_{Btu \to MMBtu}$ (Btu/MMBtu)	$CF_{g \to lb}$ (g/lb)	$CF_{S \to SO2}$ (lb SO_2/lb S)
0.0539	1.1	35.3147	2550	1.E+06	453.592	2

Option 3: 1.087 lb/MMBtu.

Basis: FARR combustion source stack SO_2 emission limit of 500 parts per million by volume dry basis (ppmvd) corrected to 7% O_2 at 40 CFR 49.129(d)(1)

EF (lb/MMBtu) = FARR SO_2 Limit (ppmvd@7%O_2) X $CF_{7 \to 0\%O2}$ X $CF_{ppm \to lb/dscfSO2}$ X F_d (dscf/MMBtu)

- $CF_{7 \to 0\%O2}$ = (20.9 - X_{O2Fd}) / (20.9 - X_{O2FARR}). To create a correction factor that adjusts the basis of the FARR emission limit from 7% O_2 to 0% O_2 (the basis for F_d), X_{O2Fd} = 0 and X_{O2FARR} = 7. The value 20.9 is the percent by volume of the ambient air that is O_2. Decreasing the O_2 from the FARR baseline increases the pollutant concentration. See Equation 19-1 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60.
- $CF_{ppm \to lb/dscfSO2}$ = 1.660 X 10^{-7} lb SO_2/dscf / ppm SO_2. See Table 19-1 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60.
- F_d = 8,710 dscf/MMBtu for combustion of propane. See Table 19-2 of EPA Method 19 at Appendix A-7 to 40 CFR Part 60.

FARR 500 ppm Calculate SO_2 EF (lb/MMBtu)	FARR SO_2 Emission Limit (ppmvd@7%O_2)	$CF_{7 \to 0\%O2}$ (unitless)	$CF_{ppm \to lb/dscfSO2}$ (lb/dscf / ppm)	F_d (dscf/MMBtu)
1.087	500	1.504	1.66E-07	8710

7

EPA's March 2011 guidance document "PSD and Title V Permitting Guidance for Greenhouse Gases" states that the GHG Report Rule (40 CFR 98), "should be considered a primary reference for sources and permitting authorities in estimating GHG emissions and establishing measurement techniques when preparing or processing permit applications." Therefore, GHG Reporting Rule emission factors will be employed to determine GHG PTE for propane combustion.

Carbon Dioxide (CO_2)

EF (lb CO_2e/MMBtu) = EF (kg CO_2/MMBtu) X $CF_{kg \to lb}$ (lb/kg) X GWP_{CO2} (lb CO_2e/lb CO_2)

Calculated CO_2e EF for CO_2 (lb CO_2e/MMBtu)	40 CFR 98 Table C-1 EF (kg CO_2/MMBtu)	$CF_{kg \to lb}$ (lb/kg)	40 CFR 98 Table A-1 GWP_{CO2} (lb CO_2e/lb CO_2)
138.605	62.87	2.20462262	1

Methane (CH_4)

EF (lb CO_2e/MMBtu) = EF (kg CH_4/MMBtu) X $CF_{kg \to lb}$ (lb/kg) X GWP_{CH4} (lb CO_2e/lb CH_4)

Calculated CO_2e EF for CH_4 (lb CO_2e/MMBtu)	40 CFR 98 Table C-2 EF (kg CH_4/MMBtu)	$CF_{kg \to lb}$ (lb/kg)	40 CFR 98 Table A-1 GWP_{CO2} (lb CO_2e/lb CH_4)
0.165	0.003	2.20462262	25

Nitrous Oxide (N_2O)

EF (lb CO_2e/MMBtu) = EF (kg N_2O/MMBtu) X $CF_{kg \to lb}$ (lb/kg) X GWP_{N2O} (lb CO_2e/lb N_2O)

Calculated CO_2e EF for N_2O (lb CO_2e/MMBtu)	40 CFR 98 Table C-2 EF (kg N_2O/MMBtu)	$CF_{kg \to lb}$ (lb/kg)	40 CFR 98 Table A-1 GWP_{CO2} (lb CO_2e/lb N_2O)
0.394	0.0006	2.20462262	298

SMC Non-HAP Potential to Emit

Emission Unit: **CA**
Description: Compressed air drying agent system (antifreeze for pneumatic controls)
Combined Dryer Rated Capacity: 40
Operation: 8760

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Patch Material	Material VOC Content (lb/gal)	Historical Maximum Material Usage (gal/yr)	VOC PTE (tpy)
Tanner Gas	6.58	990	3.3
TOTAL (tpy):			3.3

VOC PTE = (patch material VOC content) X (historical maximum material usage)

EF Reference
March 2015 Potlatch Part 71 Renewal Application

SMC Non-HAP Potential to Emit

Emission Unit: **ES**
Description: Oil and Edge Seal Line witihn Specialty Machine Center
Combined Dryer Rated Capacity: 40 msf 3/8"/hr
Operation: 8760 hr/yr

NON-FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Seal/Surface Coating Material	Material VOC Content (lb/gal)	2012 Actual Material Usage (gal/yr)	2012 Actual Plywood Coated (msf 3/8"/yr)	Maximum Plywood Throughput (msf 3/8"/yr)	Projected Maximum Mateial Usage (gal/yr)	VOC PTE (tpy)
Edge Seal	0.02	3,596	5,570	350,400	226,219	2.3
Surface Coating	0.83	700	5,570	350,400	44,036	18.3
TOTAL (tpy):						20.5

Projected maximum material usage = (2012 actual material usage) X (maximum plywood throughput) / (2012 actual plywood throughput)

VOC PTE = (material VOC content) X (projected maximum material usage)

EF Reference
March 2015 Potlatch Part 71 Renewal Application

SMC Non-HAP Potential to Emit

Emission Unit: **WP**
Description: Wood putty patching
Combined Dryer Rated Capacity: 40 msf 3/8"/hr
Operation: 8760 hr/yr

NON-FUGITIVE EMISSIONS
Potential to Emit, (tons per year)

Patch Material	Material VOC Content (lb/gal)	2014 Actual Material Usage (gal/yr)	2014 Actual Plywood Throughput (msf 3/8"/yr)	Maximum Plywood Throughput (msf 3/8"/yr)	Projected Maximum Material Usage (gal/yr)	VOC PTE (tpy)
Putty	0.32	57,701	144,313	350,400	140,101	22.4
TOTAL (tpy):						22.4

Projected maximum patch material usage = (2014 actual patch usage) X (maximum plywood throughput) / (2014 actual plywood throughput)

VOC PTE = (patch material VOC content) X (projected maximum patch material usage)

EF Reference
March 2015 Potlatch Part 71 Renewal Application

Emission Unit: **PP**
Description: Two synthetic patch lines
Combined Dryer Rated Capacity: 40 msf 3/8"/hr
Operation: 8760 hr/yr

NON-FUGITIVE EMISSIONS
Potential to Emit, (tons per year)

Patch Material	Material VOC Content (lb/gal)	2014 Actual Material Usage (gal/yr)	2014 Actual Plywood Throughput (msf 3/8"/yr)	Maximum Plywood Throughput (msf 3/8"/yr)	Projected Maximum Material Usage (gal/yr)	VOC PTE (tpy)
Part A	0	71,875	144,313	350,400	174,517	0
Part B	0	12,720	144,313	350,400	30,885	0
TOTAL (tpy):						0

Projected maximum patch material usage = (2014 actual patch usage) X (maximum plywood throughput) / (2014 actual plywood throughput)

VOC PTE = (patch material VOC content) X (projected maximum patch material usage)

EF Reference
March 2015 Potlatch Part 71 Renewal Application

SMC Non-HAP Potential to Emit

Emission Unit: **BV-1 to BV-4**
Description: Building Vents No. 1 to 4. Miscellaneous indoor activities.
Operation: 8760 hr/yr

NON-FUGITIVE EMISSIONS
Potential to Emit, (tons per year)

Emission Generating Activity	Measured PM Concentration in Building ($\mu g/m^3$)	Building Volume (ft^3)	Building Air Exhaust Rate (Changes per Hour)	PTE (tpy)		
				Particulate (PM)	Inhalable Coarse Particulate (PM10)	Fine Particulate (PM2.5)
BV-1. Miscellaneous Activities within Plywood Mill Building	1,250	5,428,500	2	3.7	3.7	3.7
BV-2. Miscellaneous Activities within Sawmill Building	1,020	387,520	2	0.2	0.2	0.2
BV-3. Miscellaneous Activities within Boiler Building	1,057	90,750	2	0.1	0.1	0.1
BV-4. Miscellaneous Activities within Planer Building	900	196,884	2	0.1	0.1	0.1
TOTAL (tpy):				4.1	4.1	4.1

Conversion Factors

1 m^3 =	35.3147	ft^3
1 g =	1000000	μg
1 lb =	453.592	g
1 ton =	2000	lb

Example Calculation

Plywood Mill Building PM PTE (tpy) = (8760 hr/yr) X (2 building volumes/hr) X (5,428,500 ft^3/building volume) X (1 m^3/35.3147 ft^3) X (1250 ($\mu g/m^3$) X (g/1x10^6 μg) X (1 lb/453.592 g) X (ton/2000 lb)

Assume measured PM = PM10 = PM2.5.

SMC Non-HAP Potential to Emit

Emission Unit: **DB**
Description: Log debarking

Debarker:	A8 22-inch	A5 22-inch
Mill:	Sawmill	Sawmill
Operation (hr/yr):	8760	8760
Lumber Drying Kilns LK-1 to LK-5 Combined Maximum Throughput (MMbf/yr):	307	

Debarker:	35-inch
Mill:	Plywood Mill
Operation (hr/yr):	8760
Plywood Mill Maximum Throughput (msf 3/8"/hr):	46.6

Emission Unit: **COS**
Description: Log bucking

Saw:	No.1	No. 2	No. 3
Mill:	Sawmill	Sawmill	Sawmill
Operation (hr/yr):	8760	8760	8760
Lumber Drying Kilns LK-1 to LK-5 Combined Maximum Throughput (MMbf/yr):	307		

Saw:	No. 4
Mill:	Plywood Mill
Operation (hr/yr):	8760
Plywood Mill Maximum Throughput (msf 3/8"/hr):	46.6

FUGITIVE EMISSIONS

Potential to Emit, (tons per year)

Emission Generating Activity (units of the EF)	Particulate (PM)		Inhalable Coarse Particulate (PM10)		Fine Particulate (PM2.5)	
	EF (lb/mmbf or lb/msf 3/8")	PTE (tpy)	EF (lb/mmbf or lb/msf 3/8")	PTE (tpy)	EF (lb/mmbf or lb/msf 3/8")	PTE (tpy)
Sawmill Log Debarking (lb/mbf)	0.074	11.3	0.002	0.3	0.0003	0.1
Plywood Mill Log Debarking (lb/msf 3/8")	0.033	6.8	0.001	0.2	0.0002	0.03
Sawmill Log Bucking (lb/mbf)	0.011	1.7	0.0003	0.05	0.00005	0.01
Plywood Mill Log Bucking (lb/msf 3/8")	0.005	1.0	0.0001	0.03	0.00002	0.00
TOTAL (tpy):		20.8		0.6		0.1

Calculation to convert Log Debarking PM, PM10 and PM2.5 EF from units of lb/ton incoming log to lb/mbf board produced:

Wood Species	EF based upon mass of incoming logs[1] PM EF (lb/ton log)	PM10 EF[3] (lb/ton log)	PM2.5 EF[3] (lb/ton log)	Log Density[4] (lb/ft^3)	PNW-East Lumber Recovery Factor[6] (bf/ft^3)	EF Based upon amount of boards produced PM EF (lb/mbf)	PM10 EF (lb/mbf)	PM2.5 EF (lb/mbf)
Grand Fir	0.024	0.000655344	0.00011148	46	7.81	0.071	0.002	0.0003
Ponderosa Pine	0.024	0.000655344	0.00011148	45	7.81	0.069	0.002	0.0003
Douglas Fir	0.024	0.000655344	0.00011148	38	7.81	0.058	0.002	0.0003
Hemlock	0.024	0.000655344	0.00011148	41	7.81	0.063	0.002	0.0003
Larch	0.024	0.000655344	0.00011148	48	7.81	0.074	0.002	0.0003
ESLP	0.024	0.000655344	0.00011148	39	7.81	0.060	0.002	0.0003
					Max:	0.074	0.002	0.0003

Calculation to convert Log Debarking PM, PM_{10} and $PM_{2.5}$ EF from units of lb/ton incoming log to lb/msf 3/8" veneer produced:

Wood Species	EF based upon mass of incoming logs[1] PM EF (lb/ton log)	PM10 EF[3] (lb/ton log)	PM2.5 EF[3] (lb/ton log)	Log Density[4] (lb/ft³)	PNW-East Veneer Recovery Factor[5] (ft² 3/8"/ft³)	EF Based upon amount of veneer produced PM EF (lb/msf 3/8")	PM10 EF (lb/msf 3/8")	PM2.5 EF (lb/msf 3/8")
Cedar	0.024	0.000655344	0.00011148	27	17.2	0.019	0.001	0.0001
Douglas Fir	0.024	0.000655344	0.00011148	38	17.2	0.027	0.001	0.0001
Hemlock	0.024	0.000655344	0.00011148	41	17.2	0.029	0.001	0.0001
Larch	0.024	0.000655344	0.00011148	48	17.2	0.033	0.001	0.0002
Lodgepole Pine	0.024	0.000655344	0.00011148	39	17.2	0.027	0.001	0.0001
					Max:	0.033	0.001	0.0002

Calculation to convert Log Bucking PM, PM10 and PM2.5 EF from units of lb/ton incoming log to lb/mbf board produced:

Wood Species	EF based upon mass of incoming logs[2] PM EF (lb/ton log)	PM10 EF[3] (lb/ton log)	PM2.5 EF[3] (lb/ton log)	Log Density[4] (lb/ft³)	PNW-East Lumber Recovery Factor[6] (bf/ft³)	EF Based upon amount of boards produced PM EF (lb/mbf)	PM10 EF (lb/mbf)	PM2.5 EF (lb/mbf)
Grand Fir	0.0035	0.000095571	1.62575E-05	46	7.81	0.010	0.0003	0.00005
Ponderosa Pine	0.0035	0.000095571	1.62575E-05	45	7.81	0.010	0.0003	0.00005
Douglas Fir	0.0035	0.000095571	1.62575E-05	38	7.81	0.009	0.0002	0.00004
Hemlock	0.0035	0.000095571	1.62575E-05	41	7.81	0.009	0.0003	0.00004
Larch	0.0035	0.000095571	1.62575E-05	48	7.81	0.011	0.0003	0.00005
ESLP	0.0035	0.000095571	1.62575E-05	39	7.81	0.009	0.0002	0.00004
					Max:	0.011	0.0003	0.00005

Calculation to convert Log Bucking PM, PM10 and PM2.5 EF from units of lb/ton incoming log to lb/msf 3/8" veneer produced:

Wood Species	EF based upon mass of incoming logs[2] PM EF (lb/ton log)	PM10 EF[3] (lb/ton log)	PM2.5 EF[3] (lb/ton log)	Log Density[4] (lb/ft³)	PNW-East Veneer Recovery Factor[5] (ft² 3/8"/ft³)	EF Based upon amount of veneer produced PM EF (lb/msf 3/8")	PM10 EF (lb/msf 3/8")	PM2.5 EF (lb/msf 3/8")
Cedar	0.0035	0.000095571	1.62575E-05	27	17.2	0.003	0.0001	0.00001
Douglas Fir	0.0035	0.000095571	1.62575E-05	38	17.2	0.004	0.0001	0.00002
Hemlock	0.0035	0.000095571	1.62575E-05	41	17.2	0.004	0.0001	0.00002
Larch	0.0035	0.000095571	1.62575E-05	48	17.2	0.005	0.0001	0.00002
Lodgepole Pine	0.0035	0.000095571	1.62575E-05	39	17.2	0.004	0.0001	0.00002
					Max:	0.005	0.0001	0.00002

[1] 0.024 lb PM/ton log for debarking, https://www.epa.gov/sites/production/files/2016-09/documents/spmpteef_memo.pdf
[2] 0.0035 lb PM/ton log for bucking based upon PotlatchDeltic 02/02/18 minor NSR application update
[3] 0.027 and 0046 is mass ratio of PM10 and PM2.5 to TSP, respectively, for fresh bark, NCASI Special Report No. 15-01, January 2015
[4] http://http://www.engineeringtoolbox.com/weigt-wood-d_821.html
[5] http://www.ruraltech.org/projects/conversions/briggs_conversions/briggs_append2/appendix02_combined.pdf
[6] Trends in Lumber Processing in the Western United States (Keegan et al. Forest Products Society 2010).

SMC Non-HAP Potential to Emit

Emission Unit: **WRD-SM**
Description: Wood residue drops at the sawmill

Lumber Drying Kilns LK-1 to LK-5 Combined Maximum Throughput (MMbf/yr): 307 MMbf/yr

FUGITIVE EMISSIONS
Potential to Emit, (tons per year)

Emission Generating Activity	Emission Unit ID	Highest Annual Ratio of Residue to Dry Lumber Production for Years '11 to '16 (bdt/MMbf)	PTE (tpy)			
			Particulate (PM)	Inhalable Coarse Particulate (PM10)	Fine Particulate (PM2.5)	VOC
Wood Chip Loadout into Trucks	WRD-SM-CH	540.1	6.22E-02	1.68E-03	2.86E-04	41.6
Sawdust Loadout into Trucks	WRD-SM-SD	124.7	1.44E-02	3.88E-04	6.60E-05	9.6
Shavings Loadout into Trucks	WRD-SM-SH	113.5	2.61E-02	7.06E-04	1.32E-04	8.7
Hog Fuel Loadout into Trucks and into Fuel Bin	WRD-SM-HF	462.0	5.32E-02	1.44E-03	2.45E-04	
TOTAL (tpy):			0.1559	0.0042	0.001	59.9

Wet Material Drop Emission Factor

Pollutant	Emission Factor (lb/bdt)	Basis
PM	0.00075	PM emission factors based on May 2014 EPA Region 10 memo on PM emission factors for sawmills for dry residue drop.
PM10	0.00002025	PM10 based on 2.7% of PM, NCASI Special Report 15-01, Table 5.18
PM2.5	0.00000345	PM2.5 based on 0.46% of PM, NCASI Special Report 15-01, Table 5.18

Dry Material Drop Emission Factor

Pollutant	Emission Factor (lb/bdt)	Basis
PM	0.0015	PM emission factors based on May 2014 EPA Region 10 memo on PM emission factors for sawmills for dry residue drop.
PM10	0.0000405	PM10 based on 2.7% of PM, NCASI Special Report 15-01, Table 5.18
PM2.5	0.0000069	PM2.5 based on 0.46% of PM, NCASI Special Report 15-01, Table 5.18

VOC Emission Factors for Pneumatic Conveyance of Green Wood Residue

Green Wood Residue Type	VOC as propane (lb/bdt)
Species: Non-Resinous Softwood (e.g. white fir[2], western hemlock and western red cedar)	
Sawdust	0.2386
Planer Shavings	0.2692
Chips	0.0734
Species: Resinous Softwood Non-Pine Family (e.g. douglas fir, engelman spruce and larch)	
Sawdust	0.2386
Planer Shavings	0.2692
Chips	0.0734
Species: Resinous Softwood Pine Family (e.g. lodgepole pine, ponderosa pine and western white pine)	
Sawdust	0.5017
Planer Shavings	0.5017
Chips	0.5017

Derivation of emission factors presented at the conclusion of this emissions inventory.

SMC Non-HAP Potential to Emit

Emission Unit: **HFP-SM**
Description: Wind erosion of sawmill's hog fuel pile
Lumber Drying Kilns LK-1 to LK-5 Combined Maximum Throughput (MMbf/yr): 307 MMbf/yr

FUGITIVE EMISSIONS
Potential to Emit, (tons per year)

Emission Generating Activity	Highest Annual Ratio of Hog Fuel Pile Area to Dry Dry Lumber Production for Years '11 to '16 (acres/MMbf)	Maximum Area Hog Fuel Pile (acres)	PTE (tpy)		
			Particulate (PM)	Inhalable Coarse Particulate (PM10)	Fine Particulate (PM2.5)
Wind Erosion of Sawmill's Hog Fuel Pile	0.001721	0.528347	0.20	0.005	0.0009

Wind Erosion Emission Factor

Pollutant	Emission Factor (ton/acre-yr)	Basis
PM	0.38	PM emission factors based on May 2014 EPA Region 10 memo on PM emission factors for sawmills for wind erosion of pile
PM10	0.01026	PM10 based on 2.7% of PM, NCASI Special Report 15-01, Table 5.18
PM2.5	0.00175	PM2.5 based on 0.46% of PM, NCASI Special Report 15-01, Table 5.18

SMC Non-HAP Potential to Emit

Emission Unit: **PT**
Description: Plant traffic

FUGITIVE EMISSIONS
Potential to Emit, (tons per year)

Emission Generating Activity	PTE (tpy)		
	Particulate (PM)	Inhalable Coarse Particulate (PM10)	Fine Particulate (PM2.5)
Paved Areas	104.8	21.0	5.1
Unpaved Areas	471.5	134.4	13
TOTAL:	576.4	155.4	18.6

PAVED AREAS
From AP-42 13.2.1
number of days with more than 0.01 in of rain = 129

The following equation may be used to estimate the dust emissions from a ***paved*** road.

$$E = k\,(sL)^{0.91}(W)^{1.02}\left(1-\frac{P}{4*365}\right)$$

k = base emission factor for particulate size range
sL = road surface silt loading (grams per square meter)
W = average weight (tons) of the vehicles traveling the road
P = number of days in year with at least 0.01 in of precipitation

Tabulated data for k values

Size Range	Multiplier (k)		
	g/VKT	g/VMT	lb/VMT
PM-2.5	0.15	0.25	0.00054
PM-10	0.62	1	0.0022
PM-15	0.77	1.23	0.0027
PM-30	3.23	5.24	0.011

UNITS
g/VKT grams per vehicle kilometer traveled
g/VMT grams per vehicle mile traveled
lb/VMT pounds per vehicle mile traveled

Values being used to calculate emission factor E:

	PM2.5	PM10	PM30	
sL =	9.700	9.700	9.700	(g/m^2)
k =	0.00054	0.0022	0.011	(lb/Vehicle Mile Traveled)

Equipment	W (tons)	E (lb/mile) $PM_{2.5}$	PM_{10}	TSP	Total Vehicles Miles for Vehicles of this type Per Day	Emissions (lb/day) $PM_{2.5}$	PM_{10}	TSP
966 Bucket Loader	35	0.15	0.60	2.98	0.0	0.00	0.00	0.00
980 Wheel Loader	35	0.15	0.60	2.98	0.0	0.00	0.00	0.00
988 Wheel Loader	56	0.24	0.96	4.81	0.0	0.00	0.00	0.00
Letoum Log Stacker (lg)	100	0.43	1.74	8.69	0.0	0.00	0.00	0.00
Letoum Log Stacker (sm)	70	0.30	1.21	6.04	0.0	0.00	0.00	0.00
Dump Trucks	30	0.12	0.51	2.55	30.0	3.75	15.28	76.38
Log Trucks	40	0.17	0.68	3.41	97.5	16.34	66.58	332.88
By-Product Trucks	40	0.17	0.68	3.41	39.0	6.54	26.63	133.15
Lumber Trucks	40	0.17	0.68	3.41	9.0	1.51	6.15	30.73
Plywood Trucks	40	0.17	0.68	3.41	0.4	0.07	0.27	1.37
					TOTAL:	28.2	114.9	574.5

UNPAVED AREAS
The following information was found in AP-42 Chapter 13.2.2
number of days with more than 0.01 in of rain = 129
Reduction factor for unpaved surfaces = 0.65

The following expression may be used to calculate the particulate emissions (lb) from an ***unpaved*** road, per vehicle mile traveled

$$E = k\,(^{s}/_{12})^{a}(^{W}/_{3})^{b} * ((365-P)/365)$$

E = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (ton)
M = surface material moisture content (%)
P = number of days in year with at least 0.01 in of precipitation

a, b, k = empirical constants

For Loaders, Stackers, Letournous, Dump Trucks, Log

	PM2.5	PM_{10}	TSP	
s =	8.4	8.4	8.4	
a =	0.9	0.9	0.7	
b =	0.45	0.45	0.45	
k =	0.15	1.5	4.9	(lb/VMT)

		E (lb/mile)			Total Vehicles Miles for Vehicles of this type	Emissions (lb/day)		
Equipment	W (tons)	PM2.5	PM10	TSP	Per Day	PM2.5	PM10	TSP
966 Bucket Loader	35	0.21	2.13	7.46	56.0	11.90	119.02	417.54
980 Wheel Loader	35	0.21	2.13	7.46	56.0	11.90	119.02	417.54
988 Wheel Loader	56	0.26	2.63	9.21	20.0	5.25	52.52	184.24
Letoum Log Stacker (lg)	100	0.34	3.41	11.96	56.0	19.09	190.89	669.68
Letoum Log Stacker (sm)	70	0.29	2.90	10.19	56.0	16.26	162.58	570.38
Dump Trucks	30	0.20	1.98	6.96	6.0	1.19	11.90	41.74
Log Trucks	40	0.23	2.26	7.92	19.5	4.40	44.01	154.40
By-Product Trucks	40	0.23	2.26	7.92	13.0	2.93	29.34	102.93
Lumber Trucks	40	0.23	2.26	7.92	3.0	0.68	6.77	23.75
Plywood Trucks	40	0.23	2.26	7.92	0.2	0.05	0.45	1.58
					TOTAL:	73.6	736.5	2583.8

Derivation of Emission Factors Employed in Emissions Inventory

EPA Region 10 WPP1 VOC Emission Factor for Hot Pressing Pacific Northwest Softwood Plywood without Air Pollution Controls

This sheet presents full-scale test data for hot pressing, without air pollution controls, primarily douglas fir plywood as reported in National Council for Air and Stream Improvement (NCASI) January 1999 Technical Bulletin No. 768 (TB768) - Volatile Organic Compound Emissions from Wood Products Manufacturing Facilities Part I - Plywood. Based upon NCASI's test data and EPA's Interim VOC Measurement Protocol for the Wood Products Industry - July 2007 (WPP1 VOC), EPA Region 10 has calculated a hot pressing VOC emission factor of 0.1027 lb/msf (3/8 inch) for any one of several resinous softwood non-pine family species including the one tested; douglas fir. In the absence of any test data for the other two Pacific Northwest softwood categories (resinous pine family and non-resinous), EPA Region 10 assumes that each will have the same emission factor as the one derived for resinous non-pine family softwood.

To calculate WPP1 VOC emissions, EPA Region 10 employed NCASI test results quantifying both total and speciated VOC. NCASI employed EPA Reference Method 25A (RM25A) to measure VOC emissions not quantified through speciated sampling and analysis. Because RM25A quantifies total hydrocarbon (THC) emissions (and because THC and VOC are not quite the same), some adjustments to the RM25A results were necessary to determine VOC emissions. NCASI reported RM25A results “as carbon” which only accounts for the carbon portion of the compounds measured. EPA Region 10 adjusted the RM25A results to express THC “as propane” to better approximate the VOC compounds generated by veneer drying. RM25A results were further adjusted to deduct that portion attributable to acetone as acetone is not a VOC. The contribution of certain VOC compounds (already quantified through speciated sampling and analysis) to RM25A results have been deducted to avoid double-counting. These adjustments to RM25A results are consistent with EPA’s Interim VOC Measurement Protocol for the Wood Products Industry - July 2007 (WPP1 VOC). Finally, for each test run, the modified RM25A emission rate is added to speciated HAP emission rates to calculate WPP1 VOC. The resultant VOC emission factor is based on the 90th percentile value when three or more test runs are available, and on the maximum value when less than three runs are available. For a listing of the sampling and analysis techniques NCASI employed to measure each of the 29 targetted hydrocarbons (HAP and non-HAP), see Tables 2.1 and 2.2 of TB768.

In certain instances, one or two of the runs resulted in an actual measurement of a hydrocarbon while the other run(s) resulted in a non-detect. For those runs resulting in a non-detect, a substitute value has been generated to reflect what we think the actual measurement may have been had detection been possible. The substitute values are noted in **bold** and reflect the lesser of (a) the pollutant-specific method detection limit for that run or (b) a calculated value (Compound X_{RUNA}) representing mass emission rate of undetected individual compound "Compound X" during test run "Run A." The value for Compound X_{RUNA} is determined by multiplying known $\Sigma HC_{i\ RUNA}$ by the known ratio of Compound X_{RUNB} to $\Sigma HC_{i\ RUNB}$. Compound $X_{RUNA} = (\Sigma HC_{i\ RUNA})$ X (Compound $X_{RUNB} / \Sigma HC_{i\ RUNB}$) where $\Sigma HC_{i\ RUNA}$ is the summation of measurements of individual hydrocarbons (HC) during Run A except for Compound X and any other hydrocarbons not detected in Run A and/or Run B. Example calculations are provided below for illustration.

Step No. 1: Summarize test results

Emission Test Run ID	Run 112-1PB1N1	Run 112-1PB1N2	Run 112-1PB1N3	Run 115-1PB1N3
Facility No.	112	112	112	115
Species (Face/Core)	DF/PP	DF/DF	DF/DF	DF/DF
No. of Plies	4	4	4	7
Resin Type	PF	PF	PF	PF
NCASI TB768 Page No.	26-42 & B10	26-42 & B10	26-42 & B10	43-54 & B23

	Mass Emission Rate as Measured (lb/msf 3/8")			
Pollutant/Compound (as measured)	Run 112-1PB1N1	Run 112-1PB1N2	Run 112-1PB1N3	Run 115-1PB1N3
THC as carbon	0.086	0.070	0.080	0.042
Acetaldehyde	**0.0016**	0.0021	**0.0020**	0
Acetone (non-VOC)	0.0030	0.0036	0.0031	0.0079
Formaldehyde	0.0011	0.0031	0.0024	0
Methanol	0.027	0.031	0.041	0.061
Methyl Ethyl Ketone	0.0020	**0.0021**	**0.0022**	0

Example calculation to estimate acetaldehyde emission rate for Run 112-1PB1N3 based upon Run 112-1PB1N2 emission measurements while similarly pressing douglas fir veneer in the same hot press:

$acetaldehyde_{RUN112\text{-}1PB1N3} = (\Sigma HC_{i\ RUN112\text{-}1PB1N3})$ X $(acetaldehyde_{RUN112\text{-}1PB1N2} / \Sigma HC_{i\ RUN112\text{-}1PB1N2})$

$acetaldehyde_{RUN112\text{-}1PB1N3}$ = (0.0031+0.0024+0.041) X (0.0021) / (0.0036+0.0031+0.031) = 0.0026 lb/msf 3/8"

Because the estimated value for $acetaldehyde_{RUN112\text{-}1PB1N3}$ of 0.0026 lb/msf 3/8" is greater than the test method detection limit of 0.0020 lb/msf 3/8" for that run, the detection limit value of 0.0020 lb/msf 3/8" is substituted instead of the calculated value.

Step No. 2: Convert measurements to a common propane basis

$Compound_X$ expressed as propane = $(Compound_X)$ X $[(MW_{propane}) / (MW_{Compound\ X})]$ X $[(\#C_{Compound\ X}) / (\#C_{propane})]$

where: $Compound_X$ represents mass emission rate of $Compound_X$

$MW_{propane}$ equals "44.0962" and represents the molecular weight for propane; the compound that is the "basis" for expressing mass of VOC

$MW_{Compound\ X}$ represents the molecular weight for $Compound_X$

$\#C_{compound\ X}$ equals number of carbon atoms in $Compound_X$

$\#C_{propane}$ equals "3" as three carbon atoms are present within propane; the compound that is the "basis" for expressing mass of VOC per

Pollutant/Compound (as propane)	Mass Emission Rate as Propane (lb/msf 3/8") Run 112-1PB1N1	Run 112-1PB1N2	Run 112-PB1N3	Run 115-1PB1N3
THC	0.1052	0.0857	0.0979	0.0514
Acetaldehyde	0.0011	0.0014	0.0013	0
Acetone (non-VOC)	0.0023	0.0027	0.0024	0.0060
Formaldehyde	0.0005	0.0015	0.0012	0
Methanol	0.0124	0.0142	0.0188	0.0280
Methyl Ethyl Ketone	0.0016	0.0017	0.0018	0

Example calculation to convert methanol as measured$_{RUN112\text{-}1PB1N1}$ to methanol as propane:

Methanol as propane$_{RUN112\text{-}1PB1N1}$ = (Methanol$_{RUN112\text{-}1PB1N1}$) X [(MW$_{propane}$) / (MW$_{methanol}$)] X [(#C$_{methanol}$) / (#C$_{propane}$)]

Methanol as propane$_{RUN112\text{-}1PB1N1}$ = (0.027) X (44.0962/32.042) X (1/3) = 0.0124 lb/msf 3/8"

Step No. 3: Calculate the contribution of individual compounds to THC analyzer measurements as propane

Compound$_X$ expressed as propane by analyzer = (Compound$_X$ expressed as propane) X (RF$_{Compound\ X}$)

where: RF$_{Compound\ X}$ represents the flame ionization detector (FID) response factor (RF) for Compound$_X$

Because THC was measured using a THC analyzer, we already know THC analyzer measurement of THC.

Pollutant/Compound (as propane per THC analyzer)	Mass Emission Rate as Propane Measured by THC Analyzer (lb/msf 3/8") Run 112-1PB1N1	Run 112-1PB1N2	Run 112-PB1N3	Run 115-1PB1N3
Acetaldehyde	0.0005	0.0007	0.0007	0
Acetone (non-VOC)	0.0015	0.0018	0.0016	0.0040
Formaldehyde	0	0	0	0
Methanol	0.0062	0.0071	0.0094	0.0140
Methyl Ethyl Ketone	0.0012	0.0013	0.0013	0

Example calculation to determine amount of acetone measured by the THC analyzer as propane$_{RUN112\text{-}1PB1N2}$:

Acetone as propane$_{RUN112\text{-}1PB1N2}$ per THC analyzer = (Acetone as propane$_{RUN112\text{-}1PB1N2}$) X (RF$_{acetone}$)

Acetone as propane$_{RUN112\text{-}1PB1N2}$ per THC analyzer = (0.0027) X (0.6667) = 0.0018 lb/msf 3/8"

Step No. 4: Subtract the contribution of individual compounds measured by the THC analyzer as propane (Step No. 3) from the THC measurement as propane (Step No. 2)

Pollutant/Compound (as propane per THC analyzer)	Mass Emission Rate (lb/msf 3/8") Run 112-1PB1N1	Run 112-1PB1N2	Run 112-PB1N3	Run 115-1PB1N3
THC	0.1052	0.0857	0.0979	0.0514
Acetaldehyde	-0.0005	-0.0007	-0.0007	0
Acetone (non-VOC)	-0.0015	-0.0018	-0.0016	-0.0040
Formaldehyde	0	0	0	0
Methanol	-0.0062	-0.0071	-0.0094	-0.0140
Methyl Ethyl Ketone	-0.0012	-0.0013	-0.0013	0
THC as propane w/o acetone and w/o double-counting VOC$_i$	0.1032	0.0831	0.0957	0.0474

Step No. 5: Calculate WPP1 VOC by adding the contribution of individual VOCs (Step No. 1) to the adjusted THC value (Step No. 4)

Pollutant/Compound	Mass Emission Rate (lb/msf 3/8") Run 112-1PB1N1	Run 112-1PB1N2	Run 112-PB1N3	Run 115-1PB1N3
THC as propane w/o acetone and w/o double-counting VOC$_i$	0.1032	0.0831	0.0957	0.0474
Acetaldehyde as measured	**0.0016**	0.0021	**0.0020**	0
Formaldehyde as measured	0.0011	0.0031	0.0024	0
Methanol as measured	0.0270	0.0310	0.0410	0.0610
Methyl Ethyl Ketone as measured	0.0020	**0.0021**	**0.0022**	0
WPP1 VOC	0.1048	0.0852	0.0977	0.0474

Step No. 6: Calculate WPP1 VOC emission factor equal to 90th percentile value of 4 runs

WPP1 VOC (4-run 90th percentile value)	0.1027	lb/msf 3/8"
4-run average value (informational purposes only)	0.0838	lb/msf 3/8"

Reference Information

Element and Compound Information

Element / Compound	FID RF	MW (lb/lb-mol)	Formula	Carbon Atoms	Hydrogen Atoms	Oxygen Atoms
Acetaldehyde	0.5	44.0530	C_2H_4O	2	4	1
Acetone (non-VOC)	0.6667	58.0798	C_3H_6O	3	6	1
Acrolein	0.6667	56.0640	C_3H_4O	3	4	1
Benzene	1	78.1134	C_6H_6	6	6	0
3-carene	1	136.2364	$C_{10}H_{16}$	10	16	0
Formaldehyde	0	30.0262	CH_2O	1	2	1
Methanol	0.5	32.0420	CH_4O	1	4	1
Methyl Ethyl Ketone	0.75	72.1066	C_4H_8O	4	8	1
Methyl Isobutyl Ketone	0.8333	100.1602	$C_6H_{12}O$	6	12	1
Phenol	0.9167	94.1128	C_6H_6O	6	6	1
Alpha-pinene	1	136.2364	$C_{10}H_{16}$	10	16	0
Beta-pinene	1	136.2364	$C_{10}H_{16}$	10	16	0
Propionaldehyde	0.6667	58.0798	C_3H_6O	3	6	1
Toluene	1	92.1402	C_7H_8	7	8	0
m,p-Xylene	1	106.1670	C_8H_{10}	8	10	0
o-xylene	1	106.1670	C_8H_{10}	8	10	0
Propane	1	44.0962	C_3H_8	3	8	0
Carbon	-	12.0110	C	1	-	-
Hydrogen	-	1.0079	H	-	1	-
Oxygen	-	15.9994	O	-	-	1

FID RF = ECN / No. carbon atoms in compound. See Attachment No. 2 to NCASI's September 2011 Technical Bulletin No. 991 (TB768) - Volatile Organic Compound Emissions from Wood Products Manufacturing Facilities Part I - Plywood. In the absence of information related to the FID NCASI employed to conduct RM25A testing, empirical effective carbon number (ECN) values will be employed to estimate FID RF.

ECN = (no. aliphatic carbon) + (no. aromatic carbon) - (no. ether oxygen) - (0.5 x no. primary alcohol oxygen)
Calculations to estimate ECN for several compounds:

Element / Compound	Formula	No. Aliphatic Carbon	No. Aromatic Carbon	No. Carbonyl Carbon	No. Carboxyl Carbon	No. Ether Oxygen	No. Primary Alcohol Oxygen	Empirical ECN
Acetaldehyde	CH_3CHO	1		1				1
Acetone (non-VOC)	$(CH_3)_2CO$	2		1				2
Acrolein	CH_2CHCHO	2		1				2
Benzene	C_6H_6		6					6
3-carene	$C_{10}H_{16}$	10						10
Formaldehyde	CH_2O							0
Methanol	CH_3OH	1					1	0.5
Methyl Ethyl Ketone	$CH_3C(O)CH_2CH_3$	3		1				3
Methyl Isobutyl Ketone	$(CH_3)_2CHCH_2C(O)CH_3$	5		1				5
Phenol	C_6H_5OH		6				1	5.5
Alpha-pinene	$C_{10}H_{16}$	10						10
Beta-pinene	$C_{10}H_{16}$	10						10
Propane	C_3H_8	3						3
Propionaldehyde	CH_3CH_2CHO	2		1				2
Toluene	$C_6H_5CH_3$	1	6					7
m,p-Xylene	$C_6H_4CH_3CH_3$	2	6					8
o-xylene	$C_6H_4CH_3CH_3$	2	6					8

Abbreviations/Acronyms
DE: dryer exit
DF: douglas fir
ECN: effective carbon number
FID: flame ionization detector (aka THC analyzer)
GC/FID: gas chromatograph with a flame ionization detector
GC/MS: gas chromatograph with a mass spectrometer
HC: hydrocarbon
HZ: heating zone
J: jet
L: longitudinal
MSF: one thousand square feet
MW: molecular weight
NCASI: National Council for Air and Stream Improvement
NMP: no measurement performed
PF: phenol formaldehyde
PP: ponderosa pine
RM25A: EPA Reference Method 25A
RF: THC analyzer response factor
RM25A: EPA Reference Method 25A
THC: total hydrocarbon
WF: white fir
WPP1 VOC: EPA Interim VOC Measurement Protocol for the Wood Products Industry - July 2007

EPA Region 10 HAP and VOC Emission Factors for Pacific Northwest Softwood Log Steaming without Air Pollution Controls

This sheet presents full-scale test data for steaming Pacific Northwest resinous non-pine family softwood logs, without air pollution controls, as reported in National Council for Air and Stream Improvement (NCASI) January 1999 Technical Bulletin No. 768 (TB768) - Volatile Organic Compound Emissions from Wood Products Manufacturing Facilities Part I - Plywood. Based upon NCASI's test data, EPA Region 10 has calculated log steaming total HAP and VOC emission factors of 0.0140 and 0.0872 lb/msf 3/8", respectively, for the resinous non-pine family softwood category. In the absence of any test data for the other two Pacific Northwest softwood categories (resinous pine family and non-resinous), EPA Region 10 assumes that each will have the same emission factors as those derived for resinous non-pine family softwood. Because NCASI did not perform RM25A testing, VOC emissions are estimated to be equal to the sum of the individual VOCs detected. Of the 20 HAPs sampled and analyzed for, only acetaldehyde and methanol were detected while steaming douglas fir and larch (both from the resinous non-pine family) logs. Of the 9 non-HAP hydrocarbons sampled and analyzed for, only alpha-pinene and beta-pinene were detected. The emission factors are based on the 90th percentile value for three test runs. For a listing of the sampling and analysis techniques NCASI employed to measure each of the 29 targetted hydrocarbons (HAP and non-HAP), see Tables 2.1 and 2.2 of TB768.

The data presented below reflects NCASI TB768 log steaming test data for only those pollutants that were detected in three runs at one Pacific Northwest plywood mill. A total of 20 HAPs were analyzed for, but only two were detected. One of the three three runs resulted in an actual measurement of beta-pinene while the other two resulted in a non-detect. For those runs resulting in a non-detect, a substitute value has been generated to reflect what we think the actual measurement may have been had detection been possible. The substitute values are noted in **bold** and reflect the lesser of (a) the pollutant-specific method detection limit for that run or (b) a calculated value (Compound X_{RUNA}) representing mass emission rate of undetected individual compound "Compound X" during test run "Run A." The value for Compound X_{RUNA} is determined by multiplying known $\Sigma HC_{i\ RUNA}$ by the known ratio of Compound X_{RUNB} to $\Sigma HC_{i\ RUNB}$. Compound $X_{RUNA} = (\Sigma HC_{i\ RUNA})$ X (Compound $X_{RUNB} / \Sigma HC_{i\ RUNB}$) where $\Sigma HC_{i\ RUNA}$ is the summation of measurements of individual hydrocarbons (HC) during Run A except for Compound X and any other hydrocarbons not detected in Run A and/or Run B. Example calculations are provided below for illustration.

Emission Test Run ID	Facility No.	Species	NCASI TB768 Page No.	Volatile Organic Compounds (lb/msf 3/8")				
				Hazardous Air Pollutant Emissions (lb/msf 3/8")		Non-HAP (lb/msf 3/8")		TOTAL
				Acetaldehyde	Methanol	Alpha-Pinene	Beta-Pinene	
Run 112-1ML1N1	112	DF	26-42 & B11	0.0041	0.0077	0.044	**0.0062**	0.0620
Run 112-1ML1N2	112	DF	26-42 & B11	0.0037	0.0060	0.057	**0.0074**	0.0741
Run 112-1ML1N3	112	L	26-42 & B11	0.0062	0.0083	0.067	0.009	0.0905
3-run 90th percentile value				0.0058	0.0082			0.0872
3-run average value (informational purposes only)				0.0047	0.0073			0.0755

3-run 90th percentile value for total HAP 0.0140

3-run average value (informational purposes only) 0.0120

Example calculation to estimate beta-pinene emission rate for Run 112-1ML1N1 based upon Runs 112-1ML1N1 and N3 emission measurements:

Beta-Pinene$_{RUN112\text{-}1ML1N1} = (\Sigma HC_{i\ RUN112\text{-}1ML1N1})$ X (Beta-Pinene$_{RUN112\text{-}1ML1N3} / \Sigma HC_{i\ RUN112\text{-}1ML1N3}$)

Beta-Pinene$_{RUN112\text{-}1ML1N1}$ = (0.0041+0.0077+0.044) X [(0.009) / (0.0063+0.0083+0.067)] = 0.0062 lb/msf 3/8"

<u>Abbreviations/Acronyms</u>

DE: dryer exit
DF: douglas fir
ECN: effective carbon number
FID: flame ionization detector (aka THC analyzer)
GC/FID: gas chromatograph with a flame ionization detector
GC/MS: gas chromatograph with a mass spectrometer
HC: hydrocarbon
HZ: heating zone
J: jet
L: longitudinal
MSF: one thousand square feet
MW: molecular weight
NCASI: National Council for Air and Stream Improvement
NMP: no measurement performed
PF: phenol formaldehyde
PP: ponderosa pine
RM25A: EPA Reference Method 25A
RF: THC analyzer response factor
RM25A: EPA Reference Method 25A
THC: total hydrocarbon
WF: white fir
WPP1 VOC: EPA Interim VOC Measurement Protocol for the Wood Products Industry - July 2007

EPA Region 10 HAP and VOC Emission Factors for Pneumatic Conveyance of Pacific Northwest Softwood Green Wood Residue without Air Pollution Controls

This sheet presents full-scale VOC test data for pneumatically conveying green Pacific Northwest douglas fir and ponderosa pine wood residue, without air pollution controls, as reported in National Council for Air and Stream Improvement (NCASI) September 1996 Technical Bulletin No. 723 (TB723) - Laboratory and Limited Field Measurements of VOC Emissions from Wood Residuals. Based upon NCASI's test data, EPA Region 10 has calculated VOC emission factors for pneumatic conveyance of green wood residue for the following categories of wood species: non-resinous softwood, resinous non-pine family softwood and resinous pine family softwood. The emission factors are also categorized by the following types of wood residue: sawdust, planer shavings and chips. In the absence of any test data for non-resinous softwood, EPA Region 10 employs test data for the less-emitting (as compared to resinuous pine family softwood) resinuous non-pine family softwood to estimate VOC emissions for pneumatic conveyance of green non-resinous softwood residue. In the absence of any test data for pneumatic conveyance of sawdust and planer shavings for ponderosa pine, EPA Region 10 employs test data for the less-emitting (as compared to sawdust and planer shavings as evidenced by data for douglas fir) chip category of wood residue to estimate VOC emissions for pneumatic conveyance of ponderosa pine sawdust and planer shavings.

The sheet also presents full-scale HAP test data for pneumatically conveying Aspen hardwood chips, without air pollution controls, as reported in NCASI's January 1999 TB773 - Volatile Organic Compound Emissions from Wood Products Manufacturing Facilities, Part VI - Hardboard and Fiberboard. Of the 20 HAPs sampled and analyzed for, only methanol was detected while pneumatically conveying green Apsen hardwood chips. None of the 9 non-HAP hydrocarbons sampled and analyzed for were detected. The methanol emission factor is based on the higher value for two test runs. For a listing of the sampling and analysis techniques NCASI employed to measure each of the 29 targetted hydrocarbons (HAP and non-HAP), see Tables 2.1 and 2.2 of TB773.

Step No. 1: Summarize Test Results and Calculate Emission Factors

Volatile Organic Compounds

Residue Type	Species	Harvest Season	Number of One-Hour Runs	Arithmetic Average of Hourly Average Values (lb C/odt)	Standard Deviation (lb C/odt)	Range of Hourly Average Values (lb C/odt)	Arithmetic Average (informational (lb C/odt)	Arithmetic Average + Two Standard (lb C/odt)	Average 95th Percentile Value (lb C/odt)	VOC (as propane) (lb/odt)
Sawdust	DF	Fall	34	0.13	0.03	0.04 - 0.18	0.12	0.18	0.195	0.2386
		Spring	58	0.11	0.05	0.05 - 0.37		0.21		
Planer Shavings	DF	Fall	44	0.09	0.04	0.04 - 0.21	0.11	0.17	0.22	0.2692
		Spring	63	0.13	0.07	0.04 - 0.37		0.27		
Chips	DF	Fall	75	0.04	0.01	0.01 - 0.07	0.04	0.06	0.06	0.0734
		Spring	150	0.04	0.01	0.01 - 0.07		0.06		
Chips	PP	Fall	49	0.35	0.03	0.26 - 0.41	0.35	0.41	0.41	0.5017

Reference: September 1996 NCASI Technical Bulletin No. 723 entitled, "Laboratory and Limited Field Measurements of VOC Emissions from Wood Residuals," Table 7 on page 27.

Hazardous Air Pollutants: Methanol

Residue Type	Species	Harvest Season	Sampling Period (hr)	Methanol (lb/odt)
Chips	Aspen (hardwood)	Spring	1	0.00083
			1	0.0016
			2-run higher value	0.0016
			2-run average value (informational purposes only)	0.0012

Reference: January 1999 NCASI Technical Bulletin No. 773 entitled, "Volatile Organic Compound Emissions from Wood Products Manufacturing Facilities, Part VI - Hardboard and Fiberboard," Source ID No. 072-1LC1, page B46.

Step No. 2: Assign Emission Factors According to Wood Species and Type of Green Wood Residue Pneumatically Conveyed

Residue	VOC as propane (lb/odt)	Methanol (lb/odt)
Species: Non-Resinous Softwood (e.g. white fir, western hemlock and western red cedar)		
Sawdust	0.2386	0.0016
Planer Shavings	0.2692	
Chips	0.0734	
Species: Resinous Softwood Non-Pine Family (e.g. douglas fir, engelman spruce and larch)		
Sawdust	0.2386	0.0016
Planer Shavings	0.2692	
Chips	0.0734	
Species: Resinous Softwood Pine Family (e.g. lodgepole pine, ponderosa pine and western white pine)		
Sawdust	0.5017	0.0016
Planer Shavings	0.5017	
Chips	0.5017	

Reference Information

Element and Compound Information

Element / Compound	MW (lb/lb-mol)	Formula	Carbon Atoms	Hydrogen Atoms	Oxygen Atoms
Propane	44.0962	C_3H_8	3	8	0
Carbon	12.0110	C	1	-	-
Hydrogen	1.0079	H	-	1	-
Oxygen	15.9994	O	-	-	1

<u>Abbreviations/Acronyms</u>

DE: dryer exit
DF: douglas fir
ECN: effective carbon number
FID: flame ionization detector (aka THC analyzer)
GC/FID: gas chromatograph with a flame ionization detector
GC/MS: gas chromatograph with a mass spectrometer
HZ: heating zone
J: jet
L: longitudinal
MSF: one thousand square feet
MW: molecular weight
NCASI: National Council for Air and Stream Improvement
PF: phenol formaldehyde
PP: ponderosa pine
RM25A: EPA Reference Method 25A
RF: THC analyzer response factor
RM25A: EPA Reference Method 25A
THC: total hydrocarbon
WF: white fir
WPP1 VOC: EPA Interim VOC Measurement Protocol for the Wood Products Industry - July 2007

EPA Region 10 WPP1 VOC Emission Factor for Pacific Northwest Softwood Layup Trim Chipping without Air Pollution Controls

This sheet presents full-scale test data for chipping southern yellow pine layup trim, without air pollution controls, as reported in National Council for Air and Stream Improvement (NCASI) January 1999 Technical Bulletin No. 768 (TB768) - Volatile Organic Compound Emissions from Wood Products Manufacturing Facilities Part I - Plywood. Based upon NCASI's test data and EPA's Interim VOC Measurement Protocol for the Wood Products Industry - July 2007 (WPP1 VOC), EPA Region 10 has calculated a southern yellow pine layup trim chipping VOC emission factor of 0.0793 lb/msf (3/8 inch). NCASI conducted no testing of this emissions generating activity for Pacific Northwest softwoods. While southern yellow pine steam-heated veneer dryer heating zone THC (as carbon) emissions are five times greater than those generated by Pacific Northwest softwoods, southern yellowpine board cooling THC (as carbon) emissions are about one-half those generated by Pacific Northwest softwoods. (See NCASI TB768 tables 6.1.1, 6.1.2 and 6.1.4.) The southern yellow pine layup line (whose trim chipping NCASI tested) employed phenol formaldehyde resin, and that type of resin is typically employed at Pacific Northwest softwood mills as evidenced by information presented in NCASI TB 768. It is uncertain whether Pacific Northwest softwood layup trim chipping VOC emissions are greater or less than those generated by southern yellow pine, and EPA Region 10 is unable at this time to offer a methodology for calculating Pacific Northwest softwood emissions based upon adjustments to the results for southern yellow pine. Under these circumstances, EPA Region 10 estimates that the Pacific Northwest softwoods VOC emission factor for this activity is about the same as that for southern yellow pine, 0.0793 lb/msf 3/8".

The "msf" in the denominator of the emission factor refers to the layup line's finished board production rate. The factor is representative of emissions generated by pneumatic conveyance of layup trim chipping exhaust (not primary residue stream). The factor is not representative of emissions exhausted to atmosphere (perhaps via a cyclone or baghouse) as the resultant primary residue stream is pneumatically conveyed to downstream storage.

To calculate WPP1 VOC emissions, EPA Region 10 employed NCASI test results quantifying both total and speciated VOC. NCASI employed EPA Reference Method 25A (RM25A) to measure VOC emissions not quantified through speciated sampling and analysis. Because RM25A quantifies total hydrocarbon (THC) emissions (and because THC and VOC are not quite the same), some adjustments to the RM25A results were necessary to determine VOC emissions. NCASI reported RM25A results “as carbon” which only accounts for the carbon portion of the compounds measured. EPA Region 10 adjusted the RM25A results to express THC “as propane” to better approximate the VOC compounds generated by veneer drying. RM25A results were further adjusted to deduct that portion attributable to acetone as acetone is not a VOC. The contribution of certain VOC compounds (already quantified through speciated sampling and analysis) to RM25A results have been deducted to avoid double-counting. These adjustments to RM25A results are consistent with EPA’s Interim VOC Measurement Protocol for the Wood Products Industry - July 2007 (WPP1 VOC). Finally, for each test run, the modified RM25A emission rate is added to speciated HAP emission rates to calculate WPP1 VOC. The resultant VOC emission factor is based on the 90th percentile value when three or more test runs are available, and on the maximum value when less than three runs are available. For a listing of the sampling and analysis techniques NCASI employed to measure each of the 29 targetted hydrocarbons (HAP and non-HAP), see Tables 2.1 and 2.2 of TB768.

In certain instances, one or two of the runs resulted in an actual measurement of a hydrocarbon while the other run(s) resulted in a non-detect. For those runs resulting in a non-detect, a substitute value has been generated to reflect what we think the actual measurement may have been had detection been possible. The substitute values are noted in **bold** and reflect the lesser of (a) the pollutant-specific method detection limit for that run or (b) a calculated value (Compound X_{RUNA}) representing mass emission rate of undetected individual compound "Compound X" during test run "Run A." The value for Compound X_{RUNA} is determined by multiplying known $\Sigma HC_{i\ RUNA}$ by the known ratio of Compound X_{RUNB} to $\Sigma HC_{i\ RUNB}$. Compound $X_{RUNA} = (\Sigma HC_{i\ RUNA})$ X (Compound X_{RUNB} / $\Sigma HC_{i\ RUNB}$) where $\Sigma HC_{i\ RUNA}$ is the summation of measurements of individual hydrocarbons (HC) during Run A except for Compound X and any other hydrocarbons not detected in Run A and/or Run B. Example calculations are provided below for illustration.

Step No. 1: Summarize test results

Emission Test Run ID	Run 165-1WD1N1	Run 165-1WD1N2	Run 165-1WD1N3
Facility No.	165	165	165
Species (Face/Core)	SYP/SYP	SYP/SYP	SYP/SYP
No. of Plies[1]	4 or 5	4 or 5	4 or 5
Resin Type	PF	PF	PF
NCASI TB768 Page No.	65-78 & B33	65-78 & B33	65-78 & B33

	Mass Emission Rate as Measured (lb/msf 3/8")		
Pollutant/Compound (as measured)	Run 165-1WD1N1	Run 165-1WD1N2	Run 165-1WD1N3
THC as carbon	0.057	0.057	0.062
Acetaldehyde as measurd	0.0013	**0.0012**	**0.0011**
Acetone (non-VOC)	0.0013	**0.0012**	**0.0011**
Formaldehyde	0.00071	**0.00029**	**0.00030**
Methanol	0.0087	0.0093	0.0080
Phenol	0.0022	0.0024	**0.0020**
Alpha-pinene	0.032	0.032	0.032

[1] Estimate based upon operating information from downstream hot press XPB1. Testing of 1WD1 and XPB1 occurred within the same general period of time. See NCASI TB768, Table 4.5.1.

Example calculation to estimate acetone emission rate for Run 165-1WD1N2 based upon Runs 165-1WD1N1 and N2 emission measurements:
$Acetone_{RUN165\text{-}1WD1N2} = (\Sigma HC_{i\ RUN165\text{-}1WD1N2})$ X $(Acetone_{RUN165\text{-}1WD1N1} / \Sigma HC_{i\ RUN165\text{-}1WD1N1})$
$Acetone_{RUN165\text{-}1WD1N2}$ = (0.0093+0.0024+0.032) X (0.0013) / (0.0087+0.0022+0.032) = 0.0013 lb/msf 3/8"

Because the estimated value for $acetone_{RUN165\text{-}1WD1N2}$ of 0.0013 lb/msf 3/8" is greater than the test method detection limit of 0.0012 lb/msf 3/8" for that run, the detection limit value of 0.0012 lb/msf 3/8" is substituted instead of the calculated value.
Emission measurements from Run 165-1WD1N3 were not considered because acetone was a non-detect for this run.

Step No. 2: Convert measurements to a common propane basis

$Compound_X$ expressed as propane = $(Compound_X) \times [(MW_{propane}) / (MW_{Compound\ X})] \times [(\#C_{Compound\ X}) / (\#C_{propane})]$

where: $Compound_X$ represents mass emission rate of $Compound_X$

$MW_{propane}$ equals "44.0962" and represents the molecular weight for propane; the compound that is the "basis" for expressing mass of VOC

$MW_{Compound\ X}$ represents the molecular weight for $Compound_X$

$\#C_{compound\ X}$ equals number of carbon atoms in $Compound_X$

$\#C_{propane}$ equals "3" as three carbon atoms are present within propane; the compound that is the "basis" for expressing mass of VOC per

Mass Emission Rate as Propane (lb/msf 3/8")

Pollutant/Compound (as propane)	Run 165-1WD1N1	Run 165-1WD1N2	Run 165-1WD1N3
THC	0.0698	0.0698	0.0759
Acetaldehyde	0.0009	0.0008	0.0007
Acetone (non-VOC)	0.0010	0.0009	0.0008
Formaldehyde	0.0003	0.0001	0.0001
Methanol	0.0040	0.0043	0.0037
Phenol	0.0021	0.0022	0.0019
Alpha-pinene	0.0345	0.0345	0.0345

Example calculation to convert methanol as $measured_{RUN165\text{-}1WD1N1}$ to methanol as propane:

Methanol as $propane_{RUN165\text{-}1WD1N1}$ = $(Methanol_{RUN165\text{-}1WD1N1}) \times [(MW_{propane}) / (MW_{methanol})] \times [(\#C_{methanol}) / (\#C_{propane})]$

Methanol as $propane_{RUN165\text{-}1WD1N1}$ = (0.0087) X (44.0962/32.042) X (1/3) = 0.0040 lb/msf 3/8"

Step No. 3: Calculate the contribution of individual compounds to THC analyzer measurements as propane

$Compound_X$ expressed as propane by analyzer = ($Compound_X$ expressed as propane) X $(RF_{Compound\ X})$

where: $RF_{Compound\ X}$ represents the flame ionization detector (FID) response factor (RF) for $Compound_X$

Because THC was measured using a THC analyzer, we already know THC analyzer measurement of THC.

Mass Emission Rate as Propane Measured by THC Analyzer (lb/msf 3/8")

Pollutant/Compound (as propane per THC analyzer)	Run 165-1WD1N1	Run 165-1WD1N2	Run 165-1WD1N3
Acetaldehyde	0.0004	0.0004	0.0004
Acetone (non-VOC)	0.0007	0.0006	0.0006
Formaldehyde	0	0	0
Methanol	0.0020	0.0021	0.0018
Phenol	0.0019	0.0021	0.0017
Alpha-pinene	0.0345	0.0345	0.0345

Example calculation to determine amount of acetone measured by the THC analyzer as $propane_{RUN165\text{-}1WD1N2}$:

Acetone as $propane_{RUN165\text{-}1WD1N2}$ per THC analyzer = (Acetone as $propane_{RUN165\text{-}1WD1N2}$) X $(RF_{acetone})$

Acetone as $propane_{RUN165\text{-}1WD1N2}$ per THC analyzer = (0.0009) X (0.6667) = 0.0006 lb/msf 3/8"

Step No. 4: Subtract the contribution of individual compounds measured by the THC analyzer as propane (Step No. 3) from the THC measurement as propane (Step No. 2)

Mass Emission Rate (lb/msf 3/8")

Pollutant/Compound (as propane per THC analyzer)	Run 165-1WD1N1	Run 165-1WD1N2	Run 165-1WD1N3
THC	0.0698	0.0698	0.0759
Acetaldehyde	-0.0004	-0.0004	-0.0004
Acetone (non-VOC)	-0.0007	-0.0006	-0.0006
Formaldehyde	0	0	0
Methanol	-0.0020	-0.0021	-0.0018
Phenol	-0.0019	-0.0021	-0.0017
Alpha-pinene	-0.0345	-0.0345	-0.0345
THC as propane w/o acetone and w/o double-counting VOC_i	0.0303	0.0300	0.0369

Step No. 5: Calculate WPP1 VOC by adding the contribution of individual VOCs (Step No. 1) to the adjusted THC value (Step No. 4)

	Mass Emission Rate (lb/msf 3/8")		
Pollutant/Compound	Run 165-1WD1N1	Run 165-1WD1N2	Run 165-1WD1N3
THC as propane w/o acetone and w/o double-counting VOC_i	0.0303	0.0300	0.0369
Acetaldehyde as measured	0.0013	**0.0012**	**0.0011**
Formaldehyde as measured	0.0007	**0.00029**	**0.00030**
Methanol as measured	0.0087	0.0093	0.0080
Phenol as measured	0.0022	0.0024	**0.0020**
Alpha-pinene as measured	0.0320	0.0320	0.0320
WPP1 VOC	0.0752	0.0752	0.0803

Step No. 6: Calculate WPP1 VOC emission factor equal to 90th percentile value of 3 runs

WPP1 VOC (3-run 90th percentile value)	0.0793	lb/msf 3/8"
Average value (for informational purposes only)	0.0769	lb/msf 3/8"

Reference Information

Element and Compound Information

Element / Compound	FID RF	MW (lb/lb-mol)	Formula	Carbon Atoms	Hydrogen Atoms	Oxygen Atoms
Acetaldehyde	0.5	44.0530	C_2H_4O	2	4	1
Acetone (non-VOC)	0.6667	58.0798	C_3H_6O	3	6	1
Acrolein	0.6667	56.0640	C_3H_4O	3	4	1
Benzene	1	78.1134	C_6H_6	6	6	0
3-carene	1	136.2364	$C_{10}H_{16}$	10	16	0
Formaldehyde	0	30.0262	CH_2O	1	2	1
Methanol	0.5	32.0420	CH_4O	1	4	1
Methyl Ethyl Ketone	0.75	72.1066	C_4H_8O	4	8	1
Methyl Isobutyl Ketone	0.8333	100.1602	$C_6H_{12}O$	6	12	1
Phenol	0.9167	94.1128	C_6H_6O	6	6	1
Alpha-pinene	1	136.2364	$C_{10}H_{16}$	10	16	0
Beta-pinene	1	136.2364	$C_{10}H_{16}$	10	16	0
Propionaldehyde	0.6667	58.0798	C_3H_6O	3	6	1
Toluene	1	92.1402	C_7H_8	7	8	0
m,p-Xylene	1	106.1670	C_8H_{10}	8	10	0
o-xylene	1	106.1670	C_8H_{10}	8	10	0
Propane	1	44.0962	C_3H_8	3	8	0
Carbon	-	12.0110	C	1	-	-
Hydrogen	-	1.0079	H	-	1	-
Oxygen	-	15.9994	O	-	-	1

FID RF = ECN / No. carbon atoms in compound. See Attachment No. 2 to NCASI's September 2011 Technical Bulletin No. 991 (TB768) - Volatile Organic Compound Emissions from Wood Products Manufacturing Facilities Part I - Plywood. In the absence of information related to the FID NCASI employed to conduct RM25A testing, empirical effective carbon number (ECN) values will be employed to estimate FID RF.

ECN = (no. aliphatic carbon) + (no. aromatic carbon) - (no. ether oxygen) - (0.5 x no. primary alcohol oxygen)
Calculations to estimate ECN for several compounds:

Element / Compound	Formula	No. Aliphatic Carbon	No. Aromatic Carbon	No. Carbonyl Carbon	No. Carboxyl Carbon	No. Ether Oxygen	No. Primary Alcohol Oxygen	Empirical ECN
Acetaldehyde	CH_3CHO	1		1				1
Acetone (non-VOC)	$(CH_3)_2CO$	2		1				2
Acrolein	CH_2CHCHO	2		1				2
Benzene	C_6H_6		6					6
3-carene	$C_{10}H_{16}$	10						10
Formaldehyde	CH_2O							0
Methanol	CH_3OH	1					1	0.5
Methyl Ethyl Ketone	$CH_3C(O)CH_2CH_3$	3		1				3
Methyl Isobutyl Ketone	$(CH_3)_2CHCH_2C(O)CH_3$	5		1				5
Phenol	C_6H_5OH		6				1	5.5
Alpha-pinene	$C_{10}H_{16}$	10						10
Beta-pinene	$C_{10}H_{16}$	10						10
Propane	C_3H_8	3						3
Propionaldehyde	CH_3CH_2CHO	2		1				2
Toluene	$C_6H_5CH_3$	1	6					7
m,p-Xylene	$C_6H_4CH_3CH_3$	2	6					8
o-xylene	$C_6H_4CH_3CH_3$	2	6					8

Abbreviations/Acronyms
DE: dryer exit
DF: douglas fir
ECN: effective carbon number
FID: flame ionization detector (aka THC analyzer)
GC/FID: gas chromatograph with a flame ionization detector
GC/MS: gas chromatograph with a mass spectrometer
HC: hydrocarbon
HZ: heating zone
J: jet
L: longitudinal
MSF: one thousand square feet
MW: molecular weight
NCASI: National Council for Air and Stream Improvement
NMP: no measurement performed
PF: phenol formaldehyde
PP: ponderosa pine
RM25A: EPA Reference Method 25A
RF: THC analyzer response factor
RM25A: EPA Reference Method 25A
THC: total hydrocarbon
WF: white fir
WPP1 VOC: EPA Interim VOC Measurement Protocol for the Wood Products Industry - July 2007

EPA Region 10 WPP1 VOC Emission Factor for Pacific Northwest Softwood Plywood Trim Chipping and Plywood Sanding without Air Pollution Controls

This sheet presents full-scale test data for chipping southern yellow pine plywood trim and associated downstream plywood sanding, without air pollution controls, as reported in National Council for Air and Stream Improvement (NCASI) January 1999 Technical Bulletin No. 768 (TB768) - Volatile Organic Compound Emissions from Wood Products Manufacturing Facilities Part I - Plywood. Based upon NCASI's test data and EPA's Interim VOC Measurement Protocol for the Wood Products Industry - July 2007 (WPP1 VOC), EPA Region 10 has calculated a southern yellow pine plywood trim chipping and plywood sanding VOC emission factor of 0.0664 lb/msf (3/8 inch). NCASI conducted no testing of this emissions generating activity for Pacific Northwest softwoods. While southern yellow pine steam-heated veneer dryer heating zone THC (as carbon) emissions are five times greater than those generated by Pacific Northwest softwoods, southern yellowpine board cooling THC (as carbon) emissions are about one-half those generated by Pacific Northwest softwoods. (See NCASI TB768 tables 6.1.1, 6.1.2 and 6.1.4.) The southern yellow pine plywood is bonded with phenol formaldehyde resin, and that type of resin is typically employed at Pacific Northwest softwood mills as evidenced by information presented in NCASI TB 768. It is uncertain whether Pacific Northwest softwood plywood trim chipping and plywood sanding VOC emissions are greater or less than those generated by southern yellow pine, and EPA Region 10 is unable at this time to offer a methodology for calculating Pacific Northwest softwood emissions based upon adjustments to the results for southern yellow pine. Under these circumstances, EPA Region 10 estimates that the Pacific Northwest softwoods VOC emission factor for this activity is about the same as that for southern yellow pine, 0.0664 lb/msf 3/8".

The "msf" in the denominator of the emission factor refers to the plywood finished board production rate. The factor is representative of emissions generated by pneumatic conveyance of plywood trim chipping exhaust (not primary residue stream) and plywood sanderdust. The factor is not representative of emissions exhausted to atmosphere (perhaps via cyclone or baghouse) as the chipper's resultant primary residue stream is pneumatically conveyed to downstream storage.

To calculate WPP1 VOC emissions, EPA Region 10 employed NCASI test results quantifying both total and speciated VOC. NCASI employed EPA Reference Method 25A (RM25A) to measure VOC emissions not quantified through speciated sampling and analysis. Because RM25A quantifies total hydrocarbon (THC) emissions (and because THC and VOC are not quite the same), some adjustments to the RM25A results were necessary to determine VOC emissions. NCASI reported RM25A results “as carbon” which only accounts for the carbon portion of the compounds measured. EPA Region 10 adjusted the RM25A results to express THC “as propane” to better approximate the VOC compounds generated by veneer drying. RM25A results were further adjusted to deduct that portion attributable to acetone as acetone is not a VOC. The contribution of certain VOC compounds (already quantified through speciated sampling and analysis) to RM25A results have been deducted to avoid double-counting. These adjustments to RM25A results are consistent with EPA’s Interim VOC Measurement Protocol for the Wood Products Industry - July 2007 (WPP1 VOC). Finally, for each test run, the modified RM25A emission rate is added to speciated HAP emission rates to calculate WPP1 VOC. The resultant VOC emission factor is based on the 90th percentile value when three or more test runs are available, and on the maximum value when less than three runs are available. For a listing of the sampling and analysis techniques NCASI employed to measure each of the 29 targetted hydrocarbons (HAP and non-HAP), see Tables 2.1 and 2.2 of TB768.

In certain instances, one or two of the runs resulted in an actual measurement of a hydrocarbon while the other run(s) resulted in a non-detect. For those runs resulting in a non-detect, a substitute value has been generated to reflect what we think the actual measurement may have been had detection been possible. The substitute values are noted in **bold** and reflect the lesser of (a) the pollutant-specific method detection limit for that run or (b) a calculated value (Compound X_{RUNA}) representing mass emission rate of undetected individual compound "Compound X" during test run "Run A." The value for Compound X_{RUNA} is determined by multiplying known $\Sigma HC_{i\ RUNA}$ by the known ratio of Compound X_{RUNB} to $\Sigma HC_{i\ RUNB}$. Compound X_{RUNA} = ($\Sigma HC_{i\ RUNA}$) X (Compound X_{RUNB} / $\Sigma HC_{i\ RUNB}$) where $\Sigma HC_{i\ RUNA}$ is the summation of measurements of individual hydrocarbons (HC) during Run A except for Compound X and any other hydrocarbons not detected in Run A and/or Run B. Example calculations are provided below for illustration.

Step No. 1: Summarize test results

Emission Test Run ID	Run 165-1WR1N1	Run 165-1WR1N2	Run 165-1WR1N3
Facility No.	165	165	165
Species (Face/Core)	SYP/SYP	SYP/SYP	SYP/SYP
No. of Plies	?	?	?
Resin Type	PF	PF	PF
NCASI TB768 Page No.	65-78 & B34	65-78 & B34	65-78 & B34

Mass Emission Rate as Measured (lb/msf 3/8")

Pollutant/Compound (as measured)	Run 165-1WR1N1	Run 165-1WR1N2	Run 165-1WR1N3
THC as carbon	NMP	0.056	NMP
Methanol	0.0073	**0.0015**	0.015
Alpha-Pinene	0.041	0.042	0.025

Example calculation to estimate methanol emission rate for Run 165-1WR1N2 based upon Runs 165-1WR1N1, N2 and N3 emission measurements:
$Methanol_{RUN165\text{-}1WR1N2}$ = 1/2 [($\Sigma HC_{i\ RUN165\text{-}1WR1N2}$ X $Methanol_{RUN165\text{-}1WR1N1}$ / $\Sigma HC_{RUN165\text{-}1WR1N1}$) + ($\Sigma HC_{i\ RUN165\text{-}1WR1N2}$ X $Methanol_{RUN165\text{-}1WR1N3}$ / $\Sigma HC_{i\ RUN165\text{-}1WR1N3}$)
$Methanol_{RUN165\text{-}1WR1N2}$ = 1/2 [(0.042 X 0.0073 / 0.041) + (0.042 X 0.015 / 0.025)] = 0.0163 lb/msf 3/8"

Because the estimated value for $methanol_{RUN165\text{-}1WR1N2}$ of 0.0163 lb/msf is greater than the test method detection limit of 0.0015 lb/msf for that run, the detection limit value of 0.0015 lb/msf is substituted instead of the calculated value.

Step No. 2: Convert measurements to a common propane basis

$Compound_X$ expressed as propane = $(Compound_X)$ X $[(MW_{propane}) / (MW_{Compound\ X})]$ X $[(\#C_{Compound\ X}) / (\#C_{propane})]$

where: $Compound_X$ represents mass emission rate of $Compound_X$

$MW_{propane}$ equals "44.0962" and represents the molecular weight for propane; the compound that is the "basis" for expressing mass of VOC per

$MW_{Compound\ X}$ represents the molecular weight for $Compound_X$

$\#C_{compound\ X}$ equals number of carbon atoms in $Compound_X$

$\#C_{propane}$ equals "3" as three carbon atoms are present within propane; the compound that is the "basis" for expressing mass of VOC per

Pollutant/Compound (as propane)	Mass Emission Rate as Propane (lb/msf 3/8") Run 165-1WR1N2
THC	0.0685
Methanol	0.0007
Alpha-Pinene	0.0453

Example calculation to convert methanol as $measured_{RUN165\text{-}1WR1N2}$ to methanol as propane:

Methanol as $propane_{RUN165\text{-}1WR1N2}$ = $(Methanol_{RUN165\text{-}1WR1N2})$ X $[(MW_{propane}) / (MW_{methanol})]$ X $[(\#C_{methanol}) / (\#C_{propane})]$

Methanol as $propane_{RUN165\text{-}1WR1N2}$ = (0.0015) X (44.0962/32.042) X (1/3) = 0.0007 lb/msf 3/8"

Step No. 3: Calculate the contribution of individual compounds to THC analyzer measurements as propane

$Compound_X$ expressed as propane by analyzer = ($Compound_X$ expressed as propane) X $(RF_{Compound\ X})$

where: $RF_{Compound\ X}$ represents the flame ionization detector (FID) response factor (RF) for $Compound_X$

Because THC was measured using a THC analyzer, we already know THC analyzer measurement of THC.

Pollutant/Compound (as propane per THC analyzer)	Mass Emission Rate as Propane Measured by THC Analyzer (lb/msf 3/8") Run 165-1WR1N2
Methanol	0.0003
Alpha-Pinene	0.0453

Example calculation to determine amount of methanol measured by the THC analyzer as $propane_{RUN165\text{-}1WR1N2}$:

Methanol as $propane_{RUN165\text{-}1WR1N2}$ per THC analyzer = (Methanol as $propane_{RUN165\text{-}1WR1N2}$) X $(RF_{methanol})$

Methanol as $propane_{RUN165\text{-}1WR1N2}$ per THC analyzer = (0.0007) X (0.50) = 0.0003 lb/msf 3/8"

Step No. 4: Subtract the contribution of individual compounds measured by the THC analyzer as propane (Step No. 3) from the THC measurement as propane (Step No. 2)

Pollutant/Compound	Mass Emission Rate (lb/msf 3/8") Run 165-1WR1N2
THC as propane per THC analyzer	0.0685
Methanol	-0.0003
Alpha-Pinene	-0.0453
THC as propane w/o acetone and w/o double-counting VOC_i	0.0229

Step No. 5: Calculate WPP1 VOC by adding the contribution of individual VOCs (Step No. 1) to the adjusted THC value (Step No. 4)

Pollutant/Compound	Mass Emission Rate (lb/msf 3/8") Run 165-1WR1N2
THC as propane w/o acetone and w/o double-counting VOC_i	0.0229
Methanol as measured	**0.0015**
Alpha-Pinene as measured	0.042
WPP1 VOC	0.0664 lb/msf 3/8"

Reference Information
Element and Compound Information

Element / Compound	FID RF	MW (lb/lb-mol)	Formula	Carbon Atoms	Hydrogen Atoms	Oxygen Atoms
Acetaldehyde	0.5	44.0530	C_2H_4O	2	4	1
Acetone (non-VOC)	0.6667	58.0798	C_3H_6O	3	6	1
Acrolein	0.6667	56.0640	C_3H_4O	3	4	1
Benzene	1	78.1134	C_6H_6	6	6	0
3-carene	1	136.2364	$C_{10}H_{16}$	10	16	0
Formaldehyde	0	30.0262	CH_2O	1	2	1
Methanol	0.5	32.0420	CH_4O	1	4	1
Methyl Ethyl Ketone	0.75	72.1066	C_4H_8O	4	8	1
Methyl Isobutyl Ketone	0.8333	100.1602	$C_6H_{12}O$	6	12	1
Phenol	0.9167	94.1128	C_6H_6O	6	6	1
Alpha-pinene	1	136.2364	$C_{10}H_{16}$	10	16	0
Beta-pinene	1	136.2364	$C_{10}H_{16}$	10	16	0
Propionaldehyde	0.6667	58.0798	C_3H_6O	3	6	1
Toluene	1	92.1402	C_7H_8	7	8	0
m,p-Xylene	1	106.1670	C_8H_{10}	8	10	0
o-xylene	1	106.1670	C_8H_{10}	8	10	0
Propane	1	44.0962	C_3H_8	3	8	0
Carbon	-	12.0110	C	1	-	-
Hydrogen	-	1.0079	H	-	1	-
Oxygen	-	15.9994	O	-	-	1

FID RF = ECN / No. carbon atoms in compound. See Attachment No. 2 to NCASI's September 2011 Technical Bulletin No. 991 (TB768) - Volatile Organic Compound Emissions from Wood Products Manufacturing Facilities Part I - Plywood. In the absence of information related to the FID NCASI employed to conduct RM25A testing, empirical effective carbon number (ECN) values will be employed to estimate FID RF.

ECN = (no. aliphatic carbon) + (no. aromatic carbon) - (no. ether oxygen) - (0.5 x no. primary alcohol oxygen)
Calculations to estimate ECN for several compounds:

Element / Compound	Formula	No. Aliphatic Carbon	No. Aromatic Carbon	No. Carbonyl Carbon	No. Carboxyl Carbon	No. Ether Oxygen	No. Primary Alcohol Oxygen	Empirical ECN
Acetaldehyde	CH_3CHO	1		1				1
Acetone (non-VOC)	$(CH_3)_2CO$	2		1				2
Acrolein	CH_2CHCHO	2		1				2
Benzene	C_6H_6		6					6
3-carene	$C_{10}H_{16}$	10						10
Formaldehyde	CH_2O							0
Methanol	CH_3OH	1					1	0.5
Methyl Ethyl Ketone	$CH_3C(O)CH_2CH_3$	3		1				3
Methyl Isobutyl Ketone	$(CH_3)_2CHCH_2C(O)CH_3$	5		1				5
Phenol	C_6H_5OH		6				1	5.5
Alpha-pinene	$C_{10}H_{16}$	10						10
Beta-pinene	$C_{10}H_{16}$	10						10
Propane	C_3H_8	3						3
Propionaldehyde	CH_3CH_2CHO	2		1				2
Toluene	$C_6H_5CH_3$	1	6					7
m,p-Xylene	$C_6H_4CH_3CH_3$	2	6					8
o-xylene	$C_6H_4CH_3CH_3$	2	6					8

Abbreviations/Acronyms
DE: dryer exit
DF: douglas fir
ECN: effective carbon number
FID: flame ionization detector (aka THC analyzer)
GC/FID: gas chromatograph with a flame ionization detector
GC/MS: gas chromatograph with a mass spectrometer
HC: hydrocarbon
HZ: heating zone
J: jet
L: longitudinal
MSF: one thousand square feet
MW: molecular weight
NCASI: National Council for Air and Stream Improvement
NMP: no measurement performed
PF: phenol formaldehyde
PP: ponderosa pine
RM25A: EPA Reference Method 25A
RF: THC analyzer response factor
RM25A: EPA Reference Method 25A
SYP: southern yellow pine
THC: total hydrocarbon
WF: white fir
WPP1 VOC: EPA Interim VOC Measurement Protocol for the Wood Products Industry - July 2007

EPA Region 10 WPP1 VOC Emission Factor for Pacific Northwest Softwood Plywood Trim and Groover Chip Residue Recovery without Air Pollution Controls

This sheet presents full-scale test data for recovering southern yellow pine plywood trim and groover chips, without air pollution controls, as reported in National Council for Air and Stream Improvement (NCASI) January 1999 Technical Bulletin No. 768 (TB768) - Volatile Organic Compound Emissions from Wood Products Manufacturing Facilities Part I - Plywood. Based upon NCASI's test data and EPA's Interim VOC Measurement Protocol for the Wood Products Industry - July 2007 (WPP1 VOC), EPA Region 10 has calculated a southern yellow pine plywood trim and groover chip residue recovery VOC emission factor of 0.0883 lb/msf (3/8 inch). NCASI conducted no testing of this emissions generating activity for Pacific Northwest softwoods. While southern yellow pine steam-heated veneer dryer heating zone THC (as carbon) emissions are five times greater than those generated by Pacific Northwest softwoods, southern yellowpine board cooling THC (as carbon) emissions are about one-half those generated by Pacific Northwest softwoods. (See NCASI TB768 tables 6.1.1, 6.1.2 and 6.1.4.) The southern yellow pine plywood is bonded with phenol formaldehyde resin, and that type of resin is typically employed at Pacific Northwest softwood mills as evidenced by information presented in NCASI TB 768. It is uncertain whether Pacific Northwest softwood plywood trim and groover chip residue recovery VOC emissions are greater or less than those generated by southern yellow pine, and EPA Region 10 is unable at this time to offer a methodology for calculating Pacific Northwest softwood emissions based upon adjustments to the results for southern yellow pine. Under these circumstances, EPA Region 10 estimates that the Pacific Northwest softwoods VOC emissions factor for this activity is about the same as that for southern yellow pine, 0.0883 lb/msf 3/8".

The "msf" in the denominator of the emission factor refers to the plywood finished board production rate. The factor is representative of emissions exhausted to atmosphere as the residue streams are pneumatically conveyed to downstream storage.

To calculate WPP1 VOC emissions, EPA Region 10 employed NCASI test results quantifying both total and speciated VOC. NCASI employed EPA Reference Method 25A (RM25A) to measure VOC emissions not quantified through speciated sampling and analysis. Because RM25A quantifies total hydrocarbon (THC) emissions (and because THC and VOC are not quite the same), some adjustments to the RM25A results were necessary to determine VOC emissions. NCASI reported RM25A results "as carbon" which only accounts for the carbon portion of the compounds measured. EPA Region 10 adjusted the RM25A results to express THC "as propane" to better approximate the VOC compounds generated by veneer drying. RM25A results were further adjusted to deduct that portion attributable to acetone as acetone is not a VOC. The contribution of certain VOC compounds (already quantified through speciated sampling and analysis) to RM25A results have been deducted to avoid double-counting. These adjustments to RM25A results are consistent with EPA's Interim VOC Measurement Protocol for the Wood Products Industry - July 2007 (WPP1 VOC). Finally, for each test run, the modified RM25A emission rate is added to speciated HAP emission rates to calculate WPP1 VOC. The resultant VOC emission factor is based on the 90th percentile value when three or more test runs are available, and on the maximum value when less than three runs are available. For a listing of the sampling and analysis techniques NCASI employed to measure each of the 29 targetted hydrocarbons (HAP and non-HAP), see Tables 2.1 and 2.2 of TB768.

In certain instances, one or two of the runs resulted in an actual measurement of a hydrocarbon while the other run(s) resulted in a non-detect. For those runs resulting in a non-detect, a substitute value has been generated to reflect what we think the actual measurement may have been had detection been possible. The substitute values are noted in **bold** and reflect the lesser of (a) the pollutant-specific method detection limit for that run or (b) a calculated value (Compound X_{RUNA}) representing mass emission rate of undetected individual compound "Compound X" during test run "Run A." The value for Compound X_{RUNA} is determined by multiplying known $\Sigma HC_{i\ RUNA}$ by the known ratio of Compound X_{RUNB} to $\Sigma HC_{i\ RUNB}$. Compound X_{RUNA} = ($\Sigma HC_{i\ RUNA}$) X (Compound X_{RUNB} / $\Sigma HC_{i\ RUNB}$) where $\Sigma HC_{i\ RUNA}$ is the summation of measurements of individual hydrocarbons (HC) during Run A except for Compound X and any other hydrocarbons not detected in Run A and/or Run B. Example calculations are provided below for illustration.

Step No. 1: Summarize test results

Emission Test Run ID	Run 170-XMW1N1	Run 170-XMW1N2	Run 170-XMW1N3
Facility No.	170	170	170
Species (Face/Core)	SYP/SYP	SYP/SYP	SYP/SYP
No. of Plies	?	?	?
Resin Type	PF	PF	PF
NCASI TB768 Page No.	79-92 & B43	79-92 & B43	79-92 & B43

	Mass Emission Rate as Measured (lb/msf 3/8")		
Pollutant/Compound (as measured)	Run 170-XMW1N1	Run 170-XMW1N2	Run 170-XMW1N3
THC as carbon	N/A	N/A	0.072
Acetaldehyde	**0.0013**	0.0013	**0.0012**
Acetone (non-VOC)	0.0020	0.0019	0.0018
Formaldehyde	0.00035	0.00046	**0.00038**
Methanol	0.016	0.017	0.0034
Alpha-Pinene	0.024	0.024	0.035

Example calculation to estimate acetaldehyde emission rate for Run 170-XMW1N3 based upon Runs 170-XMW1N1 and N3 emission measurements:
$Acetaldehyde_{RUN170\text{-}XMW1N3}$ = ($\Sigma HC_{i\ RUN170\text{-}XMW1N3}$) X ($Acetaldehyde_{RUN170\text{-}XMW1N1}$ / $\Sigma HC_{i\ RUN170\text{-}XMW1N1}$)
$Acetaldehyde_{RUN170\text{-}XMW1N3}$ = (0.0018+0.0034+0.035) X [(0.0013) / (0.0019+0.017+0.024)] = 0.0012 lb/msf 3/8"
Formaldehyde was not considered in calculation of ΣHC_i because the compound was a non-detect in at least one of the two runs.

Step No. 2: Convert measurements to a common propane basis

$Compound_X$ expressed as propane = ($Compound_X$) X [($MW_{propane}$) / ($MW_{Compound\ X}$)] X [($\#C_{Compound\ X}$) / ($\#C_{propane}$)]

where: $Compound_X$ represents mass emission rate of $Compound_X$

$MW_{propane}$ equals "44.0962" and represents the molecular weight for propane; the compound that is the "basis" for expressing mass of

$MW_{Compound\ X}$ represents the molecular weight for $Compound_X$

$\#C_{compound\ X}$ equals number of carbon atoms in $Compound_X$

$\#C_{propane}$ equals "3" as three carbon atoms are present within propane; the compound that is the "basis" for expressing mass of VOC per

Pollutant/Compound (as propane)	Mass Emission Rate as Propane (lb/msf 3/8") Run 170-XMW1N3
THC	0.0881
Acetaldehyde	0.0008
Acetone (non-VOC)	0.0014
Formaldehyde	0.0002
Methanol	0.0016
Alpha-Pinene	0.0378

Example calculation to convert methanol as $measured_{RUN170\text{-}XMW1N3}$ to methanol as propane:

Methanol as $propane_{RUN170\text{-}XMW1N3}$ = ($Methanol_{RUN170\text{-}XMW1N3}$) X [($MW_{propane}$) / ($MW_{methanol}$)] X [($\#C_{methanol}$) / ($\#C_{propane}$)]

Methanol as $propane_{RUN170\text{-}XMW1N3}$ = (0.0034) X (44.0962/32.042) X (1/3) = 0.0016 lb/msf 3/8"

Step No. 3: Calculate the contribution of individual compounds to THC analyzer measurements as propane

$Compound_X$ expressed as propane by analyzer = ($Compound_X$ expressed as propane) X ($RF_{Compound\ X}$)

where: $RF_{Compound\ X}$ represents the flame ionization detector (FID) response factor (RF) for $Compound_X$

Because THC was measured using a THC analyzer, we already know THC analyzer measurement of THC.

Pollutant/Compound (as propane per THC analyzer)	Mass Emission Rate as Propane Measured by THC Analyzer (lb/msf 3/8") Run 170-XMW1N3
Acetaldehyde	0.0004
Acetone (non-VOC)	0.0009
Formaldehyde	0
Methanol	0.0008
Alpha-Pinene	0.0378

Example calculation to determine amount of methanol measured by the THC analyzer as $propane_{RUN170\text{-}XMW1N3}$:

Methanol as $propane_{RUN170\text{-}XMW1N3}$ per THC analyzer = (Methanol as $propane_{RUN170\text{-}XMW1N3}$) X ($RF_{methanol}$)

Methanol as $propane_{RUN170\text{-}XMW1N3}$ per THC analyzer = (0.0016) X (0.5) = 0.0008 lb/msf 3/8"

Step No. 4: Subtract the contribution of individual compounds measured by the THC analyzer as propane (Step No. 3) from the THC measurement as propane (Step No. 2)

Pollutant/Compound (as propane per THC analyzer)	Mass Emission Rate (lb/msf 3/8") Run 165-1WR1N2
THC	0.0881
Acetaldehyde	-0.0004
Acetone (non-VOC)	-0.0009
Formaldehyde	0
Methanol	-0.0008
Alpha-Pinene	-0.0378
THC as propane w/o acetone and w/o double-counting VOC_i	0.0483

Step No. 5: Calculate WPP1 VOC by adding the contribution of individual VOCs (Step No. 1) to the adjusted THC value (Step No. 4)

Pollutant/Compound	Mass Emission Rate (lb/msf 3/8") Run 165-1WR1N2
THC as propane w/o acetone and w/o double-counting VOC_i	0.0483
Acetaldehyde as measured	**0.0012**
Formaldehyde as measured	**0.00038**
Methanol as measured	0.0034
Alpha-Pinene as measured	0.035
WPP1 VOC	0.0883 lb/msf 3/8"

Reference Information

Element and Compound Information

Element / Compound	FID RF	MW (lb/lb-mol)	Formula	Carbon Atoms	Hydrogen Atoms	Oxygen Atoms
Acetaldehyde	0.5	44.0530	C_2H_4O	2	4	1
Acetone (non-VOC)	0.6667	58.0798	C_3H_6O	3	6	1
Acrolein	0.6667	56.0640	C_3H_4O	3	4	1
Benzene	1	78.1134	C_6H_6	6	6	0
3-carene	1	136.2364	$C_{10}H_{16}$	10	16	0
Formaldehyde	0	30.0262	CH_2O	1	2	1
Methanol	0.5	32.0420	CH_4O	1	4	1
Methyl Ethyl Ketone	0.75	72.1066	C_4H_8O	4	8	1
Methyl Isobutyl Ketone	0.8333	100.1602	$C_6H_{12}O$	6	12	1
Phenol	0.9167	94.1128	C_6H_6O	6	6	1
Alpha-pinene	1	136.2364	$C_{10}H_{16}$	10	16	0
Beta-pinene	1	136.2364	$C_{10}H_{16}$	10	16	0
Propionaldehyde	0.6667	58.0798	C_3H_6O	3	6	1
Toluene	1	92.1402	C_7H_8	7	8	0
m,p-Xylene	1	106.1670	C_8H_{10}	8	10	0
o-xylene	1	106.1670	C_8H_{10}	8	10	0
Propane	1	44.0962	C_3H_8	3	8	0
Carbon	-	12.0110	C	1	-	-
Hydrogen	-	1.0079	H	-	1	-
Oxygen	-	15.9994	O	-	-	1

FID RF = ECN / No. carbon atoms in compound. See Attachment No. 2 to NCASI's September 2011 Technical Bulletin No. 991 (TB768) - Volatile Organic Compound Emissions from Wood Products Manufacturing Facilities Part I - Plywood. In the absence of information related to the FID NCASI employed to conduct RM25A testing, empirical effective carbon number (ECN) values will be employed to estimate FID RF.

ECN = (no. aliphatic carbon) + (no. aromatic carbon) - (no. ether oxygen) - (0.5 x no. primary alcohol oxygen)
Calculations to estimate ECN for several compounds:

Element / Compound	Formula	No. Aliphatic Carbon	No. Aromatic Carbon	No. Carbonyl Carbon	No. Carboxyl Carbon	No. Ether Oxygen	No. Primary Alcohol Oxygen	Empirical ECN
Acetaldehyde	CH_3CHO	1		1				1
Acetone (non-VOC)	$(CH_3)_2CO$	2		1				2
Acrolein	CH_2CHCHO	2		1				2
Benzene	C_6H_6		6					6
3-carene	$C_{10}H_{16}$	10						10
Formaldehyde	CH_2O							0
Methanol	CH_3OH	1					1	0.5
Methyl Ethyl Ketone	$CH_3C(O)CH_2CH_3$	3		1				3
Methyl Isobutyl Ketone	$(CH_3)_2CHCH_2C(O)CH_3$	5		1				5
Phenol	C_6H_5OH		6				1	5.5
Alpha-pinene	$C_{10}H_{16}$	10						10
Beta-pinene	$C_{10}H_{16}$	10						10
Propane	C_3H_8	3						3
Propionaldehyde	CH_3CH_2CHO	2		1				2
Toluene	$C_6H_5CH_3$	1	6					7
m,p-Xylene	$C_6H_4CH_3CH_3$	2	6					8
o-xylene	$C_6H_4CH_3CH_3$	2	6					8

Abbreviations/Acronyms
DE: dryer exit
DF: douglas fir
ECN: effective carbon number
FID: flame ionization detector (aka THC analyzer)
GC/FID: gas chromatograph with a flame ionization detector
GC/MS: gas chromatograph with a mass spectrometer
HZ: heating zone
J: jet
L: longitudinal
MSF: one thousand square feet
MW: molecular weight
NCASI: National Council for Air and Stream Improvement
PF: phenol formaldehyde
PP: ponderosa pine
RM25A: EPA Reference Method 25A
RF: THC analyzer response factor
RM25A: EPA Reference Method 25A
THC: total hydrocarbon
WF: white fir
WPP1 VOC: EPA Interim VOC Measurement Protocol for the Wood Products Industry - July 2007

EPA Region 10 WPP1 VOC Emission Factor for Pacific Northwest Softwood Plywood Sanderdust Residue Recovery without Air Pollution Controls

This sheet presents full-scale test data for recovering southern yellow pine plywood sanderdust, without air pollution controls, as reported in National Council for Air and Stream Improvement (NCASI) January 1999 Technical Bulletin No. 768 (TB768) - Volatile Organic Compound Emissions from Wood Products Manufacturing Facilities Part I - Plywood. Based upon NCASI's test data and EPA's Interim VOC Measurement Protocol for the Wood Products Industry - July 2007 (WPP1 VOC), EPA Region 10 has calculated a southern yellow pine plywood sanderdust recovery VOC emission factor of 0.2614 lb/msf (3/8 inch). NCASI conducted no testing of this emissions generating activity for Pacific Northwest softwoods. While southern yellow pine steam-heated veneer dryer heating zone THC (as carbon) emissions are five times greater than those generated by Pacific Northwest softwoods, southern yellowpine board cooling THC (as carbon) emissions are about one-half those generated by Pacific Northwest softwoods. (See NCASI TB768 tables 6.1.1, 6.1.2 and 6.1.4.) The southern yellow pine plywood is bonded with phenol formaldehyde resin, and that type of resin is typically employed at Pacific Northwest softwood mills as evidenced by information presented in NCASI TB 768. It is uncertain whether Pacific Northwest softwood plywood sanderdust recovery VOC emissions are greater or less than those generated by southern yellow pine, and EPA Region 10 is unable at this time to offer a methodology for calculating Pacific Northwest softwood emissions based upon adjustments to the results for southern yellow pine. Under these circumstances, EPA Region 10 estimates that the Pacific Northwest softwoods VOC emissions factor for this activity is about the same as that for southern yellow pine, 0.2614 lb/msf 3/8".

The "msf" in the denominator of the emission factor refers to the plywood finished board production rate. The factor is representative of emissions exhausted to atmosphere as the sanderdust residue streams are pneumatically conveyed to downstream storage.

To calculate WPP1 VOC emissions, EPA Region 10 employed NCASI test results quantifying both total and speciated VOC. NCASI employed EPA Reference Method 25A (RM25A) to measure VOC emissions not quantified through speciated sampling and analysis. Because RM25A quantifies total hydrocarbon (THC) emissions (and because THC and VOC are not quite the same), some adjustments to the RM25A results were necessary to determine VOC emissions. NCASI reported RM25A results “as carbon” which only accounts for the carbon portion of the compounds measured. EPA Region 10 adjusted the RM25A results to express THC “as propane” to better approximate the VOC compounds generated by veneer drying. RM25A results were further adjusted to deduct that portion attributable to acetone as acetone is not a VOC. The contribution of certain VOC compounds (already quantified through speciated sampling and analysis) to RM25A results have been deducted to avoid double-counting. These adjustments to RM25A results are consistent with EPA's Interim VOC Measurement Protocol for the Wood Products Industry - July 2007 (WPP1 VOC). Finally, for each test run, the modified RM25A emission rate is added to speciated HAP emission rates to calculate WPP1 VOC. The resultant VOC emission factor is based on the 90th percentile value when three or more test runs are available, and on the maximum value when less than three runs are available. For a listing of the sampling and analysis techniques NCASI employed to measure each of the 29 targetted hydrocarbons (HAP and non-HAP), see Tables 2.1 and 2.2 of TB768.

In certain instances, one or two of the runs resulted in an actual measurement of a hydrocarbon while the other run(s) resulted in a non-detect. For those runs resulting in a non-detect, a substitute value has been generated to reflect what we think the actual measurement may have been had detection been possible. The substitute values are noted in **bold** and reflect the lesser of (a) the pollutant-specific method detection limit for that run or (b) a calculated value (Compound X_{RUNA}) representing mass emission rate of undetected individual compound "Compound X" during test run "Run A." The value for Compound X_{RUNA} is determined by multiplying known $\Sigma HC_{i\ RUNA}$ by the known ratio of Compound X_{RUNB} to $\Sigma HC_{i\ RUNB}$. Compound X_{RUNA} = ($\Sigma HC_{i\ RUNA}$) X (Compound X_{RUNB} / $\Sigma HC_{i\ RUNB}$) where $\Sigma HC_{i\ RUNA}$ is the summation of measurements of individual hydrocarbons (HC) during Run A except for Compound X and any other hydrocarbons not detected in Run A and/or Run B. Example calculations are provided below for illustration.

Step No. 1: Summarize test results

Emission Test Run ID	Run 170-1SD1N1	Run 170-1SD1N2	Run 170-1SD1N3
Facility No.	170	170	170
Species (Face/Core)	SYP/SYP	SYP/SYP	SYP/SYP
No. of Plies	?	?	?
Type of Resin	PF	PF	PF
NCASI TB768 Page No.	79-92 & B42	79-92 & B42	79-92 & B42

Mass Emission Rate as Measured (lb/msf 3/8")

Pollutant/Compound (as measured)	Run 170-1SD1N1	Run 170-1SD1N2	Run 170-1SD1N3
THC as carbon	0.14	0.22	0.081
Acetaldehyde	0.0038	**0.0037**	0.0026
Acetone (non-VOC)	0.0064	0.0046	0.0031
Formaldehyde	0.0018	0.0028	0.00072
Methanol	0.014	0.016	0.0082
Alpha-Pinene	0.035	**0.0369**	**0.0197**

Example calculation to estimate alpha-pinene emission rate for Run 170-1SD1N3 based upon Runs170-1SD1N1 and N3 emission measurements:

Alpha-pinene$_{RUN170\text{-}1SD1N3}$ = ($\Sigma HC_{i\ RUN170\text{-}1SD1N3}$) X (Alpha-pinene$_{RUN170\text{-}1SD1N1}$ / $\Sigma HC_{i\ RUN170\text{-}1SD1N1}$)

Alpha-pinene$_{RUN170\text{-}1SD1N3}$ = (0.0026+0.0031+0.00072+0.0082) X [(0.035) / (0.0038+0.0064+0.0018+0.014)] = 0.0197 lb/msf 3/8"

Step No. 2: Convert measurements to a common propane basis

$Compound_X$ expressed as propane = $(Compound_X)$ X $[(MW_{propane}) / (MW_{Compound\ X})]$ X $[(\#C_{Compound\ X}) / (\#C_{propane})]$

where: $Compound_X$ represents mass emission rate of $Compound_X$

$MW_{propane}$ equals "44.0962" and represents the molecular weight for propane; the compound that is the "basis" for expressing mass of

$MW_{Compound\ X}$ represents the molecular weight for $Compound_X$

$\#C_{compound\ X}$ equals number of carbon atoms in $Compound_X$

$\#C_{propane}$ equals "3" as three carbon atoms are present within propane; the compound that is the "basis" for expressing mass of VOC per

Mass Emission Rate as Propane (lb/msf 3/8")

Pollutant/Compound (as propane)	Run 170-1SD1N1	Run 170-1SD1N2	Run 170-1SD1N3
THC	0.1713	0.2692	0.0991
Acetaldehyde	0.0025	0.0025	0.0017
Acetone (non-VOC)	0.0049	0.0035	0.0024
Formaldehyde	0.0009	0.0014	0.0004
Methanol	0.0064	0.0073	0.0038
Alpha-Pinene	0.0378	0.0398	0.0212

Example calculation to convert methanol as $measured_{RUN170\text{-}1SD1N2}$ to methanol as propane:

Methanol as $propane_{RUN170\text{-}1SD1N2}$ = $(Methanol_{RUN170\text{-}1SD1N2})$ X $[(MW_{propane}) / (MW_{methanol})]$ X $[(\#C_{methanol}) / (\#C_{propane})]$

Methanol as $propane_{RUN170\text{-}1SD1N2}$ = (0.016) X (44.0962/32.042) X (1/3) = 0.0073 lb/msf 3/8"

Step No. 3: Calculate the contribution of individual compounds to THC analyzer measurements as propane

$Compound_X$ expressed as propane by analyzer = ($Compound_X$ expressed as propane) X $(RF_{Compound\ X})$

where: $RF_{Compound\ X}$ represents the flame ionization detector (FID) response factor (RF) for $Compound_X$

Because THC was measured using a THC analyzer, we already know THC analyzer measurement of THC.

Mass Emission Rate as Propane Measured by THC Analyzer (lb/msf 3/8")

Pollutant/Compound (as propane per THC analyzer)	Run 170-1SD1N1	Run 170-1SD1N2	Run 170-1SD1N3
Acetaldehyde	0.0013	0.0012	0.0009
Acetone (non-VOC)	0.0032	0.0023	0.0016
Formaldehyde	0	0	0
Methanol	0.0032	0.0037	0.0019
Alpha-Pinene	0.0378	0.0398	0.0212

Example calculation to determine amount of methanol measured by the THC analyzer as $propane_{RUN170\text{-}1SD1N2}$:

Methanol as $propane_{RUN170\text{-}1SD1N2}$ per THC analyzer = (Methanol as $propane_{RUN170\text{-}1SD1N2}$) X $(RF_{methanol})$

Methanol as $propane_{RUN170\text{-}1SD1N2}$ per THC analyzer = (0.0073) X (0.5) = 0.0037 lb/msf 3/8"

Step No. 4: Subtract the contribution of individual compounds measured by the THC analyzer as propane (Step No. 3) from the THC measurement as propane (Step No. 2)

Mass Emission Rate (lb/msf 3/8")

Pollutant/Compound	Run 170-1SD1N1	Run 170-1SD1N2	Run 170-1SD1N3
THC as propane per THC analyzer	0.1713	0.2692	0.0991
Acetaldehyde	-0.0013	-0.0012	-0.0009
Acetone (non-VOC)	-0.0032	-0.0023	-0.0016
Formaldehyde	0	0	0
Methanol	-0.0032	-0.0037	-0.0019
Alpha-Pinene	-0.0378	-0.0398	-0.0212
THC as propane w/o acetone and w/o double-counting VOC_i	0.1258	0.2222	0.0736

Step No. 5: Calculate WPP1 VOC by adding the contribution of individual VOCs (Step No. 1) to the adjusted THC value (Step No. 4)

	Mass Emission Rate (lb/msf 3/8")		
Pollutant/Compound	Run 170-1SD1N1	Run 170-1SD1N2	Run 170-1SD1N3
THC as propane w/o acetone and w/o double-counting VOC_i	0.1258	0.2222	0.0736
Acetaldehyde as measured	0.0038	**0.0037**	0.0026
Formaldehyde as measured	0.0018	0.0028	0.0007
Methanol as measured	0.0140	0.0160	0.0082
Alpha-Pinene as measured	0.035	**0.0369**	**0.0197**
WPP1 VOC	0.1804	0.2816	0.1048

Step No. 6: Calculate WPP1 VOC emission factor equal to 90th percentile value of 3 runs

WPP1 VOC (3-run 90th percentile value):	0.2614	lb/msf 3/8"
3-run average value (informational purposes only)	0.1889	lb/msf 3/8"

Converting EF to units of lb per msf of surface area sanded based upon information presented on page 92 of TB768 (SA means surface area sanded):

Emission Test Run ID	Production Rate	
	SA (msf/hr)	Sheet (msf 3/8")
Run 170-1SD1N1	46.2	65.1
Run 170-1SD1N2	56.0	32.7
Run 170-1SD1N3	65.0	68.0

	Mass Emission Rate (lb/msf SA)		
Pollutant/Compound	Run 170-1SD1N1	Run 170-1SD1N2	Run 170-1SD1N3
WPP1 VOC	0.2543	0.1644	0.1096

WPP1 VOC (3-run 90th percentile value):	0.2363	lb/msf SA
3-run average value (informational purposes only)	0.1761	lb/msf SA

Reference Information

Element and Compound Information

Element / Compound	FID RF	MW (lb/lb-mol)	Formula	Carbon Atoms	Hydrogen Atoms	Oxygen Atoms
Acetaldehyde	0.5	44.0530	C_2H_4O	2	4	1
Acetone (non-VOC)	0.6667	58.0798	C_3H_6O	3	6	1
Acrolein	0.6667	56.0640	C_3H_4O	3	4	1
Benzene	1	78.1134	C_6H_6	6	6	0
3-carene	1	136.2364	$C_{10}H_{16}$	10	16	0
Formaldehyde	0	30.0262	CH_2O	1	2	1
Methanol	0.5	32.0420	CH_4O	1	4	1
Methyl Ethyl Ketone	0.75	72.1066	C_4H_8O	4	8	1
Methyl Isobutyl Ketone	0.8333	100.1602	$C_6H_{12}O$	6	12	1
Phenol	0.9167	94.1128	C_6H_6O	6	6	1
Alpha-pinene	1	136.2364	$C_{10}H_{16}$	10	16	0
Beta-pinene	1	136.2364	$C_{10}H_{16}$	10	16	0
Propionaldehyde	0.6667	58.0798	C_3H_6O	3	6	1
Toluene	1	92.1402	C_7H_8	7	8	0
m,p-Xylene	1	106.1670	C_8H_{10}	8	10	0
o-xylene	1	106.1670	C_8H_{10}	8	10	0
Propane	1	44.0962	C_3H_8	3	8	0
Carbon	-	12.0110	C	1	-	-
Hydrogen	-	1.0079	H	-	1	-
Oxygen	-	15.9994	O	-	-	1

FID RF = ECN / No. carbon atoms in compound. See Attachment No. 2 to NCASI's September 2011 Technical Bulletin No. 991 (TB768) - Volatile Organic Compound Emissions from Wood Products Manufacturing Facilities Part I - Plywood. In the absence of information related to the FID NCASI employed to conduct RM25A testing, empirical effective carbon number (ECN) values will be employed to estimate FID RF.

ECN = (no. aliphatic carbon) + (no. aromatic carbon) - (no. ether oxygen) - (0.5 x no. primary alcohol oxygen)
Calculations to estimate ECN for several compounds:

Element / Compound	Formula	No. Aliphatic Carbon	No. Aromatic Carbon	No. Carbonyl Carbon	No. Carboxyl Carbon	No. Ether Oxygen	No. Primary Alcohol Oxygen	Empirical ECN
Acetaldehyde	CH_3CHO	1		1				1
Acetone (non-VOC)	$(CH_3)_2CO$	2		1				2
Acrolein	CH_2CHCHO	2		1				2
Benzene	C_6H_6		6					6
3-carene	$C_{10}H_{16}$	10						10
Formaldehyde	CH_2O							0
Methanol	CH_3OH	1					1	0.5
Methyl Ethyl Ketone	$CH_3C(O)CH_2CH_3$	3		1				3
Methyl Isobutyl Ketone	$(CH_3)_2CHCH_2C(O)CH_3$	5		1				5
Phenol	C_6H_5OH		6				1	5.5
Alpha-pinene	$C_{10}H_{16}$	10						10
Beta-pinene	$C_{10}H_{16}$	10						10
Propane	C_3H_8	3						3
Propionaldehyde	CH_3CH_2CHO	2		1				2
Toluene	$C_6H_5CH_3$	1	6					7
m,p-Xylene	$C_6H_4CH_3CH_3$	2	6					8
o-xylene	$C_6H_4CH_3CH_3$	2	6					8

Abbreviations/Acronyms
DE: dryer exit
DF: douglas fir
ECN: effective carbon number
FID: flame ionization detector (aka THC analyzer)
GC/FID: gas chromatograph with a flame ionization detector
GC/MS: gas chromatograph with a mass spectrometer
HZ: heating zone
J: jet
L: longitudinal
MSF: one thousand square feet
MW: molecular weight
NCASI: National Council for Air and Stream Improvement
PF: phenol formaldehyde
PP: ponderosa pine
RM25A: EPA Reference Method 25A
RF: THC analyzer response factor
RM25A: EPA Reference Method 25A
THC: total hydrocarbon
WF: white fir
WPP1 VOC: EPA Interim VOC Measurement Protocol for the Wood Products Industry - July 2007

Appendix B

PotlatchDeltic NSR Regulated Pollutant Emissions Increase Calculations for Kiln No. 6 Project at St. Maries Complex

EPA Region 10 statement: The material presented in this appendix to the statement of basis was created by PotlatchDeltic and submitted to EPA Region 10 on May 8, 2019. The material reflects the applicant's interpretation and implementation of 40 CFR 52.21(a)(2)(iv)(f)'s "hybrid test" to determine the project's emissions increase. The material does not reflect calculations to determine the project's "net emissions increase" because the applicant did not provide that analysis.

PotlatchDeltic - St. Maries - Kiln #6 Project

PSD Applicability Analysis

Regulated Pollutant Emission Summary

Pollutant	Kiln 6 PTE lb/hr	Kiln 6 PTE tpy	CE Boiler Emission Increase tpy	Riley Boiler Emission Increase tpy	BV-2 Emission Increase tpy	BV-3 Emission Increase tpy	BH-2 Emission Increase tpy	BH-3 Emission Increase tpy	BH-4 Emission Increase tpy	BH-5 Emission Increase tpy	BH-10 Emission Increase tpy	BH-11 Emission Increase tpy	CY-2 Emission Increase tpy	DB Emission Increase tpy	CS Emission Increase tpy	MH Emission Increase tpy	PILE Emission Increase tpy	Roadways Emission Increase tpy	Project Increase Total tpy	Project Increase SER tpy
NOx	--	--	4.1	11.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	15	40
CO	--	--	8.9	40.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50	100
SO2	--	--	0.5	1.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	40
PM	0.40	1.7	0.2	0.8	0.012	0.001	0.46	0.41	0.26	0.09	0.66	0.14	0.54	2.4	0.3	0.055	0.04	7.7	16	25
PM10	0.40	1.7	0.2	1.0	0.012	0.001	0.46	0.41	0.26	0.09	0.66	0.14	0.46	0.1	0.0	0.006	0.00	2.1	8	15
PM2.5	0.40	1.7	0.2	0.7	0.012	0.001	0.23	0.21	0.13	0.05	0.33	0.07	0.27	0.01	0.0	0.001	0.00	0.25	4.2	10
VOC	8.4	50.0	0.1	0.4	--	--	--	--	--	--	--	--	--	--	--	12.0	--	--	63	40
Pb	--	--	0.001	0.003	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.004	0.6
H2SO4	--	--	0.02	0.04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.06	7
CO2e	--	--	4,278	12,681	--	--	--	--	--	--	--	--	--	--	--	--	--	--	16,958	75,000

notes:

1 - Significant Emission Rates (SERs). 40 CFR 52.21(b)(23)(i).

For each source evaluated in this PSD applicability analysis, the following pages present additional information regarding baseline actual emission rates, projected actual emission rates, and the emission factors and production values used to generate those emission rates.

PSD Baseline Periods	
NOx	2011-2012
CO	2011-2012
SO2	2011-2012
PM	2012-2013
PM10	2012-2013
PM2.5	2012-2013
VOC	2011-2012
CO2e	2011-2012
Pb	2011-2012
H2SO4	2011-2012

Pollutant	Emission Rate (tpy)					
	Lumber Dry Kiln No. 6[1]	CE & Riley Boilers [2]	Building Vents and Baghouses[2]	Fugitives[2, 3]	Total Increase	PSD SERs[4]
NO_X	--	15.4	0.0	0.0	15	40
CO	--	49.5	0.0	0.0	50	100
SO_2	--	1.9	0.0	0.0	2	40
PM (filterable)	1.7	1.0	2.6	10.5	16	25
PM_{10} (total)	1.7	1.3	2.5	2.1	8	15
$PM_{2.5}$ (total)	1.7	0.9	1.3	0.265	4	10
VOC	50.0	0.5	0.0	12.0	63	40
Lead	--	0.0	0.0	0.0	0.004	0.6
H_2SO_4	--	0.1	0.0	0.0	0.058	7
CO_2e	--	16958.4	0.0	0.0	16958	75,000

Lumber Dry Kiln ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx
Emission factor - other species (lb/mbf dried)	-	*see notes*	*see notes*	*see notes*	*see notes*	-	-

Year	Production Value (mbf dried/year)	Emission Rates (TPY)					
Baseline Actual Emissions		**-**	**0.00**	**0.00**	**0.00**	**0.00**	**-**	**-**
(Years)		-	-	-	-	-	-	-
Projected Actual Emissions	see notes	**-**	**50.0**	**1.7**	**1.7**	**1.7**	**-**	**-**
Change in Emissions (Tons/Year)		***-***	***50.0***	***1.7***	***1.7***	***1.7***	***-***	***-***

Baseline Actual Emissions Notes:

The proposed lumber dry kiln would be a 'new unit' for the purposes of PSD applicability evaluations. Therefore, its baseline actual emission rate is set at 0 tons per year for all pollutants.

Projected Actual Emissions Notes:

The proposed lumber dry kiln would be a 'new unit' for the purposes of PSD applicability evaluations. Therefore, the kiln's projected actual emission rates would be its potential to emit (PTE) for each pollutant. The kiln's annual production capacity changes based on wood species. PotlatchDeltic proposed a 50 tpy VOC limit on the new kiln. Potential particulate matter emissions are also effectively limited through the VOC limit. Potlatch is capable of drying a variety of lumber species, the emission calculations presented here use the maximum throughput of each species and the emission factors associated with each species.

Emission Factor Notes: 245 Dry Kiln Temp (F)

Specie	*Maximum for Each Species (MMbf/yr)*	*PM/PM10/PM2.5 Factors (lb/Mbf)*	*VOC Factors (lb propane/Mbf)*	*PM10 / PM2.5 Emissions (tpy)*	*VOC Emissions (tpy)*
HemFir	*68*	*0.051*	*1.08*	1.74	36.8
				Proposed Limit	***50***

PM/PM10/PM2.5 Emission Factor Detail:

Hemlock/White Fir PM emission factor conservatively based on highest source test value (Dec. 1998 Horizon Engineering Study for Willamette Industries using OSU's kiln).

VOC Emission Factor Detail:

HemFir emissions based on EPA Region 10 Emission Factors December 2012 (>200 F).

CE Boiler ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx	Pb	H2SO4	CO2e
Emission factor (lb/MMlb Steam)	*635*	*8.1*	*15*	*21*	*14*	*33.6*	*290*	0.064	1.6	305,229

Year	Production Value (MMlb Steam/year)	Emission Rates (TPY)									
		CO	**VOC**	**PM2.5**	**PM10**	**PM**	**SO2**	**NOx**	**Pb**	**H2SO4**	**CO2e**
2006	132.7	42.2	0.5	1.0	1.4	0.9	2.2	19.2	0.0043	0.1	20,252
2007	78.9	25.1	0.3	0.6	0.8	0.6	1.3	11.4	0.0025	0.1	12,047
2008	75.1	23.9	0.3	0.6	0.8	0.5	1.3	10.9	0.0024	0.1	11,468
2009	55.6	17.7	0.2	0.4	0.6	0.4	0.9	8.1	0.0018	0.0	8,481
2010	54.8	17.4	0.2	0.4	0.6	0.4	0.9	7.9	0.0018	0.0	8,359
2011	53.1	16.9	0.2	0.4	0.5	0.4	0.9	7.7	0.0017	0.0	8,096
2012	88.2	28.0	0.4	0.7	0.9	0.6	1.5	12.8	0.0028	0.1	13,457
2013	64.9	20.6	0.3	0.5	0.7	0.5	1.1	9.4	0.0021	0.1	9,897
2014	66.6	21.2	0.3	0.5	0.7	0.5	1.1	9.7	0.0021	0.1	10,169
2015	86.9	27.6	0.4	0.6	0.9	0.6	1.5	12.6	0.0028	0.1	13,263
2016	123.2	39.1	0.5	0.9	1.3	0.9	2.1	17.9	0.0040	0.1	18,795
Baseline Actual Emissions		**22.43**	**0.29**	**0.57**	**0.79**	**0.55**	**1.18**	**10.24**	**0.0023**	**0.06**	**10,777**
(Years)		2011-2012	2011-2012	2012-2013	2012-2013	2012-2013	2011-2012	2011-2012	2011-2012	2011-2012	2011-2012
Projected Actual Emissions	98.6	**31.34**	**0.40**	**0.73**	**1.02**	**0.71**	**1.65**	**14.30**	**0.0032**	**0.08**	**15,054**
Change in Emissions (Tons/Year)		***8.90***	***0.11***	***0.16***	***0.23***	***0.16***	***0.47***	***4.06***	***0.0009***	***0.02***	***4,278***
Potential Emissions	307	-	-	**2.28**	-	-	-	-	-	-	-
Change in Emissions (Tons/Year)		-	-	***1.50***	-	-	-	-	-	-	-

Projected Actual Emissions Notes:

Assumed CE Boiler would provide 25 percent of the annual steam necessary for the Dry Kiln no. 6 Project. Steam demand based on potential dry kiln no. 6 throughput and steam demand data for the exsting dry kiln no. 5. Ramboll Environ added the CE Boiler's expected steam demand increase to the boiler's average 2011 - 2012 steam production. Ramboll Environ assumed the CE boiler source test data were representative of past and future boiler operations. See below for additional detail.

- Potential emissions based on continuous maximum boiler operating rate (35 Mlb/hr).

Steam Production Increase Attributable to Project

112.1 MMlb steam/year necessary for project, dry kiln
28.0 MMlb steam/year for project, 25% from CE Boiler

Emission Factor Notes:

All emission factors except SO2, Lead, and H2SO4 based on emission factors from April 2008 CE Boiler source test. SO2 and Lead emission factors from AP-42 Section 1.6, September 2003. Factors in Section 1.6 are provided in lb/MMBtu heat input. Factors converted to lb/MMlb Steam using 1592.16 MMBtu/MMlb Steam as the conversion factor. Detailed conversion factor calculations provided below.

Pollutant	*Original AP-42 Factor*	*Source*
CO:	*635 lb/MMlb Steam*	*February 2016 Boiler MACT Performance Test*
VOC (as propane):	*8.1 lb/MMlb Steam*	*Boiler-specific source test, April 2008.*
PM10:	*21 lb/MMlb Steam*	*Maximum Boiler-specific source test (high load conditions) from April 2008, Feb 2016, and March 2017.*
PM2.5	*14.9 lb/MMlb Steam*	*NCASI TB 1013 indicates 41% of filterable PM from wood-fired boiler with ESP is PM2.5 (PotlatchDeltic, conservatively assumed 60%) from average of April 2008, Feb 2016, and March 2017 testing plus codensable PM.*
PM:	*14 lb/MMlb Steam*	*Maximum Boiler-specific source test (high load conditions) from April 2008, Feb 2016, and March 2017.*
SO2:	*0.025 lb/MMBtu*	*AP-42 Table 1.6-2, Bark/bark and wet wood/wet wood-fired boiler. All potlatchdeltic fuel tests from 2016 indicate sulfur is below detection limits (0.01% by mass, and 0.01 lb SO2/MMBtu).*
NOx:	*290 lb/MMlb Steam*	*Boiler-specific source test, April 2008.*
Lead:	*4.8E-05 lb/MMBtu*	*Table 1.6-4, Bark/bark and wet wood/wet wood-fired boiler.*
H2SO4:	*1.6 lb/MMlb Steam*	*8 percent of PM2.5 emissions, based on BART-recommended PM2.5 / sulfate speciation for hog fuel boilers.*
CO2e:	*305,229 lb/MMlb Steam*	*CO2 based on 2016 Hog Fuel testing during Boiler MACT Peformance Test; CH4, N2O, and Global Warming Potentials (GWPs) from EPA's Mandatory Reporting Rule.*

lb/MMBtu to lb/MMlb Steam Conversion Factor

February 2016 Boiler MACT Performance Testing

34,311 (lb Steam/hr) Average Steam Production
13,512 (dscf/min) Average Exhaust Flow Rate
17,605 (dscf/MMBtu) Average F-Factor from wood fuel testing
1,342 MMBtu/MMlb steam

Riley Boiler ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx	Pb	H2SO4	CO2e
(lb/MMlb Steam from Hog Fuel)	*966*	*9.3*	*7.2*	*10.5*	*8.2*	*33.4*	*270*	*0.064*	*0.8*	*301,607*

Year	Production Value	Emission Rates (TPY)									
	(MMlb Steam/year)	**CO**	**VOC**	**PM2.5**	**PM10**	**PM**	**SO2**	**NOx**	**Pb**	**H2SO4**	**CO2e**
2006	465.8	225.1	2.2	1.7	2.4	1.9	7.8	62.9	0.015	0.2	70,244
2007	531.6	256.9	2.5	1.9	2.8	2.2	8.9	71.8	0.017	0.2	80,174
2008	466.7	225.5	2.2	1.7	2.5	1.9	7.8	63.0	0.015	0.2	70,383
2009	483.1	233.4	2.3	1.7	2.5	2.0	8.1	65.2	0.015	0.2	72,851
2010	559.6	270.4	2.6	2.0	2.9	2.3	9.3	75.6	0.018	0.2	84,396
2011	567.8	274.3	2.6	2.0	3.0	2.3	9.5	76.7	0.018	0.2	85,626
2012	596.6	288.3	2.8	2.2	3.1	2.4	10.0	80.5	0.019	0.3	89,975
2013	337.0	162.8	1.6	1.2	1.8	1.4	5.6	45.5	0.011	0.1	50,819
2014	344.0	166.2	1.6	1.2	1.8	1.4	5.7	46.4	0.011	0.1	51,876
2015	406.3	196.3	1.9	1.5	2.1	1.7	6.8	54.9	0.013	0.2	61,275
2016	514.3	248.5	2.4	1.9	2.7	2.1	8.6	69.4	0.016	0.2	77,558
Baseline Actual Emissions		**281.31**	**2.72**	**1.69**	**2.45**	**1.91**	**9.71**	**78.60**	**0.02**	**0.24**	**87,801**
(Years)		2011-2012	2011-2012	2012-2013	2012-2013	2012-2013	2011-2012	2011-2012	2011-2012	2011-2012	2011-2012
Projected Actual Emissions	666.3	**321.93**	**3.11**	**2.41**	**3.50**	**2.73**	**11.12**	**89.95**	**0.02**	**0.28**	**100,481**
Change in Emissions (Tons/Year)		***40.63***	***0.39***	***0.72***	***1.05***	***0.82***	***1.40***	***11.35***	***0.0027***	***0.04***	***12,681***
Potential Emissions	885	-	-	**3.19**	-	-	-	-	-	-	-
Change in Emissions (Tons/Year)		-	-	***1.53***	-	-	-	-	-	-	-

Projected Actual Emissions Notes:

Assumed Riley Boiler would provide 75 percent of the annual steam necessary for the Dry Kiln no. 6 Project. Steam demand based on potential dry kiln no. 6 throughput and steam demand data for the exsting dry kiln no. 5. Ramboll Environ added the Riley Boiler's expected steam demand increase to the boiler's average 2011 - 2012 steam production. Ramboll Environ assumed the Riley boiler source test data were representative of past and future boiler operations. See below for additional detail.

- Potential emissions based on continuous maximum boiler operating rate (101 Mlb/hr).

Steam Production Increase Attributable to Project

112.1 MMlb steam/year necessary for project, dry kiln
84.1 MMlb steam/year for project, 75% from Riley Boiler

Emission Factor Notes:

All emission factors except SO2, Lead, and H2SO4 based on emission factors derived from May 2008 Riley Boiler source test. SO2 and Lead emission factors are from AP-42 Section 1.6, September 2003. Factors in Section 1.6 are provided in lb/MMBtu heat input. Factors converted to lb/MMlb Steam using 1594.48 MMBtu/MMlb Steam as the conversion factor. Detailed conversion factor calculations provided below.

Pollutant	*Emission Factor*	*Source*
CO:	*966 lb/MMlb Steam*	*February 2016 Boiler MACT Performance Test*
VOC (as propane):	*9.3 lb/MMlb Steam*	*Boiler-specific source test, May 2008.*
PM10:	*10.5 lb/MMlb Steam*	*Maximum Boiler-specific source test (mid and high load conditions) from May 2008, Feb 2016, and March 2017.*
PM2.5	*7.22 lb/MMlb Steam*	*NCASI TB 1013 indicates 41% of filterable PM from wood-fired boiler with ESP is PM2.5 (PotlatchDeltic, conservatively assumed 60%) from average of May 2008, Feb 2016, and March 2017 testing plus condensable PM.*
PM:	*8.2 lb/MMlb Steam*	*Maximum Boiler-specific source test (mid and high load conditions) from May 2008, Feb 2016, and March 2017.*
SO2:	*0.025 lb/MMBtu*	*AP-42 Table 1.6-2, Bark/bark and wet wood/wet wood-fired boiler. All PotlatchDeltic fuel tests from 2016 indicate sulfur is below detection limits (0.01% by mass, and 0.01 lb SO2/MMBtu).*
NOx:	*270 lb/MMlb Steam*	*Boiler-specific source test, May 2008.*
Lead:	*4.8E-05 lb/MMBtu*	*AP42 Table 1.6-4, Bark/bark and wet wood/wet wood-fired boiler.*
H2SO4:	*0.8 lb/MMlb Steam*	*8 percent of PM2.5 emissions, based on BART-recommended PM2.5 / sulfate speciation for hog fuel boilers.*
CO2e:	*301,607 lb/MMlb Steam*	*CO2 based on 2016 Hog Fuel testing during Boiler MACT Peformance Test; CH4, N2O, and Global Warming Potentials (GWPs) from EPA's Mandatory Reporting Rule.*

lb/MMBtu to lb/MMlb Steam Conversion Factor

February 2016 Boiler MACT Performance Testing

90,101 (lb Steam/hr) Average Steam Production
31,648 (dscf/min) Average Exhaust Flow Rate
15,789 (dscf/MMBtu) Average F-Factor from wood fuel testing
1,335 MMBtu/MMlb steam

Building Vents, Sawmill Building ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx
Emission factor (lb/hour of operation)	-	-	*0.05*	*0.05*	*0.05*	-	-

Year	Production Value (hrs of operation/yr)	Emission Rates (TPY)						
2006	4,094	-	-	0.1	0.1	0.1	-	-
2007	4,112	-	-	0.1	0.1	0.1	-	-
2008	3,891	-	-	0.1	0.1	0.1	-	-
2009	3,492	-	-	0.1	0.1	0.1	-	-
2010	4,036	-	-	0.1	0.1	0.1	-	-
2011	3,964	-	-	0.1	0.1	0.1	-	-
2012	4,162	-	-	0.1	0.1	0.1	-	-
2013	4,199	-	-	0.1	0.1	0.1	-	-
2014	4,145	-	-	0.1	0.1	0.1	-	-
2015	4,168	-	-	0.1	0.1	0.1	-	-
2016	4,109	-	-	0.1	0.1	0.1	-	-
Baseline Actual Emissions		**-**	**-**	**0.10**	**0.10**	**0.10**	**-**	**-**
(Years)		-	-	2012-2013	2012-2013	2012-2013	**-**	**-**
Projected Actual Emissions	4,679	**-**	**-**	**0.12**	**0.12**	**0.12**	**-**	**-**
Change in Emissions (Tons/Year)		***-***	***-***	***0.012***	***0.012***	***0.012***	***-***	***-***
Potential Emissions	8,760	**-**	**-**	**0.22**	-	-	-	-
Change in Emissions (Tons/Year)		-	-	***0.11***	-	-	-	-

Projected Actual Emissions Notes:

Existing sawmill cyclone, baghouses, and building vents are similarly not expected to increase annual hours of operation, compared to baseline actual operation. However, to be conservative for the PSD applicability analysis, PD has assumed that annual sawmill operations will increase by 480 hours per year, compared to baseline actual operation.

Emission Factor Notes:

The PM emission factor is based on OSHA testing of the particulate matter concentration in the building, the airspace in the building, and the number of air changes per hour. Detailed conversion calculations provided below.

Pollutant	*Emission Factor Basis*	*Source*
PM:	*1020 ug/m3*	*OSHA Testing (From Table C-1, Note H, in Attachment C to October 1999 Part 71 Application.)*
PM10/PM2.5:	*Assume equivalent to PM emission factor*	

ug/m3 to lb/hr Conversion

Flow Rate:		*Conversions:*	
387,520 cubic feet	*Building volume*	*1,000,000*	*ug/g*
2	*Air changes per hour*	*453.59*	*g/lb*
12,917 cfm	*Total flow rate from building*	*60*	*min/hr*
		0.0283	*m3/ft3*

Building Vents, Boiler Building (BV-3) ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx
Emission factor (lb/hour of operation)	-	-	*0.01*	*0.01*	*0.01*	-	-

Year	Production Value (hrs of operation/yr)	Emission Rates (TPY)						
		CO	**VOC**	**PM2.5**	**PM10**	**PM**	**SO2**	**NOx**
2006	8,568	-	-	0.05	0.05	0.05	-	-
2007	8,616	-	-	0.05	0.05	0.05	-	-
2008	8,540	-	-	0.05	0.05	0.05	-	-
2009	8,544	-	-	0.05	0.05	0.05	-	-
2010	8,544	-	-	0.05	0.05	0.05	-	-
2011	8,544	-	-	0.05	0.05	0.05	-	-
2012	8,676	-	-	0.05	0.05	0.05	-	-
2013	8,560	-	-	0.05	0.05	0.05	-	-
2014	8,640	-	-	0.05	0.05	0.05	-	-
2015	8,640	-	-	0.05	0.05	0.05	-	-
2016	8,588	-	-	0.05	0.05	0.05	-	-
Baseline Actual Emissions		**-**	**-**	**0.05**	**0.05**	**0.05**	-	-
(Years)		-	-	2012-2013	2012-2013	2012-2013	-	-
Projected Actual Emissions	8,712	**-**	**-**	**0.05**	**0.05**	**0.05**	-	-
Change in Emissions (Tons/Year)		-	-	***0.001***	***0.001***	***0.001***	-	-
Potential Emissions	8,760	**-**	**-**	**0.05**	-	-	-	-
Change in Emissions (Tons/Year)		-	-	***0.001***	-	-	-	-

Projected Actual Emissions Notes:

The maximum number of hours recorded for this process (8,712 hrs, 2004).

Emission Factor Notes:

The PM emission factor is based on OSHA testing of the particulate matter concentration in the building, the airspace in the building, and the number of air changes per hour. Detailed conversion calculations provided below.

Pollutant	*Emission Factor Basis*	*Source*
PM:	*1057 ug/m3*	*OSHA Testing (From Table C-1, Note H, in Attachment C to October 1999 Part 71 Application.)*

ug/m3 to lb/hr Conversion

Flow Rate:		*Conversions:*	
90,750 cubic feet	*Building volume*	*1,000,000*	*ug/g*
2	*Air changes per hour*	*453.59*	*g/lb*
3,025 cfm	*Total flow rate from building*	*60*	*min/hr*
		0.0283	*m3/ft3*

BH-2: Planer Baghouse ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx
Emission factor (lb/hour of operation)	-	-	*0.82*	*1.65*	*1.65*	-	-

Year	Production Value (hrs of operation/yr)	Emission Rates (TPY)						
2006	4,000	-	-	1.6	3.3	3.3	-	-
2007	3,888	-	-	1.6	3.2	3.2	-	-
2008	3,647	-	-	1.5	3.0	3.0	-	-
2009	3,553	-	-	1.5	2.9	2.9	-	-
2010	4,077	-	-	1.7	3.4	3.4	-	-
2011	4,101	-	-	1.7	3.4	3.4	-	-
2012	4,394	-	-	1.8	3.6	3.6	-	-
2013	4,552	-	-	1.9	3.7	3.7	-	-
2014	4,155	-	-	1.7	3.4	3.4	-	-
2015	4,258	-	-	1.8	3.5	3.5	-	-
2016	4,077	-	-	1.7	3.4	3.4	-	-
Baseline Actual Emissions		**-**	**-**	**1.84**	**3.68**	**3.68**	-	-
(Years)		-	-	2012-2013	2012-2013	2012-2013	-	-
Projected Actual Emissions	5,032	**-**	**-**	**2.07**	**4.14**	**4.14**	-	-
Change in Emissions (Tons/Year)		-	-	***0.23***	***0.46***	***0.46***	-	-
Potential Emissions	7,488	**-**	**-**	**3.08**	-	-	-	-
Change in Emissions (Tons/Year)		-	-	***1.4***	-	-	-	-

Projected Actual Emissions Notes:

Existing sawmill cyclone, baghouses, and building vents are similarly not expected to increase annual hours of operation, compared to baseline actual operation. However, to be conservative for the PSD applicability analysis, PD has assumed that annual sawmill operations will increase by 480 hours per year, compared to baseline actual operation.

Emission Factor Notes:

The Actual Emissions PM, PM10, and PM2.5 emission factors are based on a June 13, 1996 source tested grain loading and the existing baghouse fan's airflow rating.

Pollutant	*Emission Factor Basis*	*Source*
PM/PM10:	*0.0064 grains/dscf*	*6-13-96 source test (from Table C-1, Note B, in Attachment C of October 1999 Part 71 Permit Application.)*
PM2.5	*0.0032 grains/dscf*	*Conservatively assume 50% of filterable PM from past testing is PM2.5. NCASI Special Report 15-01 indicates that PM2.5 fraction to TSP is 0.46% for wood chips and bark, and EPA's PM Augmentation Tool assumes the PM2.5 fraction of TSP is 0.15% for planning and transferring sawdust/shavings with baghouse controls.*

gr/dscf to lb/hr Conversion

BH-2 Fan Rating

1800 mcf per hour

Conversions:

7,000 gr/lb

1,000 cf/mcf

60 min/hr

BH-3: Trimmer/Chipper Baghouse ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx
Emission factor (lb/hour of operation)	-	-	*0.74*	*1.48*	*1.48*	-	-

Year	Production Value (hrs of operation/yr)	Emission Rates (TPY)						
2006	4,000	-	-	1.5	3.0	3.0	-	-
2007	3,888	-	-	1.4	2.9	2.9	-	-
2008	3,647	-	-	1.4	2.7	2.7	-	-
2009	3,553	-	-	1.3	2.6	2.6	-	-
2010	4,077	-	-	1.5	3.0	3.0	-	-
2011	4,101	-	-	1.5	3.0	3.0	-	-
2012	4,394	-	-	1.6	3.3	3.3	-	-
2013	4,552	-	-	1.7	3.4	3.4	-	-
2014	4,155	-	-	1.5	3.1	3.1	-	-
2015	4,258	-	-	1.6	3.2	3.2	-	-
2016	4,126	-	-	1.5	3.1	3.1	-	-
Baseline Actual Emissions		**-**	**-**	**1.66**	**3.31**	**3.31**	-	-
(Years)		-	-	2012-2013	2012-2013	2012-2013	-	-
Projected Actual Emissions	5,032	**-**	**-**	**1.86**	**3.73**	**3.73**	-	-
Change in Emissions (Tons/Year)		-	-	***0.21***	***0.41***	***0.41***	-	-
Potential Emissions	7,488	**-**	**-**	**2.77**	-	-	-	-
Change in Emissions (Tons/Year)		-	-	***1.2***	-	-	-	-

Projected Actual Emissions Notes:

Existing sawmill cyclone, baghouses, and building vents are similarly not expected to increase annual hours of operation, compared to baseline actual operation. However, to be conservative for the PSD applicability analysis, PD has assumed that annual sawmill operations will increase by 480 hours per year, compared to baseline actual operation.

Emission Factor Notes:

The Actual Emissions PM, PM10, and PM2.5 emission factors are based on a June 13, 1996 source tested grain loading and the existing baghouse fan's airflow rating.

Pollutant	*Emission Factor Basis*	*Source*
PM/PM10:	*0.0064 grains/dscf*	*6-13-96 source test (from Table C-1, Note B, in Attachment C of October 1999 Part 71 Permit Application.)*
PM2.5	*0.0032 grains/dscf*	*Conservatively assume 50% of filterable PM from past testing is PM2.5. NCASI Special Report 15-01 indicates that PM2.5 fraction to TSP is 0.46% for wood chips and bark, and EPA's PM Augmentation Tool assumes the PM2.5 fraction of TSP is 0.15% for planning and transferring sawdust/shavings with baghouse controls.*

gr/dscf to lb/hr Conversion

BH-3 Fan Rating		*Conversions:*	
1620	*mcf per hour*	*7,000 gr/lb*	*60 min/hr*
		1,000 cf/mcf	

BH-4: Plytrim Truck Bin Baghouse ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx
Emission factor (lb/hour of operation)	-	-	*0.16*	*0.33*	*0.33*	-	-

Year	Production Value (hrs of operation/yr)	Emission Rates (TPY)						
2008	4,760	-	-	0.4	0.8	0.8	-	-
2009	3,656	-	-	0.3	0.6	0.6	-	-
2010	4,636	-	-	0.4	0.8	0.8	-	-
2011	4,774	-	-	0.4	0.8	0.8	-	-
2012	3,658	-	-	0.3	0.6	0.6	-	-
2013	3,698	-	-	0.3	0.6	0.6	-	-
2014	3,799	-	-	0.3	0.6	0.6	-	-
2015	4,168	-	-	0.3	0.7	0.7	-	-
2016	4,126	-	-	0.3	0.7	0.7	-	-
Baseline Actual Emissions		**-**	**-**	**0.30**	**0.61**	**0.61**	-	-
(Years)		-	-	2012-2013	2012-2013	2012-2013	-	-
Projected Actual Emissions	5,254	**-**	**-**	**0.43**	**0.86**	**0.86**	-	-
Change in Emissions (Tons/Year)		-	-	***0.13***	***0.26***	***0.26***	-	-
Potential Emissions	7,488	**-**	**-**	**0.62**	-	-	-	-
Change in Emissions (Tons/Year)		-	-	***0.3***	-	-	-	-

Projected Actual Emissions Notes:

Plytrim truck bin handles plywood mill dry waste and chipped trim ends from the planar mill. Hours of operation are primarily due to plywood mill operations; therefore projected actual hours of operation are not anticipated to increase, compared to baseline actual operation, as a result of the Kiln 6 project. However, to be conservative for the PSD applicability analysis, PD has assumed that annual sawmill operations will increase by 480 hours per year, compared to baseline actual operation.

Emission Factor Notes:

The Actual Emissions PM, PM10, and PM2.5 emission factors are based on a June 13, 1996 source tested grain loading and the existing baghouse fan's airflow rating.

Pollutant	*Emission Factor Basis*	*Source*
PM/PM10:	*0.0064 grains/dscf*	*6-13-96 source test (from Table C-1, Note B, in Attachment C of October 1999 Part 71 Permit Application.)*
PM2.5	*0.0032 grains/dscf*	*Conservatively assume 50% of filterable PM from past testing is PM2.5. NCASI Special Report 15-01 indicates that PM2.5 fraction to TSP is 0.46% for wood chips and bark, and EPA's PM Augmentation Tool assumes the PM2.5 fraction of TSP is 0.15% for planning and transferring sawdust/shavings with baghouse controls.*

gr/dscf to lb/hr Conversion

BH-4 Fan Rating		*Conversions:*	
	360 mcf per hour	*7,000 gr/lb*	*60 min/hr*
		1,000 cf/mcf	

BH-5: Planer Shaving Truck Bin Baghouse ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx
Emission factor (lb/hour of operation)	-	-	*0.16*	*0.33*	*0.33*	-	-

Year	Production Value (hrs of operation/yr)	Emission Rates (TPY)						
2006	4,000	-	-	0.3	0.7	0.7	-	-
2007	3,888	-	-	0.3	0.6	0.6	-	-
2008	3,647	-	-	0.3	0.6	0.6	-	-
2009	3,553	-	-	0.3	0.6	0.6	-	-
2010	4,077	-	-	0.3	0.7	0.7	-	-
2011	4,101	-	-	0.3	0.7	0.7	-	-
2012	4,394	-	-	0.4	0.7	0.7	-	-
2013	4,552	-	-	0.4	0.7	0.7	-	-
2014	4,155	-	-	0.3	0.7	0.7	-	-
2015	4,258	-	-	0.4	0.7	0.7	-	-
2016	4,077	-	-	0.3	0.7	0.7	-	-
Baseline Actual Emissions		**-**	**-**	**0.37**	**0.74**	**0.74**	-	-
(Years)		-	-	2012-2013	2012-2013	2012-2013	-	-
Projected Actual Emissions	5,032	**-**	**-**	**0.41**	**0.83**	**0.83**	-	-
Change in Emissions (Tons/Year)		-	-	***0.05***	***0.09***	***0.09***	-	-
Potential Emissions	7,488	**-**	**-**	**0.62**		-	-	-
Change in Emissions (Tons/Year)		-	-	***0.3***	-	-	-	-

Projected Actual Emissions Notes:

Existing sawmill cyclone, baghouses, and building vents are similarly not expected to increase annual hours of operation, compared to baseline actual operation. However, to be conservative for the PSD applicability analysis, PD has assumed that annual sawmill operations will increase by 480 hours per year, compared to baseline actual operation.

Emission Factor Notes:

The Actual Emissions PM, PM10, and PM2.5 emission factors are based on a June 13, 1996 source tested grain loading and the existing baghouse fan's airflow rating.

Pollutant	*Emission Factor Basis*	*Source*
PM/PM10:	*0.0064 grains/dscf*	*6-13-96 source test (from Table C-1, Note B, in Attachment C of October 1999 Part 71 Permit Application.)*
PM2.5	*0.0032 grains/dscf*	*Conservatively assume 50% of filterable PM from past testing is PM2.5. NCASI Special Report 15-01 indicates that PM2.5 fraction to TSP is 0.46% for wood chips and bark, and EPA's PM Augmentation Tool assumes the PM2.5 fraction of TSP is 0.15% for planning and transferring sawdust/shavings with baghouse controls.*

gr/dscf to lb/hr Conversion

BH-5 Exhaust Flowrate

360 mcf per hour

Conversions:

7,000 gr/lb

60 min/hr

1,000 cf/mcf

BH-10: Sawmill Baghouse ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx
2006 - Current emission factor (lb/hour of operation)	-	-	*1.33*	*2.66*	*2.66*	-	-

Year	Production Value (hrs of operation/yr)	Emission Rates (TPY)						
2006	4,094	-	-	2.7	5.4	5.4	-	-
2007	4,112	-	-	2.7	5.5	5.5	-	-
2008	3,891	-	-	2.6	5.2	5.2	-	-
2009	3,492	-	-	2.3	4.6	4.6	-	-
2010	4,036	-	-	2.7	5.4	5.4	-	-
2011	3,964	-	-	2.6	5.3	5.3	-	-
2012	4,162	-	-	2.8	5.5	5.5	-	-
2013	4,199	-	-	2.8	5.6	5.6	-	-
2014	4,145	-	-	2.8	5.5	5.5	-	-
2015	4,168	-	-	2.8	5.5	5.5	-	-
2016	4,109	-	-	2.7	5.5	5.5	-	-
Baseline Actual Emissions		**-**	**-**	**2.78**	**5.55**	**5.55**	-	-
(Years)		-	-	2012-2013	2012-2013	2012-2013	-	-
Projected Actual Emissions	4,679	**-**	**-**	**3.11**	**6.21**	**6.21**	-	-
Change in Emissions (Tons/Year)		-	-	***0.33***	***0.66***	***0.66***	-	-
Potential Emissions	7,488	**-**	**-**	**4.97**	-	-	-	-
Change in Emissions (Tons/Year)		-	-	***2.2***	-	-	-	-

Projected Actual Emissions Notes:

Existing sawmill cyclone, baghouses, and building vents are similarly not expected to increase annual hours of operation, compared to baseline actual operation. However, to be conservative for the PSD applicability analysis, PD has assumed that annual sawmill operations will increase by 480 hours per year, compared to baseline actual operation.

Emission Factor Notes:

The Baseline and Projected Actual Emissions PM, PM10, and PM2.5 emission factors are based on a June 13, 1996 source tested grain loading and the baghouse fan's airflow rating.

Pollutant	*Emission Factor Basis*	*Source*
PM/PM10:	*0.0064 grains/dscf*	*6-13-96 source test (from Table C-1, Note B, in Attachment C of October 1999 Part 71 Permit Application.)*
PM2.5	*0.0032 grains/dscf*	*Conservatively assume 50% of filterable PM from past testing is PM2.5. NCASI Special Report 15-01 indicates that PM2.5 fraction to TSP is 0.46% for wood chips and bark, and EPA's PM Augmentation Tool assumes the PM2.5 fraction of TSP is 0.15% for planning and transferring sawdust/shavings with baghouse controls.*

gr/dscf to lb/hr Conversion

Conversions:

2006 and current BH-10 Fan Design Rating — *48,418 cfm*

7,000 gr/lb
1,000 cf/mcf
60 min/hr

BH-11: Sawdust Bin Baghouse ('Dry Kiln #6 Project')

		CO	VOC	PM2.5	PM10	PM	SO2	NOx
Emission factor (lb/hour of operation)		-	-	*0.29*	*0.58*	*0.58*	-	-

Year	Production Value (hrs of operation/yr)	Emission Rates (TPY)						
2006	4,094	-	-	0.6	1.2	1.2	-	-
2007	4,112	-	-	0.6	1.2	1.2	-	-
2008	3,891	-	-	0.6	1.1	1.1	-	-
2009	3,492	-	-	0.5	1.0	1.0	-	-
2010	4,036	-	-	0.6	1.2	1.2	-	-
2011	3,964	-	-	0.6	1.2	1.2	-	-
2012	4,162	-	-	0.6	1.2	1.2	-	-
2013	4,199	-	-	0.6	1.2	1.2	-	-
2014	4,145	-	-	0.6	1.2	1.2	-	-
2015	4,168	-	-	0.6	1.2	1.2	-	-
2016	4,109	-	-	0.6	1.2	1.2	-	-
Baseline Actual Emissions		**-**	**-**	**0.61**	**1.22**	**1.22**	-	-
(Years)		-	-	2012-2013	2012-2013	2012-2013	-	-
Projected Actual Emissions	4,679	**-**	**-**	**0.68**	**1.36**	**1.36**	-	-
Change in Emissions (Tons/Year)		-	-	***0.07***	***0.14***	***0.14***	-	-
Potential Emissions	7,488	**-**	**-**	**1.09**	-	-	-	-
Change in Emissions (Tons/Year)		-	-	***0.5***	-	-	-	-

Projected Actual Emissions Notes:

Existing sawmill cyclone, baghouses, and building vents are similarly not expected to increase annual hours of operation, compared to baseline actual operation. However, to be conservative for the PSD applicability analysis, PD has assumed that annual sawmill operations will increase by 480 hours per year, compared to baseline actual operation.

Emission Factor Notes:

The Baseline and Projected Actual Emissions PM, PM10, and PM2.5 emission factors are based on a June 13, 1996 source tested grain loading and the baghouse fan's airflow rating.

Pollutant	*Emission Factor Basis*	*Source*
PM/PM10:	*0.0064 grains/dscf*	*6-13-96 source test (from Table C-1, Note B, in Attachment C of October 1999 Part 71 Permit Application.)*
PM2.5	*0.0032 grains/dscf*	*Conservatively assume 50% of filterable PM from past testing is PM2.5. NCASI Special Report 15-01 indicates that PM2.5 fraction to TSP is 0.46% for wood chips and bark, and EPA's PM Augmentation Tool assumes the PM2.5 fraction of TSP is 0.15% for planning and transferring sawdust/shavings with baghouse controls.*

gr/dscf to lb/hr Conversion

Conversions:

BH-11 Fan Design Rating — *10,600 cfm*

7,000 gr/lb — *60 min/hr*

1,000 cf/mcf

CY-2: Chip Bin Cyclone ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx
Emission factor (lb/hour of operation)	-	-	*1.09*	*1.86*	*2.19*	-	-

Year	Production Value (hrs of operation/yr)	Emission Rates (TPY)						
2006	4,094	-	-	2.2	3.8	4.5	-	-
2007	4,112	-	-	2.2	3.8	4.5	-	-
2008	3,891	-	-	2.1	3.6	4.3	-	-
2009	3,492	-	-	1.9	3.2	3.8	-	-
2010	4,036	-	-	2.2	3.7	4.4	-	-
2011	3,964	-	-	2.2	3.7	4.3	-	-
2012	4,162	-	-	2.3	3.9	4.5	-	-
2013	4,199	-	-	2.3	3.9	4.6	-	-
2014	4,145	-	-	2.3	3.9	4.5	-	-
2015	4,168	-	-	2.3	3.9	4.6	-	-
2016	4,109	-	-	2.2	3.8	4.5	-	-
Baseline Actual Emissions		**-**	**-**	**2.28**	**3.88**	**4.57**	-	-
(Years)		-	-	2012-2013	2012-2013	2012-2013	-	-
Projected Actual Emissions	4,679	**-**	**-**	**2.56**	**4.35**	**5.11**	-	-
Change in Emissions (Tons/Year)		-	-	***0.27***	***0.46***	***0.54***	-	-
Potential Emissions	7,488	**-**	**-**	**4.09**	-	-	-	-
Change in Emissions (Tons/Year)		-	-	***1.8***	-	-	-	-

Projected Actual Emissions Notes:

Existing sawmill cyclone, baghouses, and building vents are similarly not expected to increase annual hours of operation, compared to baseline actual operation. However, to be conservative for the PSD applicability analysis, PD has assumed that annual sawmill operations will increase by 480 hours per year, compared to baseline actual operation.

Emission Factor Notes:

The Baseline and Projected Actual Emissions PM, PM10, and PM2.5 emission factors are based on a June 13, 1996 source tested grain loading and the baghouse fan's airflow rating.

Pollutant	*Emission Factor Basis*	*Source*
PM	*0.030 grains/dscf*	*AP-42 4th Ed, Section 10.4.1 (2/80) (from Table C-1, Note I, in Attachment C of Part 71 application*
PM10	*0.026 grains/dscf*	*Based on EPA guidance, assume PM10 is 85% of PM and PM2.5 is 50% of PM.*
PM2.5	*0.015 grains/dscf*	

gr/dscf to lb/hr Conversion

CY-2 Fan Design Rating
8,500 cfm

Conversions:
7,000 gr/lb
1,000 cf/mcf
60 min/hr

DB: Fugitives from Debarking ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx
Emission Factor (lb/mbf)	-	-	*0.000*	*0.002*	*0.066*	-	-

Year	Production Value (mbf/yr)	Emission Rates (TPY)						
2008	116,217	-	-	0.02	0.1	3.8	-	-
2009	125,363	-	-	0.02	0.1	4.1	-	-
2010	147,612	-	-	0.02	0.1	4.9	-	-
2011	163,678	-	-	0.02	0.1	5.4	-	-
2012	175,939	-	-	0.03	0.2	5.8	-	-
2013	176,622	-	-	0.03	0.2	5.8	-	-
2014	176,775	-	-	0.03	0.2	5.8	-	-
2015	178,366	-	-	0.03	0.2	5.9	-	-
2016	180,510	-	-	0.03	0.2	5.9	-	-
Baseline Actual Emissions		**-**	**-**	**0.03**	**0.16**	**5.80**	-	-
(Years)		-	-	2012-2013	2012-2013	2012-2013	-	-
Projected Actual Emissions	248,643	**-**	**-**	**0.04**	**0.22**	**8.18**	-	-
Change in Emissions (Tons/Year)		-	-	***0.01***	***0.06***	***2.38***	-	-
Potential Emissions	285,267	**-**	**-**	**0.04**	-	-	-	-
Change in Emissions (Tons/Year)		-	-	***0.02***	-	-	-	-

Projected Actual Emissions Notes:

Based on increasing sawmill throughput by capacity of Kiln 6 (average from drying varous wood species, 84,560 mbf/yr).

Emission Factor Notes:

Pollutant	*Emission Factor Basis*	*Source*
PM (Filt.)	*0.066 lb/mbf*	*PM emission factor based on May 2014 EPA Region 10 memo on PM emission factors for sawmills. Coverted 0.024 lb PM/ton log to lb PM/mbf based log density (lb/ft^3) and lumber recovery factor (bf / ft^3 log input).*
PM10 (Filt. & Cond.)	*0.002 lb/mbf*	*PM10 based on 2.7% of PM, NCASI Special Report 15-01, Table 5.18*
PM2.5 (Filt.& Cond.)	*0.0003 lb/mbf*	*PM2.5 based on 0.46% of PM, NCASI Special Report 15-01, Table 5.18*

EPA Region 10 Emission Factor for debarking

0.024 lb PM/ton log

Wood Specie	*Log Density(lb/ft^3)*	*Lumber Re*	*lb PM/mbf*
Grand Fir	*46*	*7.81*	*0.071*
Ponderosa Pine	*45*	*7.81*	*0.069*
Douglas Fir	*38*	*7.81*	*0.058*
Hemlock	*41*	*7.81*	*0.063*
Larch	*48*	*7.81*	*0.074*
ESLP	*39*	*7.81*	*0.060*
		average	*0.066*

Log Density from http://www.engineeringtoolbox.com/weigt-wood-d_821.html
Recevery Factors from Trends in Lumber Processing in the Western United States (Keegan et al. Forest Products Society 2010).

CS: Fugitives from Cut-Off Saws ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx
Emission Factor (lb/mbf)	-	-	*0.000*	*0.000*	*0.010*	-	-

Year	Production Value (mbf/yr)	Emission Rates (TPY)						
2008	116,217	-	-	0.0	0.0	0.6	-	-
2009	125,363	-	-	0.0	0.0	0.6	-	-
2010	147,612	-	-	0.0	0.0	0.7	-	-
2011	163,678	-	-	0.0	0.0	0.8	-	-
2012	175,939	-	-	0.0	0.0	0.8	-	-
2013	176,622	-	-	0.0	0.0	0.8	-	-
2014	176,775	-	-	0.0	0.0	0.8	-	-
2015	178,366	-	-	0.0	0.0	0.9	-	-
2016	180,510	-	-	0.0	0.0	0.9	-	-
Baseline Actual Emissions		**-**	**-**	**0.00**	**0.02**	**0.85**	-	-
(Years)		-	-	2012-2013	2012-2013	2012-2013	-	-
Projected Actual Emissions	248,643	**-**	**-**	**0.01**	**0.03**	**1.19**	-	-
Change in Emissions (Tons/Year)		-	-	***0.0016***	***0.01***	***0.35***	-	-
Potential Emissions	285,267	**-**	**-**	**0.01**	-	-	-	-
Change in Emissions (Tons/Year)		-	-	***0.002***	-	-	-	-

Projected Actual Emissions Notes:

Based on increasing sawmill throughput by capacity of Kiln 6 (average from drying varous wood species, 84,560 mbf/yr).

Emission Factor Notes:

Pollutant	*Emission Factor Basis*	*Source*
PM (Filt.)	*0.010 lb/mbf*	*PM emission factor based on May 2014 EPA Region 10 memo on PM emission factors for sawmills. Coverted 1% of the 0.35 lb PM/ton log to lb PM/mbf based log density (lb/ft^3) and lumber recovery factor (bf / ft^3 log input).*
PM10 (Filt. & Cond.)	*0.00026 lb/mbf*	*PM10 based on 2.7% of PM, NCASI Special Report 15-01, Table 5.18*
PM2.5 (Filt.& Cond.)	*0.00004 lb/mbf*	*PM2.5 based on 0.46% of PM, NCASI Special Report 15-01, Table 5.18*

Based on 1% of EPA Region 10 Emission Factor for sawing, fugitive emissions from bucking/cut-off saw operation is negligable.

0.004 lb PM/ton log

Wood Specie	*Log Density(lb/ft^3)*	*Lumber Re*	*lb PM/mbf*
Grand Fir	*46*	*7.81*	*0.010*
Ponderosa Pine	*45*	*7.81*	*0.010*
Douglas Fir	*38*	*7.81*	*0.009*
Hemlock	*41*	*7.81*	*0.009*
Larch	*48*	*7.81*	*0.011*
ESLP	*39*	*7.81*	*0.009*
		average	*0.010*

Log Density from http://www.engineeringtoolbox.com/weigt-wood-d_821.html
Recevery Factors from Trends in Lumber Processing in the Western United States (Keegan et al. Forest Products Society 2010).

MH: Fugitives from Material Handling ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx
Emission Factor (lb/BDT) - Wet Material Drop (Chips)	-	*0.18*	*0.00000*	*0.00002*	*0.00075*	-	-
Emission Factor (lb/BDT) - Wet Material Drop (Sawdust)	-	*0.24*	*0.00000*	*0.00002*	*0.00075*	-	-
Emission Factor (lb/BDT) - Dry Material Drop (Shavings)	-	*0.23*	*0.00010*	*0.00070*	*0.0015*	-	-

Year	**Dried Lumber**	**Material Loaded into Trucks (BDT/yr)**				**Hog Fuel Bin**	**Emission Rates (TPY)**						
	(mbf/yr)	**Wood Chips**	**Sawdust**	**Shavings**	**Hog Fuel**	**BDT/yr**	CO	VOC	PM2.5	PM10	PM	SO2	NOx
2011	163,678	86,183	16,674	18,580	0	73,420	-	18.1	0.001	0.008	0.080	-	-
2012	175,939	95,017	16,873	16,824	0	81,281	-	19.4	0.001	0.008	0.085	-	-
2013	176,622	91,826	22,032	18,419	0	47,826	-	17.0	0.001	0.008	0.074	-	-
2014	176,775	93,526	21,900	16,118	21,526	48,876	-	18.9	0.001	0.008	0.082	-	-
2015	178,366	95,506	19,287	13,421	19,099	58,776	-	19.1	0.001	0.007	0.082	-	-
2016	180,510	88,168	20,990	13,326	4,553	76,071	-	18.9	0.001	0.007	0.081	-	-
Emissions							**-**	**18.8**	**0.001**	**0.008**	**0.080**	-	-
(Years)							-	2011-2012	2012-2013	2012-2013	2012-2013	-	-
Projected Actual Emissions	265,425	143,344	33,109	30,130	32,321	90,794	**-**	**30.8**	**0.002**	**0.01**	**0.13**	-	-
Change in Emissions (Tons/Year)							-	***12.0***	***0.001***	***0.006***	***0.055***	-	-
Potential Emissions	381,960	206,280	47,646	43,358	46,512	176,459	-	-	**0.0030**	-	-	-	-
Change in Emissions (Tons/Year)							-	-	***0.002***	-	-	-	-

Projected Actual Emissions Notes:

Scaled up past actual wood chip, sawdust, and shaving shipments by the increased sawmill throughput by capacity of Kiln 6 (average from drying varous wood species, 84,560 mbf/yr).

Past actual and projected actual hog fuel bin handling emissions based on wood chip emission factors, annual steam production from Riley and CE boilers, boiler efficiency estimates (lb fuel / lb steam) from 2016 source testing.

Note: Wood Chips, Sawdust, and Hog Fuel are wet materials; and planer shavings are dry materials.

Emission Factor Notes:

Pollutant	*Emission Factor Basis*	*Source*
PM (Filt.)	*0.00075 lb/BDT*	*PM emission factors based on May 2014 EPA Region 10 memo on PM emission factors for sawmills for wet drop.*
PM10 (Filt. & Cond.)	*0.00002 lb/BDT*	*PM10 based on 2.7% of PM, NCASI Special Report 15-01, Table 5.18*
PM2.5 (Filt.& Cond.)	*0.000003 lb/BDT*	*PM2.5 based on 0.46% of PM, NCASI Special Report 15-01, Table 5.18*
PM (Filt.)	*0.00150 lb/BDT*	
PM10 (Filt. & Cond.)	*0.00070 lb/BDT*	
PM2.5 (Filt.& Cond.)	*0.00010 lb/BDT*	*PM emission factors based on May 2014 EPA Region 10 memo on PM emission factors for sawmills for dry material drop.*
VOC (as Propane)	*0.18 lb/BDT*	*Average chipping emission factor from NCASI TB723 (average Douglas Fir fall, Douglas Fir Spring, and Ponderosa Pine fall)*
VOC (as Propane)	*0.24 lb/BDT*	*Average sawdust emission factor from NCASI TB723 (average Douglas Fir fall, Douglas Fir Spring, and Ponderosa Pine chipping EF)*
VOC (as Propane)	*0.23 lb/BDT*	*Average planing emission factor from NCASI TB723 (average Douglas Fir fall, Douglas Fir Spring, and Ponderosa Pine chipping EF)*

PILE: Fugitives from Hog Fuel Pile ('Dry Kiln #6 Project')

	CO	VOC	PM2.5	PM10	PM	SO2	NOx
Emission Factor (ton/acre-yr) - Hog Fuel Pile	-	-	*0.00175*	*0.01026*	*0.38000*	-	-

Year	**Dried Lumber (mbf/yr)**	**Hog Fuel Pile (acres)**	**Emission Rates (TPY)**						
2008	116,217	0.2	-	-	0.0003	0.002	0.08	-	-
2009	125,363	0.2	-	-	0.0003	0.002	0.08	-	-
2010	147,612	0.2	-	-	0.0003	0.002	0.08	-	-
2011	163,678	0.2	-	-	0.0003	0.002	0.08	-	-
2012	175,939	0.2	-	-	0.0003	0.002	0.08	-	-
2013	176,622	0.2	-	-	0.0003	0.002	0.08	-	-
2014	176,775	0.2	-	-	0.0003	0.002	0.08	-	-
2015	178,366	0.2	-	-	0.0003	0.002	0.08	-	-
2016	180,510	0.2	-	-	0.0003	0.002	0.08	-	-
Emissions			**-**	**-**	**0.0003**	**0.002**	**0.08**	-	-
(Years)			-	-	2012-2013	2012-2013	2012-2013	-	-
Projected Actual Emissions	248,643	0.3	**-**	**-**	**0.0005**	**0.003**	**0.12**	-	-
Change in Emissions (Tons/Year)			-	-	***0.0002***	***0.001***	***0.04***	-	-
Potential Emissions	285,267	**0.3**	-	-	**0.0006**	**-**	**-**	**-**	**-**
Change in Emissions (Tons/Year)		-	-	-	***0.0003***	-	-	-	-

Projected Actual Emissions Notes:

PotlatchDeltic maintains a small hog fuel pile southeast of the primary hog fuel silo. Only excess hog fuel is stored outside. PotlatchDeltic has conservatively scaled up the hog fuel pile area by the increased sawmill throughput by capacity of Kiln 6 (average from drying varous wood species, 84,560 mbf/yr).

Note: The hog fuel is a wet material (~50% moisture) and fugitive emissions are negligable.

Emission Factor Notes:

Pollutant	*Emission Factor Basis*	
PM (Filt.)	*0.38 ton/acre-yr*	*PM emission factors based on May 2014 EPA Region 10 memo on PM emission factors for sawmills for piles.*
PM10 (Filt. & Cond.)	*0.010 ton/acre-yr*	*PM10 based on 2.7% of PM, NCASI Special Report 15-01, Table 5.18*
PM2.5 (Filt.& Cond.)	*0.002 ton/acre-yr*	*PM2.5 based on 0.46% of PM, NCASI Special Report 15-01, Table 5.18*

PT: Fugitives from Sawmill Plant Traffic ('Dry Kiln #6 Project')

Year	Production Value (hours/yr)	CO	VOC	PM2.5	PM10	PM	SO2	NOx
		-	-	-	-	-	-	-
		Emission Rates (TPY)						
2006	4,094	-	-	2.1	16.9	63.0	-	-
2007	4,112	-	-	2.1	16.9	63.3	-	-
2008	3,891	-	-	2.0	16.0	59.9	-	-
2009	3,492	-	-	1.8	14.4	53.8	-	-
2010	4,036	-	-	2.0	16.6	62.1	-	-
2011	3,964	-	-	2.0	16.3	61.0	-	-
2012	4,162	-	-	2.1	17.1	64.1	-	-
2013	4,199	-	-	2.1	17.3	64.7	-	-
2014	4,145	-	-	2.1	17.1	63.8	-	-
2015	4,168	-	-	2.1	17.2	64.2	-	-
2016	4,109	-	-	2.1	16.9	63.3	-	-
Baseline Actual Emissions		**-**	**-**	**2.11**	**17.21**	**64.37**	**-**	**-**
(Years)		-	-	2012-2013	2012-2013	2012-2013	-	-
Projected Actual Emissions	4,679	-	-	2.4	19.3	72.1	-	-
Change in Emissions (Tons/Year)		-	-	***0.25***	***2.05***	***7.68***	-	-
Potential Emissions	7,488	**-**	**-**	**2.52**	-	-	-	-
Change in Emissions (Tons/Year)		-	-	***0.43***	-	-	-	-

Projected Actual Emissions Notes:

Increases in fugitive dust from roadway traffice is expected to be minimial as a result of the project. PD currently trucks green lumber to Stimson Lumber Company and PD Lumber Drying Division for drying. The dried lumber is then trucked to the Complex for planing. It is likely there will be no change in fugitive emissions from plant traffic, as the decrease in on-site truck traffic associated with delivering and returning lumber to and from the Stimson Lumber Company and the Lumber Drying Division, will be balanced by additional on-site vehicle operations associated with the additional 480 hours per year of operation. The PSD applicability analysis assumes that projected annual fugitive roadway dust emissions will be similar to maximum annual emissions from the baseline period.

PAVED AREAS

From AP-42 13.2.1

number of days with more than 0.01 in of rain =	129	
Reduction factor for unpaved surfaces =	0.65	
Control Efficiency for sweeping and watering paved areas =	75%	Ref: Reasonably Available Control Measures for Fugitive Dust Sources (Sept. 1980), Table 2.1.1-3.

The following equation may be used to estimate the dust emissions from a ***paved*** road.

$$E = k\,(sL)^{0.91}(W)^{1.02}\left(1-\frac{P}{4*365}\right)$$

k = base emission factor for particulate size range
sL = road surface silt loading (grams per square meter)
W = average weight (tons) of the vehicles traveling the road
P = number of days in year with at least 0.01 in of precipitation

Tabulated data for k values

Size Range	Multiplier (k)		
	g/VKT	g/VMT	lb/VMT
PM-2.5	0.15	0.25	0.00054
PM-10	0.62	1	0.0022
PM-15	0.77	1.23	0.0027
PM-30	3.23	5.24	0.011

UNITS

g/VKT	grams per vehicle kilometer traveled
g/VMT	grams per vehicle mile traveled
lb/VMT	pounds per vehicle mile traveled

Values being used to calculate emission factor E:

	PM2.5	PM10	PM30	
sL =	9.700	9.700	9.700	(g/m^2)
k =	0.00054	0.0022	0.011	(lb/Vehicle Mile Traveled)

Equipment	W (tons)	E (lbs/mile) $PM_{2.5}$	E (lbs/mile) PM_{10}	E (lbs/mile) TSP	Total Vehicles Miles for Vehicles of this type Per Day	Emissions (lb/day) $PM_{2.5}$	Emissions (lb/day) PM_{10}	Emissions (lb/day) TSP
966 Bucket Loader	35	0.15	0.60	2.98	0.0	0.00	0.00	0.00
980 Wheel Loader	35	0.15	0.60	2.98	0.0	0.00	0.00	0.00
988 Wheel Loader	56	0.24	0.96	4.81	0.0	0.00	0.00	0.00
Letoum Log Stacker (lg)	100	0.43	1.74	8.69	0.0	0.00	0.00	0.00
Letoum Log Stacker (sm)	70	0.30	1.21	6.04	0.0	0.00	0.00	0.00

PT: Fugitives from Sawmill Plant Traffic ('Dry Kiln #6 Project')

Dump Trucks	30	0.12	0.51	2.55	21.0	2.62	10.69	53.46
Log Trucks	40	0.17	0.68	3.41	68.3	11.44	46.60	233.02
By-Product Trucks	40	0.17	0.68	3.41	27.3	4.58	18.64	93.21
Lumber Trucks	40	0.17	0.68	3.41	9.0	1.51	6.15	30.73
Plywood Trucks	40	0.17	0.68	3.41	0.0	0.00	0.00	0.00

- Except for lumber trucks, vehicle trips reduced by 30%, and plywood trucks to zero in order to estimate emissions from only the sawmill operations.

UNPAVED AREAS

The following information was found in AP-42 Chapter 13.2.2

57% Control Efficiency for reducing speed limit to 15 mph, with electronic radar. WRAP Fugitive Dust Handbook, Table 3-7.

50% Control Efficiency for watering unpaved areas (overhead sprinklers & water trucks). AP-42 13.2.2 and WRAP Fugitive Dust Handbook Chapter 6 note that a small increase in moisture content of results in up to 75% control. PotlatchDeltic conservatively uses 50% control for watering.

79% Combined Control Efficiency for unpaved roadways

The following expression may be used to calculate the particulate emissions (lb) from an ***unpaved*** road, per vehicle mile traveled

$$E = k\,(s/_{12})^{a}(W/_{3})^{b} - ((365\text{-}P)/365)$$

E = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (ton)
M = surface material moisture content (%)
P = number of days in year with at least 0.01 in of precipitation

a, b, k = empirical constants

For Loaders, Stackers, Letournous, Dump Trucks, Log Trucks, By-Product Trucks

	PM2.5	PM_{10}	TSP	
s =	8.4	8.4	8.4	
a =	0.9	0.9	0.7	
b =	0.45	0.45	0.45	
k =	0.15	1.5	4.9	(lb/VMT)

		E (lb/mile)			Total Vehicles Miles for Vehicles of this type	Emissions (lb/day)		
Equipment	W (tons)	PM2.5	PM_{10}	TSP	Per Day	PM2.5	PM_{10}	TSP
966 Bucket Loader	35	0.21	2.13	7.46	39.2	8.33	83.31	292.28
980 Wheel Loader	35	0.21	2.13	7.46	39.2	8.33	83.31	292.28
988 Wheel Loader	56	0.26	2.63	9.21	14.0	3.68	36.76	128.97
Letoum Log Stacker (lg)	100	0.34	3.41	11.96	39.2	13.36	133.62	468.78
Letoum Log Stacker (sm)	70	0.29	2.90	10.19	39.2	11.38	113.81	399.26
Dump Trucks	30	0.20	1.98	6.96	4.2	0.83	8.33	29.22
Log Trucks	40	0.23	2.26	7.92	13.7	3.08	30.81	108.08
By-Product Trucks	40	0.23	2.26	7.92	9.1	2.05	20.54	72.05
Lumber Trucks	40	0.23	2.26	7.92	3.0	0.68	6.77	23.75
Plywood Trucks	40	0.23	2.26	7.92	0.0	0.00	0.00	0.00

- Except for lumber trucks, vehicle trips reduced by 30%, and plywood trucks to zero in order to estimate emissions from only the sawmill operations.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 155
Seattle, WA 98101-3188

AIR & RADIATION
DIVISION

MEMORANDUM

SUBJECT: **Potlatch Kiln 6 Tribal Minor NSR Permit Application Review: Air Quality Impact Analysis**

FROM: Jay McAlpine, Regional Air Permit Modeler

TO: Doug Hardesty, Permit Review Lead

This memorandum is a summary of findings from the review of the Tribal Minor New Source Review (TMNSR) permit application for the PotlatchDeltic Corporation (PLC) St. Maries Facility Kiln 6 project. This review focused on all aspects of the air quality impact analysis (AQIA) used for the TMNSR permit application. The following documents were reviewed:

a) St. Maries Complex Kiln 6 Project New Source Review Application dated Nov. 13, 2017, hereafter referred to as "the Application." The application included the original air quality impact assessment and associated modeling input, output, and pre-processing files.
b) St. Maries Complex Kiln 6 Project Permit Application Incompleteness Response Letter dated Feb. 1, 2018, hereafter referred to as the "Response Letter." A revised cumulative $PM_{2.5}$ modeling analysis was included in the Response Letter.
c) The August 17, 2018 letter from Mark Benson, Director of PLC, to EPA Region 10 Office of Air and Waste Director Tim Hamlin, hereafter referred to as the "Benson Letter." Attachment 4 of the letter contained a revised cumulative $PM_{2.5}$ modeling analysis, hereafter referred to as the "revised AQIA."
d) The *May 2019 Updated Cumulative PM2.5 Modeling Analysis for Kiln No. 6 Permit Application* report provided to EPA Region 10 on May 14, 2019 and accompanying calculations spreadsheet and modeling files.

1. PROJECT OVERVIEW

PLC owns and operates a lumber and plywood mill in St. Maries, Idaho. PLC has submitted an air permit application for the construction of a new kiln (Kiln 6). The PLC facility is an existing major source of air pollutants. Potential emission increases of NO_x, CO, PM_{10}, and $PM_{2.5}$ attributable to the project trigger minor NSR review. Annual emission increases of these pollutants exceed the Minor NSR thresholds for attainment areas specified in Table 1 of 40 CFR Part 49.156.

Table 1 includes a summary of criteria pollutant emission increases associated with the project. The emissions summary was reported in the Response Letter. VOC emissions exceed the PSD SER. An ozone source impact analysis was conducted as part of the PSD application and is reviewed in the separate PSD AQIA memorandum. NO_x, CO, PM_{10}, and $PM_{2.5}$ emissions exceed the threshold for TMNSR.

Table 1. PSD and Tribal Minor NSR applicability.

Pollutant	Total Increase	PSD SERs	Tribal mNSR thresholds for attainment areas
NO_x	26	40	10
CO	85	100	10
SO_2	3	40	10
PM	19	25	10
PM_{10}	8	15	5
$PM_{2.5}$	5	10	3
VOC	122	40	5

2. AIR QUALITY IMPACT ANALYSIS REQUIREMENTS

The applicant is required to conduct an AQIA under TMNSR only when requested by the reviewing authority, as directed in 40 CFR Part 49.151(e)(4) which specifies:

"The reviewing authority may require you to submit an Air Quality Impact Analysis (AQIA) if it has reason to be concerned that the construction of your minor source or modification would cause or contribute to a NAAQS or PSD increment violation."

After consulting with the Idaho Dept. of Environmental Quality (IDEQ) and the EPA Region 10 Air Planning Unit, it was evident significant concern regarding high $PM_{2.5}$ concentrations in the St. Maries community justified the need for an AQIA of $PM_{2.5}$ emissions. In pre-application discussions and in the preliminary modeling protocol review, EPA Region 10 indicated an AQIA for primary $PM_{2.5}$ would be required for this application, in accordance with 40 CFR Part 49.151(e)(4). We did not request review of secondary $PM_{2.5}$ because NO_x and SO_2 emissions were below the SERs, and as a result, the contribution from secondary impacts was deemed to be negligible[1]. As specified in 40 CFR 51.166(b)(49)(*b*)(4), VOC is presumed to not be a significant precursor to $PM_{2.5}$ in an attainment area and assessment of VOC contribution to $PM_{2.5}$ formation is not required under attainment NSR.

EPA Region 10 applied the Northwest-AirQuest criteria pollutant design value lookup tool[2] to examine the regional background concentrations in the St. Maries area. The information was used to gauge the need to assess air quality impacts of NO_x, CO, and PM_{10} emissions associated with the project. The values, listed in **Table 2**, are derived from air quality monitoring and modeling results using the 3-year AIRPACT 2009-2011 modeling run. The AIRPACT model is a CMAQ photochemical transport model operated by the NW-Airquest modeling consortium. The online tool provides the design values for a grid model cell upon user request. EPA Region 10 concluded the design values for St. Maries provide sufficient evidence to support a decision to not require AQIA for NO_2, CO, and PM_{10} as part of the TMNSR review of the project. These values are well below the respective NAAQS.

[1] Secondary $PM_{2.5}$ impacts need not be assessed if NO_x and SO_2 emissions are below the SERs as recommended by the EPA in *Guidance for $PM_{2.5}$ Permit Modeling*, EPA-454/B-14-001, May 2014.
[2] http://lar.wsu.edu/nw-airquest/

Table 2. NW-Airquest design values for St. Maries, Idaho.

Pollutant	Averaging Period	NW-AIRQUEST design value	NAAQS	Fraction of NAAQS
NO_2	1-hour	6.8 ppb	100.0 ppb	7 %
	Annual	0.8 ppb	53.0 ppb	2 %
CO	1-hour	1.3 ppm	35.0 ppm	4 %
	8-hour	0.8 ppm	9.0 ppm	9 %
$PM_{2.5}$[a]	24-hour	22 μg/m^3	35 μg/m^3	63 %
	Annual	6.9 μg/m^3	12 μg/m^3	58 %
PM_{10}	24-hour	65 μg/m^3	150 μg/m^3	43 %

[a]Note, the St. Maries monitor design background concentrations were assessed in place of the NW-Airquest values in the assessment of $PM_{2.5}$ NAAQS exceedance concern.

An AQIA for primary $PM_{2.5}$ was requested by EPA Region 10 in accordance with 40 CFR Part 49.151(e)(4) and 49.154(d)(1). The AQIA must be conducted in accordance with 40 CFR Part 51, Appendix W, the Guideline on Air Quality Models ("the *Guideline*"), as specified in 40 CFR 49.154 (d)(2). The $PM_{2.5}$ AQIA was required specifically to assess impacts in the immediate vicinity of St. Maries, where an IDEQ air quality monitor has recently measured high background concentrations of $PM_{2.5}$. If the AQIA reveals a violation of an air quality standard, a permit can only be issued if the impacts can be mitigated. These requirements are specified in 40 CFR Part 49.154:

40 CFR Part 49.154 (d) When may the reviewing authority require an air quality impacts analysis (AQIA)? Paragraphs (d)(1) through (3) of this section govern AQIA requirements under this program.
(1) If the reviewing authority has reason to be concerned that the construction of your minor source or modification would cause or contribute to a NAAQS or PSD increment violation, it may require you to conduct and submit an AQIA.
(2) If required, you must conduct the AQIA using the dispersion models and procedures of part 51, Appendix W of this chapter.
(3) If the AQIA reveals that construction of your source or modification would cause or contribute to a NAAQS or PSD increment violation, the reviewing authority must require you to reduce or mitigate such impacts before it can issue you a permit.

The requirements for the assessment of primary particulate matter are described in Section 4.0 of the *Guideline*. Assessment of local primary $PM_{2.5}$ impacts requires the use of the AERMOD regulatory dispersion model. PLC performed a preliminary single-source impact analysis, in accordance with Section 9.2.3(a)(i) of the *Guideline*, and found project emissions would result in impacts greater than the $PM_{2.5}$ SIL[3,4]. The AQIA submitted with the application and the revised AQIA submitted with the Response Letter were conducted in accordance with Section 9.2.3(a)(ii) of the *Guideline*, being a cumulative study of $PM_{2.5}$ concentrations.

Section 4.2.3.5 of the *Guideline* includes specific instructions for the handling of fugitive dust in a $PM_{2.5}$ AQIA. It notes the procedure accounting for $PM_{2.5}$ impacts shall be determined on a case-by-case basis through consultation with the reviewing authority, due to the difficult nature of characterizing and modeling fugitive dust and emissions:

[3] The preliminary single-source impact analysis was conducted by PLC prior to the modeling protocol meeting. This analysis was not submitted by the applicant and the EPA did not review this analysis. PLC opted to submit only the cumulative AQIA with the application.
[4] Initially applied the draft PM2.5 SILs, as agreed in the pre-application meeting. The $PM_{2.5}$ SILs were finalized in EPA guidance released April 17, 2018 in a memo from Peter Tsirigotis, EPA OAQPS director, to the Regional Air Division Directors of Regions 1-10.

40 CFR Part 51, Appendix W, Section 4.2.3.5, Models for $PM_{2.5}$, (c): Fugitive dust usually refers to dust put into the atmosphere by the wind blowing over plowed fields, dirt roads, or desert or sandy areas with little or no vegetation. Fugitive emissions include the emissions resulting from the industrial process that are not captured and vented through a stack, but may be released from various locations within the complex. In some unique cases, a model developed specifically for the situation may be needed. Due to the difficult nature of characterizing and modeling fugitive dust and fugitive emissions, the proposed procedure shall be determined in consultation with the appropriate reviewing authority (paragraph 3.0(b)) for each specific situation before the modeling exercise is begun. Re-entrained dust is created by vehicles driving over dirt roads (e.g., haul roads) and dust-covered roads typically found in arid areas. Such sources can be characterized as line, area or volume sources.61 63 Emission rates may be based on site-specific data or values from the general literature.

EPA Region 10 requested fugitive dust emissions be modeled in AERMOD using a set of simplified consolidated volume sources representing the area-wide fugitive emissions at each part of the facility. We did not specify any specific requirements related to the number of volume sources, spacing, or other parameters. We also did not encourage PLC to apply overly-conservative assumptions regarding the location of fugitive emissions (such as unrealistic high levels of emission along the fenceline). We assumed highly detailed specification of the distribution and location of fugitive emissions was not necessary to assess the general impact of project emissions on $PM_{2.5}$ concentrations in the St. Maries area.

2.1 Cumulative AQIA requirements

The purpose of a cumulative analysis is to find if projected project emissions, in conjunction with emissions from nearby sources, will cause or contribute to a violation of the NAAQS. Therefore, such an analysis must include the modeling of project emissions and must include the modeling of emissions from nearby sources not accounted for in the background concentration.

The main parts of the *Guideline* that specifically address the requirements for a cumulative analysis are Section 8.2 (Source data requirements) and Section 8.3 (Background concentrations). Section 8.2 describes the requirements for source unit emissions in a cumulative analysis:

c. For the purposes of demonstrating NAAQS compliance in a PSD assessment, the regulatory modeling of inert pollutants shall use the emissions input data shown in Table 8–2 for short and long-term NAAQS. The new or modifying stationary point source shall be modeled with ''allowable'' emissions in the regulatory dispersion modeling. As part of a cumulative impact analysis, Table 8–2 allows for the model user to account for actual operations in developing the emissions inputs for dispersion modeling of nearby sources, while other sources are best represented by air quality monitoring data. For purposes of situations involving emissions trading, refer to current EPA policy and guidance to establish input data. Consultation with the appropriate reviewing authority (paragraph 3.0(b)) is advisable on the establishment of the appropriate emissions inputs for regulatory modeling applications with respect to PSD assessments for a proposed new or modifying source.

Section 8.3 of the *Guideline* focuses on the importance of a representative background concentration in the determination of the cumulative air quality impacts. Section 8.3.1 of the *Guideline* states the background air quality should not include the ambient impacts of the project source under consideration. The *Guideline* recommends use of a background value that is representative of local and regional sources. Emissions from non-project source units in the vicinity of the project source should be explicitly included in the modeling. In cases where the representative monitor is located in close proximity to the source in question, and as a result, project source emissions impact the monitor, Section 8.3.2 of the *Guideline* provides an option to remove periods when the project source impact the monitor.

The requirements of Section 8.3 are discussed in detail in Sections 3 and 4 of this memo. The current project is a unique case where the nearest representative $PM_{2.5}$ monitor is located very near to the project source and is impacted by both project source emissions and local residential woodsmoke during cold stagnant periods. EPA Region 10 opted to allow a "weight of evidence" modeling approach to account for the unique characteristics of the case, as described in detail in Section 3 of this memo. The conditions and circumstances warranting a unique approach include:

- Local residential woodsmoke contributes significantly to background $PM_{2.5}$ concentrations.
- The St. Maries monitor dataset is the only source of information adequately quantifying the residential woodsmoke contribution in the town of St. Maries.
- The monitor is impacted by PLC emissions as well as residential woodsmoke emissions,
- Alternative methods to quantify a background concentration do not fully account for the local residential woodsmoke contribution.
- Residential woodsmoke sources are numerous, transient, and difficult to quantify. Therefore, accurate explicit representation of these sources in the modeling would be difficult to simulate.

3. MODELING METHODOLOGY AND RESULTS

The $PM_{2.5}$ cumulative AQIA was conducted in response to EPA Region 10's request to assess $PM_{2.5}$ impacts in the St. Maries area due to concerns regarding high background concentrations measured at the St. Maries monitor.

EPA Region 10 conducted a review of the St. Maries $PM_{2.5}$ monitor dataset and local meteorology. Based on our review, we noted some difficulties in application of the dataset for use in the AQIA, summarized as:

I) The St. Maries monitor is located near to the project source and impacted by the source emissions during westerly/north-westerly winds and likely during stagnant periods.
II) The contribution of actual emissions from the source cannot be removed from the monitor record to determine a representative background because high concentrations occur in cold stagnant conditions where wind speed is low and wind direction is variable.
III) Source emissions, emissions from vehicles, and residential woodsmoke emissions impact the monitor concurrently during cold stagnant periods. The exact location and emission rates of automobile and residential woodsmoke sources are unknown and transient.

Concerning Issue I, identified above, Section 8.3.2(c)(i) of the *Guideline* recommends the following:

For situations involving a modifying source where the existing facility is determined to impact the ambient monitor, the background concentration at each monitor can be determined by excluding values when the source in question is impacting the monitor. In such cases, monitoring sites inside a 90° sector downwind of the source may be used to determine the area of impact.

However, the removal of record (by wind sector) option is not useful in the current case because of the situations described in Issues II and III, above. As an alternative, EPA Region 10 considered use of an alternative background dataset. We considered use of the NW-Airquest $PM_{2.5}$ design value from the background lookup tool[5]. Use of background concentrations derived by such a tool are allowed under Section 8.3.2(f). However, we were concerned this approach may result in an under-prediction of

[5] Northwest International Air Quality Environmental Science and Technology Consortium, http://lar.wsu.edu/nw-airquest/lookup.html

maximum $PM_{2.5}$ concentrations in the St. Maries vicinity by not accounting for the contribution of local residential woodsmoke and other local sources during the periods of atmospheric stagnation.

Ultimately, EPA Region 10 agreed to a unique AQIA modeling approach not specifically recommended in the *Guideline*. The approach, initially proposed by PLC in the pre-application meeting and modeling protocol, assumed actual emissions from the facility were conservatively represented in the background design value determined from the St. Maries monitor dataset. Therefore, only emission increases related to the project were explicitly modeled and impacts were added to the background concentration to determine a cumulative impact. Additional analysis, summarized in this memo, was conducted to provide a "weight of evidence" to justify the modeling approach to ensure the NAAQS will be protected. This approach deviates from some of the specific requirements of Section 8.2.2 and Table 8-2 of the *Guideline*, to avoid an overly-conservative modeling approach given the unique situation with the background air quality.

3.1 Assessment of facility emission impacts at the St. Maries monitor

The cumulative AQIA modeling method relies on the assumption the contribution of the project source maximum actual emissions is represented in the St. Maries monitor background design value. This "weight of evidence" approach relies on several assumptions:

A. Existing facility emissions impact the monitor during worse-case meteorological conditions and therefore contribute significantly to the design concentration or that the design concentration is sufficiently high enough to account for the full impacts of existing emissions.

B. Maximum facility impacts at the monitor are relatively indicative of total maximum impacts that have occurred in the region due to facility emissions.

EPA Region 10 conducted an analysis using the St. Maries monitor $PM_{2.5}$ and meteorological datasets and supplemental AERMOD modeling to find evidence to support these two assumptions. The methods and results are summarized in this section. An assessment of the $PM_{2.5}$ concentration and wind datasets collected at the St. Maries monitor, included in Section 3.1.1, provides sufficient evidence to support assumption A. Supplemental AERMOD modeling was conducted using facility actual emissions, as summarized in Section 3.1.2. This analysis provides sufficient evidence to support assumption B.

3.1.1 Assessment of monitor datasets

The Saint Maries monitor is operated by IDEQ and is located on the rooftop of a government garage / vehicle maintenance center at the intersection of North 11st Street and Center Avenue in downtown St. Maries. A map of the area including location of the St. Maries monitor, the Potlatch site-specific meteorological dataset, and facility fenceline is shown in **Figure 1**. The monitor contains both regulatory and non-regulatory (AQI) $PM_{2.5}$ monitors as well as non-PSD wind speed and direction monitors.

To conduct this analysis, we obtained a copy of the 2015, 2016, and 2017 hourly and daily air quality and meteorological measurement data recorded at the monitor. $PM_{2.5}$ datasets were obtained from the

EPA's Air Quality System (AQS) data archive, available for download from the EPA's AirData tool[6]. The AQS dataset contains both official daily average $PM_{2.5}$ concentrations determined using the regulatory filter-based method and the hourly and daily average of $PM_{2.5}$ concentration determined from a non-regulatory monitor used to determine an air-quality index. Non-PSD wind speed and direction are monitored using a Met-One Instruments Model 590/591 windset. The three-year wind dataset was obtained from IDEQ[7].

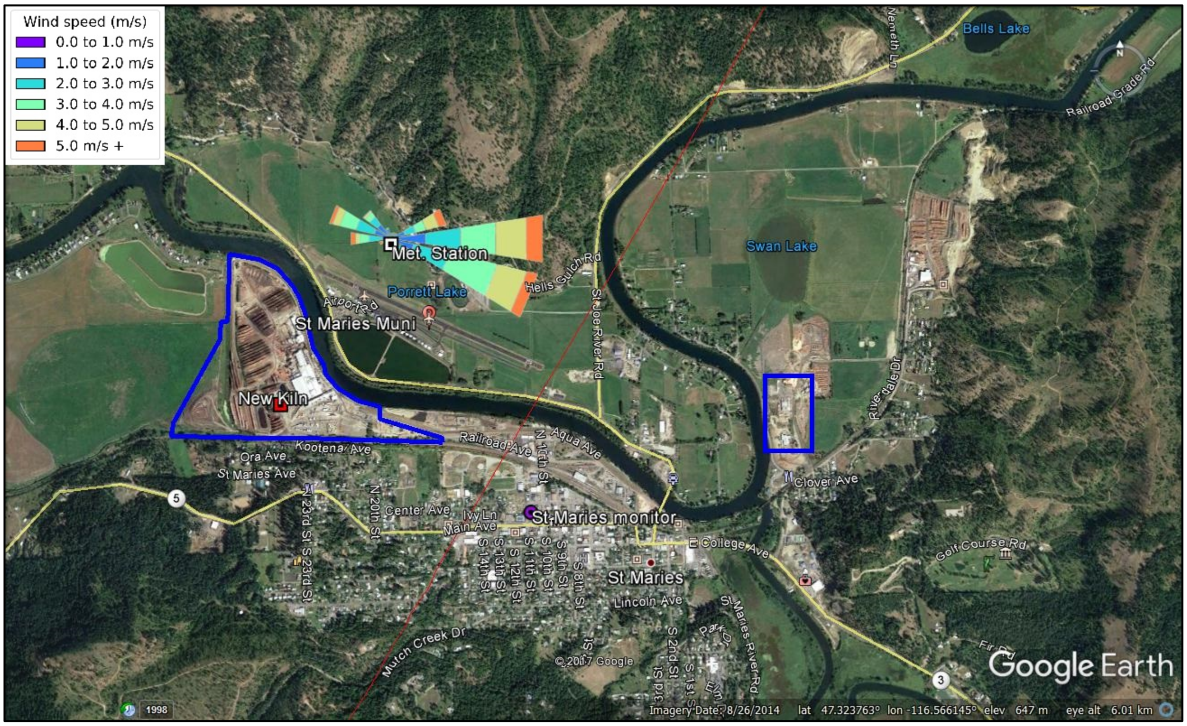


Figure 1. Map of area including project facility fenceline (blue), location of St. Maries $PM_{2.5}$ monitor, and windrose from the Potlatch PSD meteorological dataset (2003-2004).

Wind-roses were developed to visualize the distribution of wind speed and direction. Both the Potlatch 2003-2004 site-specific meteorological dataset and 2015-2017 monitor wind data were plotted, shown in **Figure 2**. It is evident from the plots the wind climate did not vary substantially between the two sites and time periods, in terms of direction and frequency. However, wind speed at the St. Maries monitor is lower due to the greater surface roughness in its vicinity. We can conclude from this comparison the distribution of meteorological conditions during the period modeled (2003 – 2004) likely do not vary substantially from the January 2015 to June 2017 period of the background monitoring. The monitor is directly downwind of the Potlatch St. Maries facility roughly 15% of the hours of the year.

[6] EPA AirData online data access tool: https://epa.maps.arcgis.com/home/index.html
[7] 2015, 2016, and 2017 (through Dec. 3, 2017) wind speed and direction datasets were provided by Mary Walsh, Air Quality Analysis, IDEQ via email personal communication with Jay McAlpine on December 4, 2017.

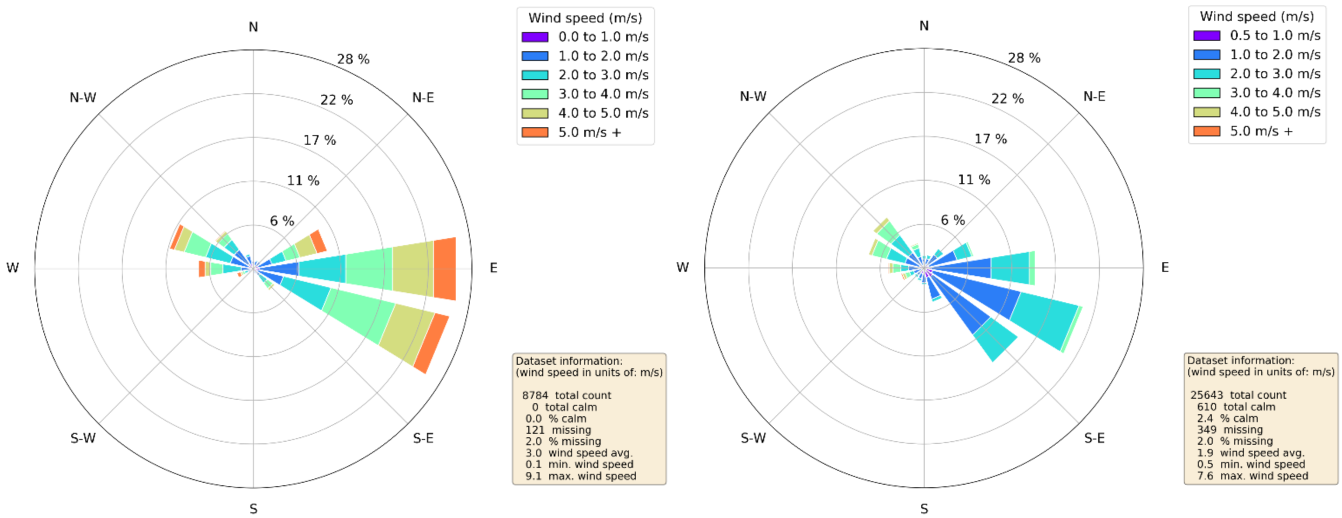


Figure 2. Windroses of 2003-2004 Potlatch PSD-quality site-specific dataset (left) and St. Maries monitor 2015-2017 rooftop wind data (right).

Figure 3 contains a plot of the 24-hour average $PM_{2.5}$ concentrations determined from the BAMS instrument compared to the official filter-based 24-hour average $PM_{2.5}$ concentrations. This plot shows the BAMS-based averages tend to slightly over-predict $PM_{2.5}$ concentration on average. However, the average error is small and the R^2 value of 0.93 is high enough to indicate the BAMS dataset is a reasonable proxy for the official filter-based dataset used to assess regional $PM_{2.5}$ attainment. This is important because assessment of $PM_{2.5}$ concentrations on an hourly basis offers useful insight into dispersion patterns during days of high $PM_{2.5}$ concentration.

The relationship between 24-hour average 2015 - 2017 $PM_{2.5}$ concentration and daily median wind direction is shown in **Figure 4**. The majority of days with average concentrations that exceed the $PM_{2.5}$ 24-hour NAAQS (35 µg/m^3) have median east-southeast winds. East-southeast winds advect PLC facility emissions away from the monitor. Concentrations were generally below 35 µg/m^3 on days median wind direction was favorable for advecting facility emissions towards the monitor (in the range of 270 – 330˚). Days with sustained westerly wind tend to correspond to periods of neutral and unstable atmospheric stability. At face value, this evidence would suggest facility emissions do not contribute to periods of high concentration. However, these findings do not account for the intraday variability of winds during the peak concentration periods.

The relationship of hourly average $PM_{2.5}$ concentration to hourly average wind directions is shown in **Figure 5**. The main mode of peak concentration occurs in the 90˚ – 150˚ sector, corresponding with periods the wind transports facility emissions away from the monitor. However, a secondary mode is evident in the 270˚ - 330˚ sector, corresponding with periods wind transports facility emissions towards the monitor. The secondary mode is evident in the wind-direction histogram provided in **Figure 6**. These data provide evidence the source may likely be contributing to the maximum $PM_{2.5}$ 24-hour concentrations when wind direction is variable during the days of maximum $PM_{2.5}$ concentration.

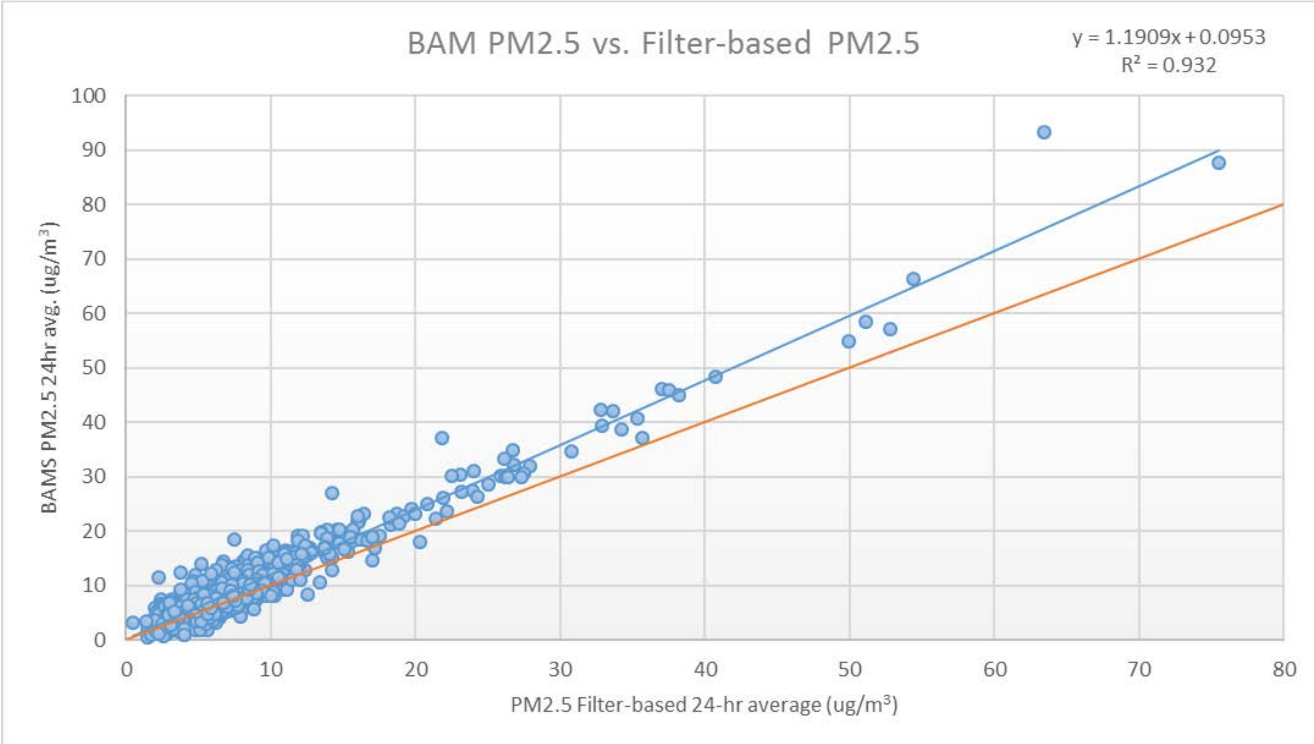


Figure 3. St. Maries Monitor 2015-2017 BAMS $PM_{2.5}$ 24-hour average concentrations vs. official filter-based $PM_{2.5}$ concentrations (orange line is the 1:1 line, linear regression line in blue).

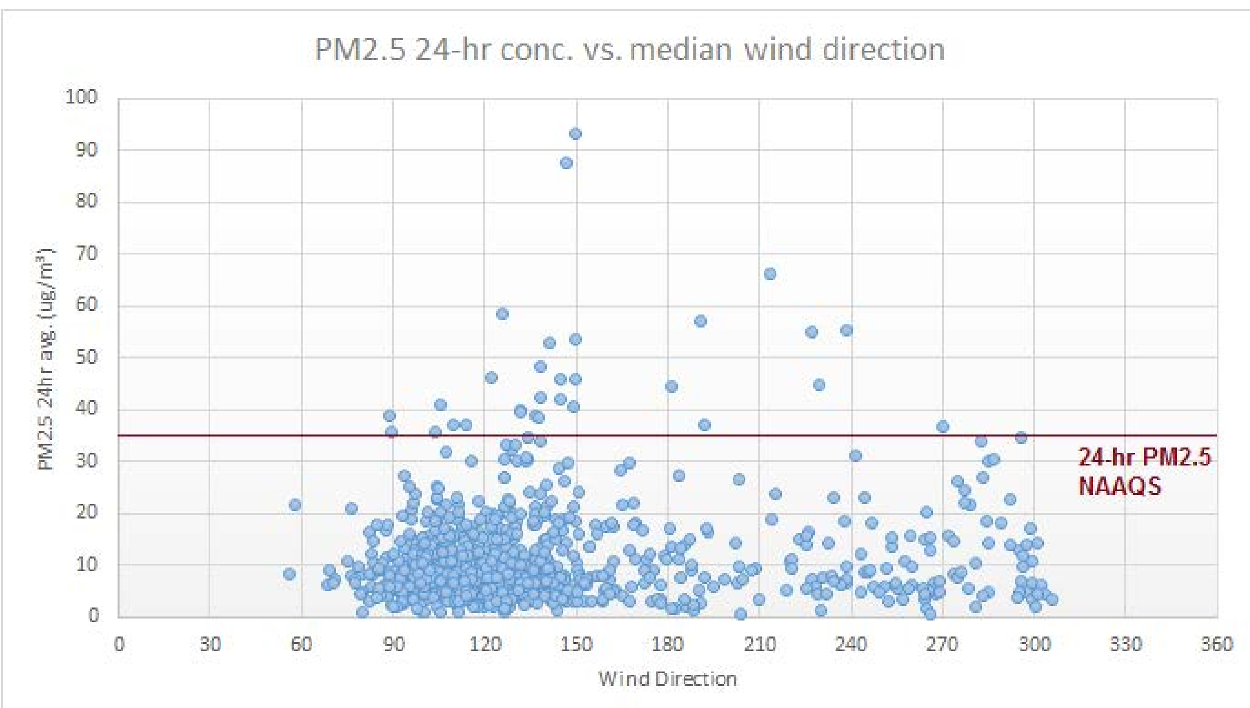


Figure 4. PM2.5 daily average concentration vs. daily median wind direction (2015 - 2017).

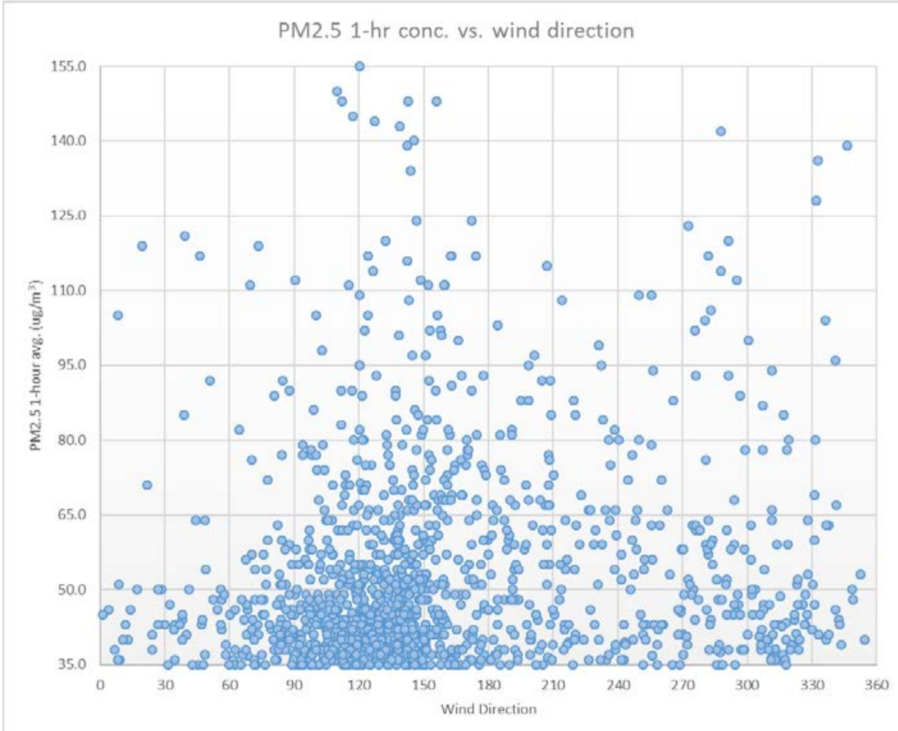


Figure 5. Jan. 2015 – Jun. 2017 $PM_{2.5}$ 1-hour avg. conc. versus wind direction for periods exceeding 35 μg/m^3.

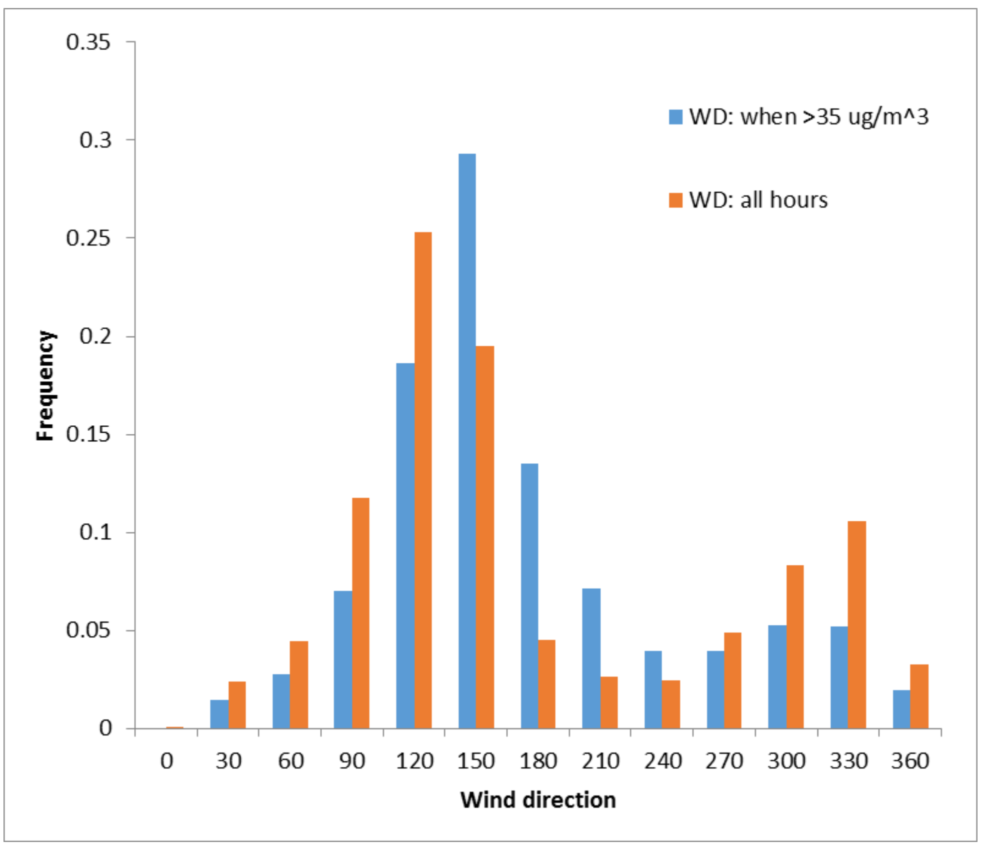


Figure 6. Histogram of wind direction for periods with hourly $PM_{2.5}$ concentration above 35 μg/m^3.

Meteorological conditions occurring during the days with the highest 24-hour concentrations (official filter-based concentrations) were examined to find evidence the source could be contributing to high concentrations. The days contributing to the 98th percentile 24-hour $PM_{2.5}$ concentrations were selected for the analysis, listed in **Table 3**, as well as any other days exceeding 35 µg/m^3 (18 days total selected for the analysis). EPA Region 10 examined archived surface meteorological maps as well as the hourly records from the St. Maries monitor. Hourly wind direction and $PM_{2.5}$ concentration records for each of the selected days is plotted in a set of figures included in Appendix A. Similar meteorological conditions generally occur across all of the selected days, characterized by the following:

- Cold, modified arctic air parked over northern Idaho
- Strong surface high pressure in the range of 1020 – 1040 mb over northern Idaho
- Temperatures generally below freezing in the St. Maries area.
- Light and variables winds
- Stable, stagnant boundary layer with some mixing with the free-layer aloft during peak solar heating hours.
- Wind directions fluctuating between east- and west- directions throughout the day.

The daily plots in Appendix A reveal two general regimes:

I) A regime dominated by south-easterly winds, where wind shifts to the west-northwest during peak heating hours. $PM_{2.5}$ concentration drops during the period of mixing.
II) A regime dominated by variable winds with peak concentrations during westerly-northwesterly winds. $PM_{2.5}$ concentration peaks during nighttime hours.

During "regime I" conditions, the facility may not be contributing significantly to high $PM_{2.5}$ concentrations because winds are primarily from the southeast, blowing emissions away from the monitor. The high concentrations are likely primarily due to residential woodsmoke. During peak daytime heating, winds shift to the west-northwest as the surface boundary layer interacts with the mixed layers aloft. Although facility emissions may reach the monitor during these daytime hours, concentrations at the monitor are lower due to atmospheric mixing with the cleaner layers aloft. The maximum days in 2015 and November 2016 were characterized by regime I conditions.

During "regime II" conditions, winds are variable, fluctuating primarily between northwest and southeast directions during the stable nighttime hours. $PM_{2.5}$ concentrations peak at nighttime hours with a dip during peak heating hours, although not as pronounced as during regime I conditions. The majority of the selected days in 2017 are regime II days. The January 2016 days are partially regime II days. During regime II periods, it is likely emissions from the facility are contributing significantly to the high $PM_{2.5}$ concentrations.

Overall, EPA Region 10 has concluded the evidence provided in this analysis is sufficient to support "assumption A" above. It is evident PLC facility emissions are likely impacting the monitor during worst-case $PM_{2.5}$ periods, notably during "regime II" conditions. This is particularly evident during the extended January 2017 stagnation episode, which resulted in the highest 24-hour average $PM_{2.5}$ concentrations in the three-year record (other than exceptional events). To note: during the January 2017 episode, the Riley Boiler was operating near its potential, with several daily steam rates recorded as above the 2016-2017 98th percentile daily steam flow.

Table 3. St. Maries $PM_{2.5}$ monitor top 98th percentile 24-hour average values and selected days for daily analysis.

Year	Total days (# of samples)	98th percentile sample	High	Day	24-hour average $PM_{2.5}$ (μg/m³)	24-hour average BAMS $PM_{2.5}$ (μg/m³)	24-hour median wind direction	24-hour average wind speed (m/s)
2015	54	2nd high	1	11/20	37.0	46.1	145	1.1
			2	11/26	32.8	42.3	138	1.4
2016	342	7th high	1	11/11	63.4	93.2	149.7	1.9
			2	1/5	35.3	40.6	149.2	1.1
			3	11/9	34.2	38.7	137.8	1.6
			4	1/6	32.9	39.5	131.6	0.8
			5	10/13	27.9	31.9	107	2.5
			6	11/5	27.5	30.6	126.2	1.9
			7	11/10	26.4	29.9	147	1.4
2017	333	7th high	1	1/4	75.5	87.6	146.6	0.7
			2	2/2	54.4	66.3	213.6	1.0
			3	1/14	52.8	57.2	191	0.9
			4	1/16	51.1	58.4	125.9	1.1
			5	1/15	49.9	55.0	227.3	0.9
			6	1/13	40.7	48.3	138.5	1.0
			7	2/1	38.2	44.9	229.5	1.8
			8	1/7	37.5	45.9	149.7	1.2
			9	1/12	35.7	37.1	191.9	0.9

3.1.2 Supplemental modeling to assess facility contribution at monitor

Supplemental AERMOD modeling was conducted to explore the assumption that maximum facility impacts at the monitor are relatively indicative of total maximum impacts from the facility. Details regarding the meteorological dataset, receptors, source parameters, and AERMOD settings are described in the remaining sections of Section 3. The modeling was conducted in the following manner:

- Using the 2003-2004 meteorological dataset submitted by PLC
- Applying actual emissions from the project source units (2015-2016 emissions), assuming a constant emission rate from all source units and volume sources.
- Applying two general large volume sources to account for vehicle fugitive dust. "North" and "south" volume sources were assigned at each half of the facility and the on-road and off-road fugitive dust emissions were distributed evenly between these sources. The dimensions of the sources were based on the width of the facility, sized according to AERMOD modeling guidance.
- The St. Maries monitor was simulated using a 100-meter radius ring of receptors at 10° spacing (36 receptors total), centered on the location of the monitor. The receptors were set at the height of the monitor at 7 meters above the ground, coinciding with the estimated height of the monitor above the ground. For each period modeled, the maximum concentration about the receptor ring was selected for the analysis. The receptor ring approach was used to account for the inherent spatial uncertainty in the modeling approach.
- The 50-meter spaced ground-level receptors and ground-level fenceline receptors used by PLC were also used in the supplemental modeling.

As demonstrated in Section 3.1.1, highest $PM_{2.5}$ concentrations occur during stagnant periods characterized by a statically-stable atmosphere and low wind speeds. For this analysis, modeling was conducted using a subset of the 2003-2004 meteorological dataset to focus on these worst-case conditions. The subset was selected based on the following criteria:

- Wind direction between 295˚ and 310˚ (wind blowing from facility to monitor)
- Wind speed less than 2.5 m/s.
- Positive Monin-Obukhov length (L), as determined by AERMET, to capture only statically-stable conditions.

The maximum hourly $PM_{2.5}$ concentration at the monitor was 17.4 µg/m^3 (no background was assumed; impacts are from facility emissions only). The overall maximum concentration for this hour was 18.6 µg/m^3, occurring at a ground-level monitor just downwind of the monitor receptors, as shown in **Figure 7**.

The overall maximum concentration (all receptors) was 25.4 µg/m^3 and second-highest concentration was 24.8 µg/m^3. The highest "error" (difference between the maximum concentration and monitor concentration for a given hour) occurred at this second-high hour, where the monitor hourly $PM_{2.5}$ concentration was 5.1 µg/m^3. The "highest-error" scenario results are plotted in **Figure 8**. Most of the high-error cases have a similar pattern as shown in this figure. It can be inferred from **Figure 8**, slight differences in wind direction or stability could easily lead to higher concentrations at the monitor receptors. In many of the cases the high concentration occurs on elevated terrain near or downwind of the monitor, rather than directly at the fenceline.

The maximum 24-hour average concentration at the monitor under the actual-emissions modeling scenario was 4.1 µg/m^3. The overall maximum 24-hour average concentration was 6.5 µg/m^3, occurring along the southeast fenceline of the facility. The maximum 8th-high 24-hour average concentration was 4.5 µg/m^3.

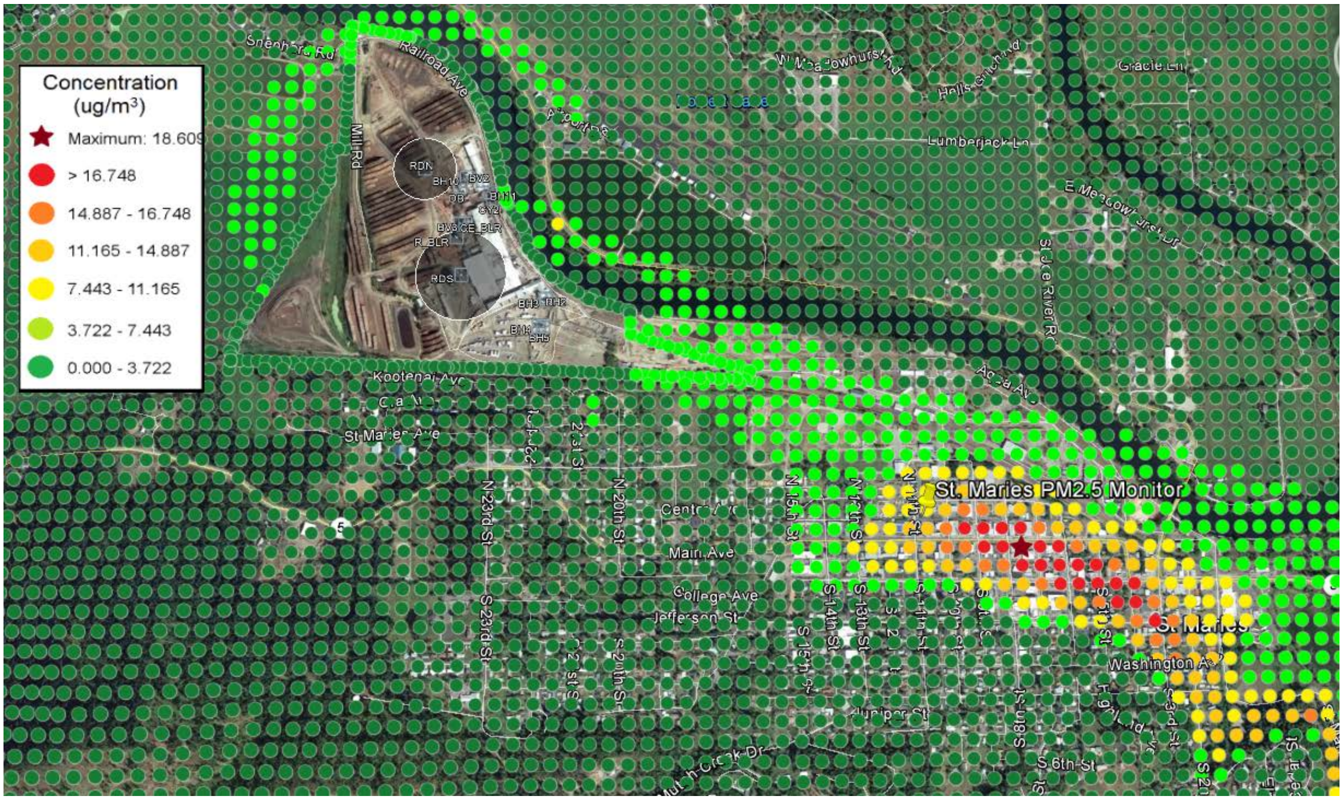


Figure 7. Plot of AERMOD results, 1-hr average resulting in highest impacts at monitor, 2015-2016 actual emissions.

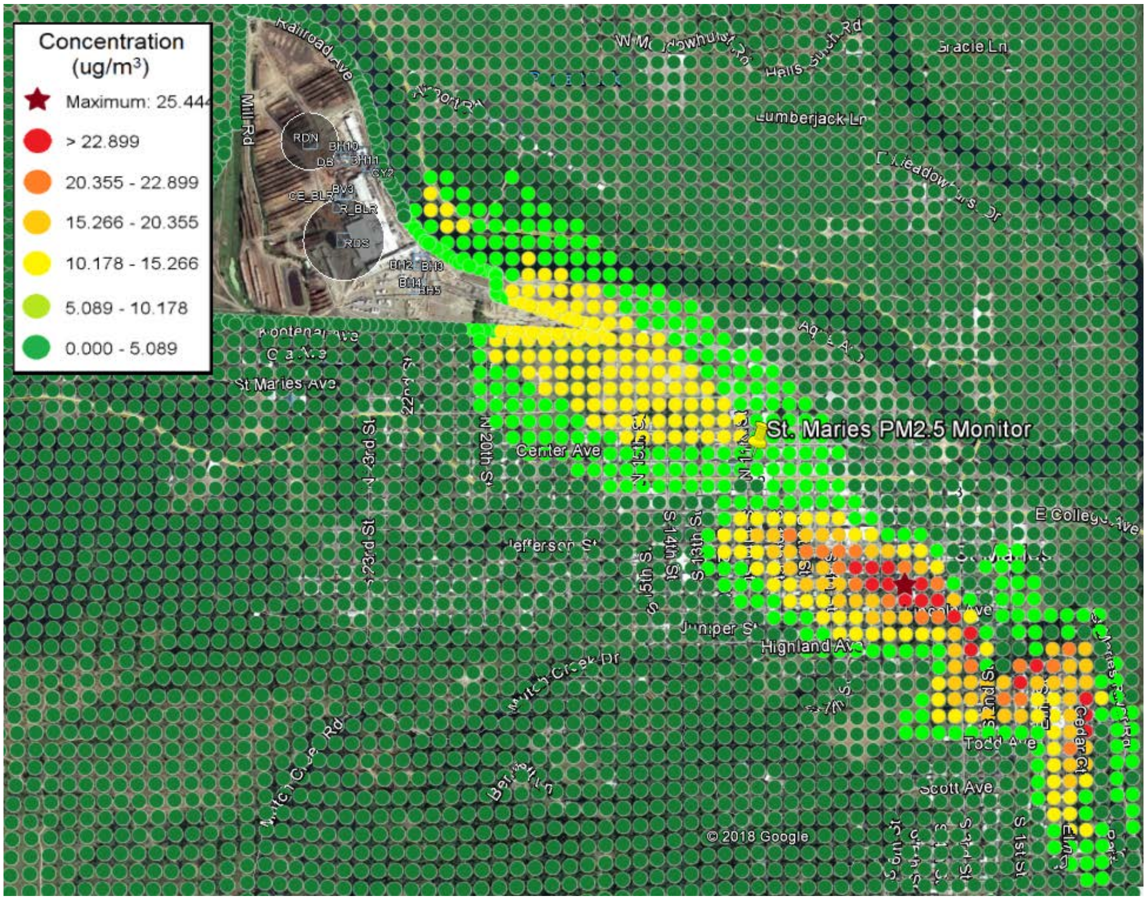


Figure 8. Plot of AERMOD results, 1-hr average resulting in largest error between monitor and maximum concentration.

The hourly-average $PM_{2.5}$ concentrations from all modeled hours are plotted in a scatterplot and QQ-plot in **Figure 9** and **Figure 10**, respectively. Overall, these results demonstrate that when the highest concentrations modeled at the monitor occur, the concentration magnitude is generally representative of the highest concentrations occurring anywhere in the domain for a given hour. Concentrations at the monitor are generally lower than the maximum concentrations, but the QQ-plot demonstrates the upper-end of concentrations are well within a factor-of-two from the maximum total concentration.

Outliers were examined and found to occur during highly stable periods with *L* values generally below 5. In these cases, maximum impacts tend to occur 1 – 2 kilometers downwind of the facility on the higher terrain south of the monitor. Slight differences in wind direction or static stability, within the range of variance that would occur naturally over a given hour, could easily have resulted in higher concentrations at the monitor in most of these cases.

Finally, the Robust High Concentration (RHC)[8] was computed using the modeling results. The RHC is an EPA-preferred statistic used to compare the upper-end concentration distributions of monitored or modeled datasets. It is determined from a tail exponential fit of the high-end of the distribution of monitored or measured set of values, as follows in Equation *(1)*:

[8] EPA, 1992: Protocol for determining the best performing model. U.S. EPA OAQPS, Sept. 1992, EPA-454/R-92-025.

$$RHC = X(N) + [\ \bar{X} - X(N)\ ] \ln\left[\frac{3N - 1}{2}\right], \quad (1)$$

Where X(N) is the Nth largest value, N is the number of values selected from the top of the distribution of the dataset, and $\bar{X}$ is the average of the N-1 largest values. The RHC is sensitive to the selection of N. The EPA default[6] N value is an arbitrary 26, generally intended for evaluation of full-year datasets. For this evaluation, RHC was calculated twice, using N values of 8 and 16, coinciding with the top 5% and 10% of the 160 hourly cases modeled, respectively. The results of the RHC analysis, listed in **Table 4**, indicate monitor RHC is within a factor-of-two of RHC based on the maximum concentration distribution.

Table 4. Robust High Concentrations determined from supplemental actual-emissions modeling.

	Monitor RHC	**All receptors RHC**
Total hours	160	160
N: top 5%	21 µg/m^3	30 µg/m^3
N: top 10%	19 µg/m^3	28 µg/m^3

Overall, maximum concentrations at the monitor attributable to facility emissions are of similar magnitude, but lower than overall maximum concentrations. Therefore, the assumption facility actual emission impacts are fully represented in the background design is not entirely conservative. However, as shown in Section 3.1.1 the peak $PM_{2.5}$ concentrations can likely be attributed to emissions from both facility and local residential woodsmoke sources. Given the proximity and density of local wood-burning residences to the monitor compared to the lower density of such residences near the facility, it is safe to assume the background design concentration is sufficiently conservative.

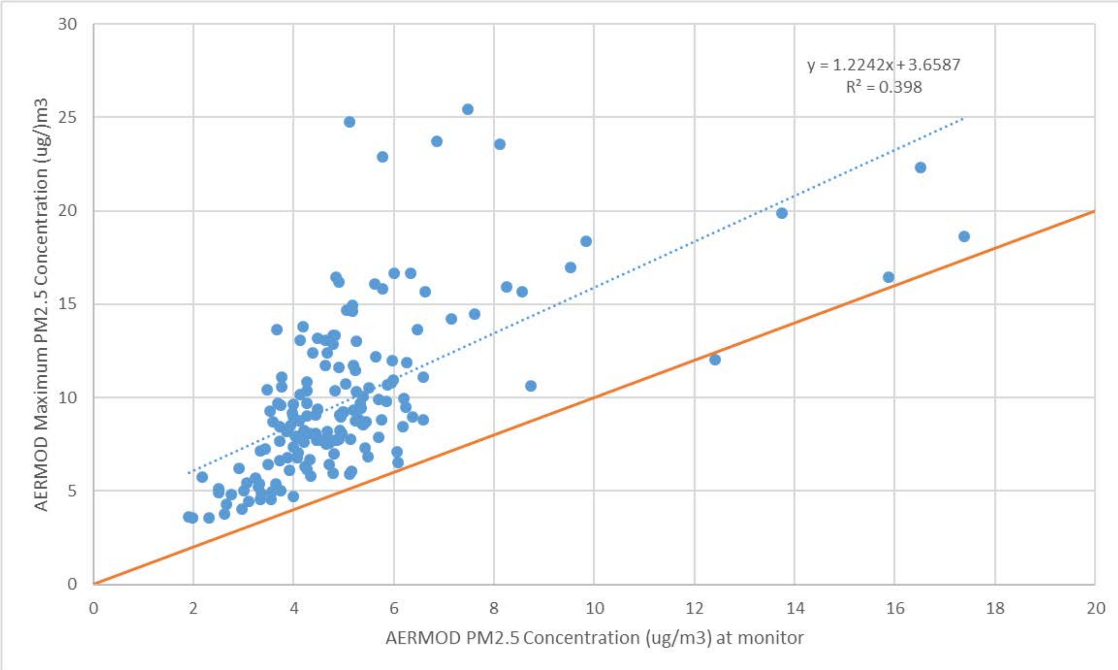


Figure 9. AERMOD 1-hour average concentrations at monitor vs. maximum concentrations over selected meteorological conditions (1:1 line in orange, regression line in dotted blue).

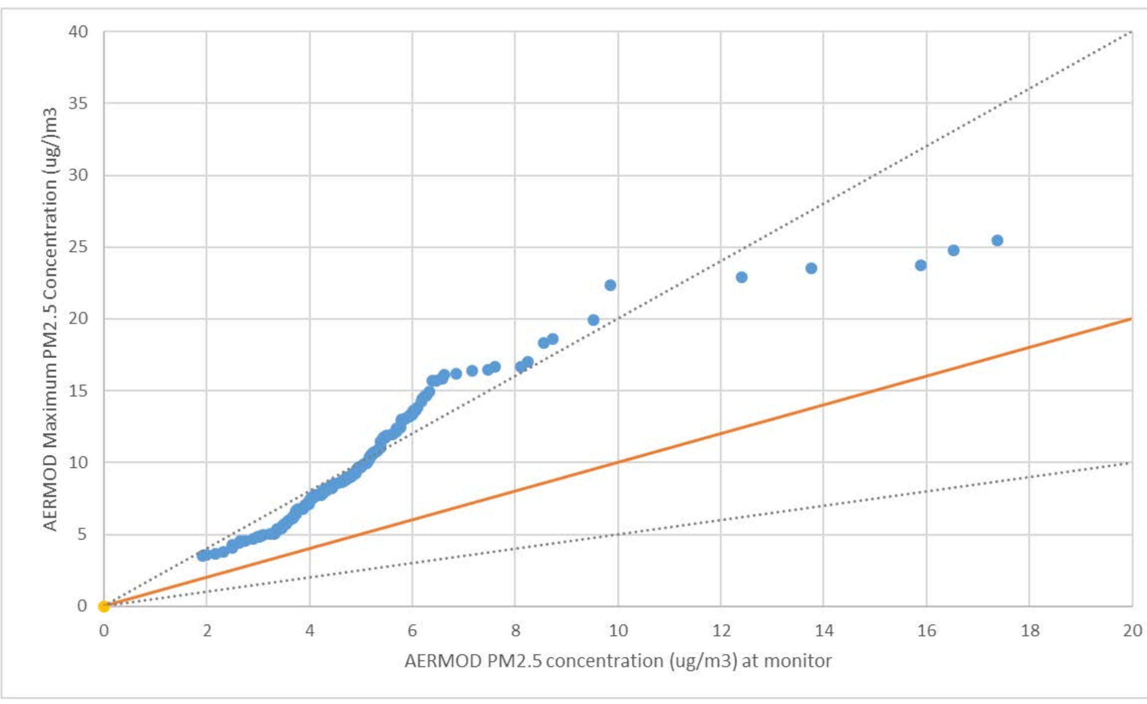


Figure 10. QQ plot of AERMOD 1-hour average concentrations at monitor vs. maximum concentrations over selected meteorological conditions (1:1 line in orange, factor-of-two lines in dotted black).

3.2 Meteorology

The meteorological inputs to AERMOD were developed using the meteorological preprocessor AERMET with the following inputs:

- A 1-year site-specific meteorological dataset collected by PLC from November 2003 through October 2004.
- Upper-air twice-daily radiosonde datasets collected at the National Weather Service's Spokane upper-air site (KOTX).
- Land-use parameters provided by the AERSURFACE preprocessor, developed for a location of 47.3268 N, 116.578 W, corresponding with the location of the St. Maries Municipal Airport.
- Site-specific data from November 1st, 2003 through October 31st, 2004 used, spanning a total of 366 days and 8784 hours (2004 was a leap-year).

The site-specific dataset was collected under a PSD-quality meteorological monitoring plan, approved by the State of Idaho. In the application, PLC included a letter from Idaho Dept. Environmental Quality (IDEQ) dated January 24, 2005 indicating the quality assurance documentation had been reviewed by IDEQ and found to be PSD quality. EPA Region 10 confirmed the datasets comply with completeness requirements and were properly configured for input into AERMET, as verified in the AERMET output files.

The surface parameters provided by AERSURFACE are correct and the methods used to compute these parameters generally comply with EPA guidance. PLC selected to use a 120˚ sector for the 330˚ to 90˚ sector to determine surface roughness length. The method is reasonable since this sector overlays the forested mountainous terrain north and east of the meteorological station. The remaining sectors are spaced at 30˚ and cover the flat farmland area and airport runway.

3.3 Terrain and receptor network

The grid of receptors used in the modeling corresponds with the grid proposed in the modeling protocol. The grid is comprised of a high-resolution set of receptors spaced at 25 meters along the facility fenceline, a 50 meter spaced grid surrounding the facility extending out to about 3 kilometers from the facility, a 250 m spaced grid extending to about 4 kilometers from the facility, and an outer grid at 500 m spacing extending to about 5 kilometers from the facility.

Modeling confirmed the grid spacing and extent was sufficient for this assessment. Maximum design concentrations are on or near to the fenceline. Refined modeling is not necessary given the high resolution of receptors in the areas of the concentration maxima.

Receptors were placed at ground level, in accordance with EPA guidance. Receptor heights were determined using the most recent version of AERMAP (11103).

3.4 Sources and emissions

Cumulative modeling was performed using the emission increases associated with the project. Emission increases associated with the project are as follows:

a) Emissions from the new Kiln #6.
b) Increased emissions from the Boilers due to increased utilization on a daily and annual basis.
c) Increased emissions from source units associated with the sawmill due to increased utilization on an annual basis.
d) Increased fugitive emissions from increased vehicle operations on onroad and offroad areas of the facility on an annual basis.

Given facility maximum actual emissions are considered to be represented in the existing background design concentration, the cumulative modeling in this application is based on application of emission increases only. The emissions applied are the allowable emission increases only: the same as would be used for the SILs analysis (refer to discussion in Section 2.1 of this memo). EPA policy, based on the Draft NSR Workbook[9,10], recognizes the allowable emission increase should be based on the difference between associated source unit allowable/potential emissions and actual emissions.

Actual emissions on an annual basis are determined as defined in 40 CFR 52.21(b)(21):

(ii) In general, actual emissions as of a particular date shall equal the average rate, in tons per year, at which the unit actually emitted the pollutant during a consecutive 24-month period which precedes the particular date and which is representative of normal source operation.

There is no official EPA policy regarding short-term actual emissions rates, and the EPA provides Reviewing Authorities broad discretion in methodology. EPA policy recognizes the need to account for unit emissions in short-term modeling when such units are projected to increase annual utilization but not short-term potential emissions[11]. EPA Region 10 determined short-term actual emissions should be based on the 98th percentile daily-average emission rate, based on the previous two-years operations, to account for the contribution of actual emissions to the background design concentration. This approach was selected given the $PM_{2.5}$ 24-hour NAAQS is based on the 98th percentile daily average concentration.

PLC provided emission rates based on the emission increases determined as required by EPA Region 10, as follows (values in original and revised modeling; some emission factors were changed in the May 2019 revised modeling):

- Kiln #6 potential emission rate (same rate used for daily and annual assessments)
- CE boiler:
  - daily potential emission rates based on highest observed daily steam rate 2016-2017 of 43 Mlb steam/hr.
  - daily actual rate based on the 98th percentile daily steam rate in 2016-2017 of 31 Mlb/hr.
  - annual potential emission rate based on continuous maximum boiler operating rate of 35 Mlb steam/hr.
  - annual actual emission rate based on 2015-2016 annual average emissions.

---

9 U.S. EPA, 1990: New Source Review Workshop Manual (Draft), October 1990, available online at: https://www.epa.gov/sites/production/files/2015-07/documents/1990wman.pdf

10 Policy statement issued by Dan Deroeck, EPA OAQPS, Aug. 4, 1994, archived online at: https://cfpub.epa.gov/oarweb/MCHISRS/index.cfm?fuseaction=main.resultdetails&recnum=94-IV%20%20-12

11 EPA Model Clearinghouse policy statement, Dan Deroeck, EPA OAQPS response to Region VII, available at: https://cfpub.epa.gov/oarweb/MCHISRS/index.cfm?fuseaction=main.resultdetails&recnum=00-VII%20-02

- emission factor of 0.0206 lb/Mlb steam applied in all cases (adopted from boiler source tests).

- Riley boiler:
  - daily potential emission rates based on highest observed daily steam rate 2016-2017 of 98 Mlb/hr.
  - daily actual rate based on the 98th percentile daily steam rate in 2016-2017 of 87 Mlb/hr.
  - annual potential emission rate based on continuous maximum boiler operating rate of 101 Mlb/hr.
  - annual actual emission rate based on 2015-2016 annual average emissions.
  - emission factor of 0.0105 lb/Mlb steam applied in all cases (adopted from boiler source tests).
- Sawmill-associated units and fugitive dust sources with increased utilization:
  - potential emission rates based on assumption of 23 and 24 hours per day of operation and emission factors based on source tests and calculations.
  - annual actual emissions based on 2016-2017 annual average production.
  - daily actual emissions were based on 98th percentile 2016-2017 daily operations.
- Vehicle fugitive dust from paved and unpaved areas of the facility:
  - potential emission rates based on assumption of 8,760 hours of operation and emission factors based on AP-42 Chapters 13.2.1 and 13.2.2.
  - 79% combined dust control efficiency assumed for unpaved areas.
  - annual actual emissions based on 2015-2016 annual average production.
  - daily actual emissions were based on 2016-2017 98th percentile operations.

The source unit parameter and emissions information are listed in **Table 5**. Revised parameters used in the May 2019 revised modeling are listed in **Table 6**.

Table 5. Verified modeling emissions and source parameters.

Source unit/ volume	$PM_{2.5}$ Emis. factor	Annual potential (tpy)	Annual actuals (tpy)[a]	Annual potential increase (tpy)	Annual-scenario emission rate (g/s)	Daily potential (lb/day)	Daily actuals (lb/day)	Daily increase (lb/day)	Daily emis. rate (g/s)	Configuration / Details	Ht. (m)	Diam. (m)	Temp. (K)	Vel (m/s)
Kiln #6	0.021 lb / Mbf	0.916	0.0	0.916	0.0264	6.7	0.0	6.7	0.0352	Emitted from 10 roof vents at center of roof, capped stacks at 0.1 m above roof height	8.7	0.803	350.9˚	0.93
CE boiler	15 lb / MMlb steam	3.16	1.08	2.08	0.0597	21.3	15.3	5.9	0.0312	Vertical stack, daily potential based on max. 2016-2017 daily steam rate, daily actual based on 98th percentile steam rate	15.2	0.9	445.7˚	18.9
Riley boiler	7.2 lb / MMlb steam	4.65	2.42	2.23	0.0641	24.7	21.9	2.8	0.0145	Vertical stack, daily potential based on max. 2016-2017 daily steam rate, daily actual based on 98th percentile steam rate	24.4	1.6	499.6˚	15.2
(BV-2) sawmill building vents	0.05 lb / hour oper.	0.216	0.102	0.114	0.00328	1.18	0.99	0.20	0.00104	Horizontal stack,	9.8	1.2	294.3	5.2
(BV-3) boiler building vents	0.01 lb / hour oper.	0.0525	0.0516	0.0009	0.0000252	0.29	0.29	0.24	0.000252	Horizontal stack,	9.1	1.2	294.3	1.2
(BH-2) planer baghouse	1.65 lb / hour oper.	6.91	3.43	3.48	0.100	39.6	37.9	33.2	0.02419	Vertical stack,	15.5	0.9	294.3	21.6
(BH-3) trimmer / chipper baghouse	1.48 lb / hour oper.	6.22	3.09	3.13	0.0895	34.1	29.9	4.15	0.02177	Vertical stack,	16.2	0.9	294.3	19.4
(BH-4) plytrim truck bin baghouse	0.33 lb / hour oper.	1.442	0.683	0.759	0.0218	7.9	6.6	1.3	0.00657	Vertical stack,	15.2	0.4	294.3	20.3
(BH-5) planer shaving truck bin baghouse	0.33 lb / hour oper.	1.442	0.686	0.756	0.0217	7.9	6.6	1.3	0.00657	Vertical stack,	17.1	0.6	294.3	10.2
(BH-10) sawmill baghouse	2.66 lb / hour oper.	11.15	5.50	5.65	0.163	61.1	53.1	8.0	0.0418	Vertical stack,	19.8	1.1	294.3	25.6
(BH-11) sawdust bin baghouse	0.58 lb / hour oper.	2.547	1.203	1.344	0.0387	14.0	11.6	2.3	0.0122	Vertical stack,	11.8	0.5	294.3	21.5
(CY-2) chip bin cyclone	1.09 lb / hour oper.	4.787	2.261	2.526	0.0726	26.2	21.9	4.4	0.02295	Vertical stack	21.3	0.7	294.3	10.9
(DB) fugitives from debarking	0.0003 lb/Mbf	0.058	0.027	0.031	0.000882	0.43	0.36	0.07	0.000375	Volume	4.6	--	--	--
(CS) fugitives from cut-off saws	0.0000441 lb / Mbf	0.0085	0.0040	0.0045	0.00013	0.063	0.053	0.011	0.0000546	Three volumes	4.6	--	--	--
(MH) fugitives from material handling	various	0.003	0.001	0.002	0.00006	0.0056	0.0047	0.0009	0.000018	Volume	3.7	--	--	--

Source unit/ volume	$PM_{2.5}$ Emis. factor	Annual potential (tpy)	Annual actuals (tpy)[a]	Annual potential increase (tpy)	Annual-scenario emission rate (g/s)	Daily potential (lb/day)	Daily actuals (lb/day)	Daily increase (lb/day)	Daily emis. rate (g/s)	Configuration / Details	Ht. (m)	Diam. (m)	Temp. (K)	Vel (m/s)
Fugitives from hog fuel pile	0.00175 ton / acre-yr	0.0008	0.0003	0.0005	0.0000134	0.006	0.005	0.001	0.0000134	Volume	3.0	--	--	--
Fugitives from unpaved roads	various[b]	2.03[c]	1.44	0.59	0.0077	13.4	11.1	2.3	0.0053	Two volumes covering facility, assuming 79% dust control	5.2	--	--	--
Fugitives from paved roads	various[b]	0.92[c]	0.65	0.27	0.0170	6.0	5.0	1.0	0.0117	Two volumes covering facility, assuming 75% dust control	5.2	--	--	--

[a]Actual emissions based on 2015-2016 operations

[b]Mobile source fugitive emission rates determined by PLC used a daily emission rate based on vehicle miles traveled assumed for vehicle fleet, assuming maximum long-term average of 16 hours of vehicle operation per day.

[c]Annual potential is based on assumption of 365 days per year at the maximum long-term potential daily rate assumed by PLC.

Table 6. May 2019 revised modeling emissions and source parameters.[**]

Source unit/ volume	$PM_{2.5}$ Emis. factor	Annual potential (tpy)	Annual actuals (tpy)[a]	Annual potential increase (tpy)	Annual-scenario emission rate (g/s)	Daily potential (lb/day)	Daily actuals (lb/day)	Daily increase (lb/day)	Daily emis. rate (g/s)	Configuration / Details	Ht. (m)	Diam. (m)	Temp. (K)	Vel (m/s)
Kiln #6	**0.051 lb / Mbf**	**1.74**	0.0	**1.74**	**0.05**	**10.0**	0.0	**10.0**	**0.05**	Emitted from 10 roof vents at center of roof, capped stacks at 0.1 m above roof height	8.7	0.803	350.9°	0.93
CE boiler	15 lb / MMlb steam	**2.28**	**0.78**	**1.50**	**0.0431**	**15.4**	**11.1**	**4.3**	**0.0226**	Vertical stack, daily potential based on max. 2016-2017 daily steam rate, daily actual based on 98th percentile steam rate	15.2	0.9	445.7°	18.9
Riley boiler	7.2 lb / MMlb steam	**3.19**	**1.66**	**1.53**	**0.0440**	**17.0**	**15.1**	**1.9**	**0.0100**	Vertical stack, daily potential based on max. 2016-2017 daily steam rate, daily actual based on 98th percentile steam rate	24.4	1.6	499.6°	15.2
(BV-2) sawmill building vents	0.05 lb / hour oper.	0.216	0.102	0.114	0.00328	1.18	0.99	0.20	0.00104	Horizontal stack,	9.8	1.2	294.3	5.2
(BV-3) boiler building vents	0.01 lb / hour oper.	0.0525	0.0516	0.0009	0.0000252	0.29	0.29	0.24	0.000252	Horizontal stack,	9.1	1.2	294.3	1.2
(BH-2) planer baghouse	**0.82 lb / hour oper.**	**3.08**	**1.71**	**1.37**	**0.0394**	**19.7**	**16.6**	**3.1**	**0.0164**	**Horizontal stack,**	**11.0**	**1.07**	294.3	**15.8**
(BH-3) trimmer / chipper baghouse	**0.74 lb / hour oper.**	**2.77**	**1.55**	**1.22**	**0.0351**	**17.8**	**15.0**	**2.80**	**0.0148**	Vertical stack,	**11.6**	**1.07**	294.3	**14.3**
(BH-4) plytrim truck bin baghouse	**0.16 lb / hour oper.**	**0.62**	**0.34**	**0.275**	**0.0079**	**3.9**	**3.3**	**0.6**	**0.0033**	**Horizontal stack,**	**12.2**	0.4	294.3	20.3
(BH-5) planer shaving truck bin baghouse	**0.16 lb / hour oper.**	**0.62**	**0.34**	**0.273**	**0.0079**	**3.9**	**3.3**	**0.6**	**0.0033**	**Horizontal stack,**	**14.0**	0.6	294.3	10.2
(BH-10) sawmill baghouse	**1.33 lb / hour oper.**	**4.97**	**2.75**	**2.22**	**0.0639**	**31.9**	**26.6**	**5.3**	**0.0279**	Vertical stack,	**12.5**	**1.2**	294.3	**19.6**
(BH-11) sawdust bin baghouse	**0.29 lb / hour oper.**	**1.09**	**0.60**	**0.49**	**0.0141**	**7.0**	**5.8**	**1.2**	**0.0611**	Vertical stack,	**7.2**	**0.6**	294.3	**17.9**
(CY-2) chip bin cyclone	1.09 lb / hour oper.	**4.09**	**2.24**	**1.85**	**0.0527**	26.2	21.9	4.4	0.02295	**Capped stack**	**16.8**	**0.9**	294.3	**6.1**
(DB) fugitives from debarking	0.0003 lb/Mbf	0.058	0.027	0.031	0.000882	0.43	0.36	0.07	0.000375	Volume	4.6	--	--	--
(CS) fugitives from cut-off saws	0.0000441 lb / Mbf	0.0085	0.0040	0.0045	0.00013	0.063	0.053	0.011	0.0000546	Three volumes	4.6	--	--	--
(MH) fugitives from material handling	various	0.003	0.001	0.002	0.00006	0.0056	0.0047	0.0009	0.000018	Volume	3.7	--	--	--

Source unit/ volume	$PM_{2.5}$ Emis. factor	Annual potential (tpy)	Annual actuals (tpy)[a]	Annual potential increase (tpy)	Annual-scenario emission rate (g/s)	Daily potential (lb/day)	Daily actuals (lb/day)	Daily increase (lb/day)	Daily emis. rate (g/s)	Configuration / Details	Ht. (m)	Diam. (m)	Temp. (K)	Vel (m/s)
Fugitives from hog fuel pile	0.00175 ton / acre-yr	0.0008	0.0003	0.0005	0.0000134	0.006	0.005	0.001	0.0000134	Volume	3.0	--	--	--
Fugitives from unpaved roads	various[b]	2.03[c]	1.44	0.59	0.0077	13.4	11.1	2.3	0.0053	Two volumes covering facility, assuming 79% dust control	5.2	--	--	--
Fugitives from paved roads	various[b]	0.92[c]	0.65	0.27	0.0170	6.0	5.0	1.0	0.0117	Two volumes covering facility, assuming 75% dust control	5.2	--	--	--

[a]Actual emissions based on 2015-2016 operations
[b]Mobile source fugitive emission rates determined by PLC used a daily emission rate based on vehicle miles traveled assumed for vehicle fleet, assuming maximum long-term average of 16 hours of vehicle operation per day.
[c]Annual potential is based on assumption of 365 days per year at the maximum long-term potential daily rate assumed by PLC.
**parameters that have changed from the original modeling are bolded and shaded blue.

3.5 Background concentration

The background concentration methodology is discussed in Section 4 of this memo. A background design concentration was determined using 2015-2017 St. Maries $PM_{2.5}$ monitor daily-average measurements. The May 2019 revised modeling applied a background concentration using a seasonal (winter) 2016 – 2018 design value of 31 µg/m^3. The annual and 24-hour average values are listed in **Table 7**.

Table 7. Background concentrations.

Period	98th percentile 24-hour $PM_{2.5}$ average (µg/m^3)	Annual $PM_{2.5}$ average (µg/m^3)
2015	33	9.1
2016	26	7.9
2017	38	10.2
2018	31	9.7
3-year average (2015-2017)	***32***	***9.1***
3-year average (2016-2018)	***32***	***9.3***

3.6 Model selection and options

AERMOD version 18081, the regulatory version of AERMOD at the time of the submittal of the final modeling, was applied. Regulatory default settings were used, applying site-specific meteorology. Application of the model was conducted in accordance with the *Guideline*.

3.7 Modeling results

Final modeling results reported here are based on supplemental AERMOD simulations submitted by PLC as part of the Benson Letter. The results of the $PM_{2.5}$ modeling are listed in **Table 8**.

Table 8. Modeling results.

Scenario	Form	Modeled Results (µg/m^3)	Background concentration (µg/m^3)	Design concentration (µg/m^3)	$PM_{2.5}$ NAAQS (µg/m^3)
Annual Concentration	Arithmetic mean	2.82[b]	9.1[a]	11.92	12.0
24-hour average concentration	98th percentile of daily averages	2.94[b]	32[a]	34.94	35

[a]Background concentrations rounded as specified in 40 CFR Part 50, Appendix N.
[b]Modeling results are not rounded, in accordance with EPA policy.

3.8 May 2019 modeling revision

Additional modeling was submitted in May 2019 to support revised emission factors. The revised modeling analysis applied an updated background concentration based on 2016-2018 St. Maries monitor data. Results are listed in **Table 9**.

Table 9. May 2019 revised modeling results.

Scenario	Form	Modeled Results (µg/m³)	Background concentration (µg/m³)	Design concentration (µg/m³)	$PM_{2.5}$ NAAQS (µg/m³)
Annual Concentration	Arithmetic mean	2.48[b]	9.3[a]	11.78	12
24-hour average concentration	98th percentile of daily averages	3.79[b]	31[a]	34.79	35

[a]Background concentrations rounded as specified in 40 CFR Part 50, Appendix N, based on the maximum seasonal value corresponding with the period of maximum impact.
[b]Modeling results are not rounded, in accordance with EPA policy.

Sensitivity modeling was conducted by PLC to confirm the lumber dry kiln $PM_{2.5}$ emission factor of 0.051 lb/mbf could increase up to 0.055 lb/mbf (24-hr average) and 0.059 lb/mbf (annual average) without exceeding the respective NAAQS.

3.9 Source unit impact apportionment

EPA Region 10 conducted additional AERMOD modeling runs to examine the apportionment of source unit project impact at the maximum receptors. The results are listed in **Table 10**.

Source apportionment analysis was also conducted for the May 2019 revised modeling, listed in **Table 11**.

Table 10. Source apportionment analysis results.

24-hour AERMOD results:			**Annual AERMOD results:**		
Source Unit:	**max receptor impact on 8th highest day (µg/m3)**	**fraction of impact**	**Source Unit:**	**max annual receptor µg/m3**	**fraction of impact**
Kiln 6	1.88549	64.24%	**Traffic fugitives**	0.56662	20.12%
BH2	0.22705	7.74%	**BH2**	0.50893	18.07%
Traffic fugitives	0.22608	7.70%	**BH3**	0.4513	16.03%
BH3	0.2055	7.00%	**Kiln 6**	0.38866	13.80%
CY2	0.08579	2.92%	**BH10**	0.2304	8.18%
CE Boiler	0.08205	2.80%	**CY2**	0.18756	6.66%
BH4	0.05847	1.99%	**BH11**	0.17145	6.09%
BH10	0.05489	1.87%	**CE Boiler**	0.102	3.62%
BH5	0.05326	1.81%	**BH4**	0.08461	3.00%
BH11	0.04781	1.63%	**BH5**	0.07601	2.70%
BV2	0.00322	0.11%	**Riley Boiler**	0.01867	0.66%
Riley Boiler	0.00172	0.06%	**BV2**	0.01553	0.55%
BV3	0.00168	0.06%	**Debarker**	0.01049	0.37%
Debarker	0.00129	0.04%	**Material Handling 1**	0.00075	0.03%
Material Handling 1	0.00043	0.01%	**Hog fuel pile**	0.00074	0.03%
Hog fuel pile	0.00019	0.01%	**Cut-off saw 3**	0.00055	0.02%
Cut-off saw 2	0.00007	0.00%	**Cut-off saw 2**	0.00051	0.02%
Cut-off saw 1	0.00006	0.00%	**Cut-off saw 1**	0.00048	0.02%
Cut-off saw 3	0.00006	0.00%	**BV3**	0.00027	0.01%
Material Handling 2	0.00001	0.00%	**Material Handling 2**	0.00008	0.00%

24-hour AERMOD results:			Annual AERMOD results:		
Material Handling 3	0.00001	0.00%	**Material Handling 4**	0.00006	0.00%
Material Handling 4	0	0.00%	**Material Handling 3**	0.00002	0.00%
total:	2.93513	µg/m3	**total:**	2.81569	µg/m3

Table 11. May 2019 revised modeling source apportionment analysis results.

24-hour AERMOD results:			**Annual AERMOD results:**		
Source Unit:	**max receptor impact on 8th highest day (µg/m3)**	**fraction of impact**	**Source Unit:**	**max annual receptor µg/m3**	**fraction of impact**
Kiln 6	2.8100	70.35%	**Kiln 6**	1.2377	48.18%
Traffic fugitives	0.6405	16.04%	**BH2**	0.3624	14.11%
BH2	0.2655	6.65%	**Traffic fugitives**	0.2323	9.05%
BH3	0.1865	4.67%	**BH3**	0.2263	8.81%
BH4	0.0302	0.76%	**CY2**	0.1533	5.97%
BH5	0.0245	0.61%	**BH10**	0.0888	3.46%
BH11	0.0131	0.33%	**CE Boiler**	0.0752	2.93%
CY2	0.0056	0.14%	**BH4**	0.0583	2.27%
CE Boiler	0.0052	0.13%	**BH5**	0.0488	1.90%
BH10	0.0049	0.12%	**BH11**	0.0487	1.90%
BV3	0.0028	0.07%	**Riley Boiler**	0.0153	0.59%
Debarker	0.0027	0.07%	**BV2**	0.0105	0.41%
Material Handling 1	0.0008	0.02%	**Debarker**	0.0082	0.32%
Hog fuel pile	0.0006	0.02%	**Material Handling 1**	0.0009	0.03%
BV2	0.0002	0.01%	**Hog fuel pile**	0.0005	0.02%
Cut-off saw 2	0.0001	0.00%	**Cut-off saw 3**	0.0004	0.02%
Cut-off saw 3	0.0001	0.00%	**Cut-off saw 2**	0.0004	0.02%
Cut-off saw 1	0.0001	0.00%	**Cut-off saw 1**	0.0004	0.01%
Material Handling 2	0.0000	0.00%	**BV3**	0.0002	0.01%
Material Handling 4	0.0000	0.00%	**Material Handling 2**	0.0001	0.00%
Material Handling 3	0.0000	0.00%	**Material Handling 4**	0.0001	0.00%
Riley Boiler	0.0000	0.00%	**Material Handling 3**	0.0000	0.00%
total:	3.99	µg/m3	**total:**	2.57	µg/m3

4. BACKGROUND CONCENTRATION ANALYSIS

The 2015-2017 St. Maries monitoring dataset was originally used to develop the background design concentrations for the AQIA. EPA Region 10 contacted Mary Walsh of IDEQ to discuss aspects of the St. Maries monitoring program. Mary confirmed the 2015 - 2017 $PM_{2.5}$ concentrations are based on 24-hour FRM filter-based sample measurements. The datasets have been reviewed by the State of Idaho and submitted to EPA's AQS system. Idaho has identified and flagged exceptional events in 2015 and 2017 attributed to forest fire smoke impacts. EPA Region 10 has opted to adopt Idaho's flagged days for the purposes of this AQIA, in accordance with procedures specified in the *Guideline*.

In 2015, the 24-hour filter-based measurements were taken every three days. The 2015 dataset contained a number of state-flagged exceptional events, due to wildfires. These requested exclusion periods are flagged in the AQS database. With these values removed, there are a total of 54 24-hour average values in the 2015 dataset. The 98th percentile is the 2nd-high value in this case[12]. For 2016, the filter-based 24-hour average measurements were taken each day. No exceptional events were flagged in the 2016 dataset posted to AQS. The 2016 dataset consists of a total of 342 24-hour average values. The 98th percentile value is the 7th high 24-hour average value in this case. The 2017 dataset consists of a total of 345 daily average values. Idaho flagged 32 of these days as exceptional events due to wildfire smoke impacts. The 98th percentile value is the 7th high of 313 values remaining in the 2017 dataset.

The May 2019 revised modeling used seasonal background values based on the 2016 – 2018 period. The highest seasonal 24-hr average background of 31 µg/m^3 coincided with the period of maximum impact from the project.

The 24-hour average and annual average design values are presented in **Table 12**.

Table 12. Background concentration analysis

Period	**Total 24-hour average samples**	**Samples applied (flagged exceptional events removed)**	**98th percentile form**	**98th percentile 24-hour average concentration (µg/m^3)**	**Annual arithmetic average (µg/m^3)**
2015	59	54	2nd high	33	9.1
2016	342	342	7th high	26	7.9
2017	345	313	7th high	38	10.2
2018	299	291	6th high	31	9.7
2015-2017 3-yr avg.	--	--	--	32	9.1
2016-2018 3-yr avg.	--	--	--	32	9.3

[12] Calculated in accordance with 40 CFR Part 50, Appendix N: 98th percentiles determined according to Table 1 of this section.

Appendix A: Daily plots of hourly $PM_{2.5}$ and wind direction for selected days

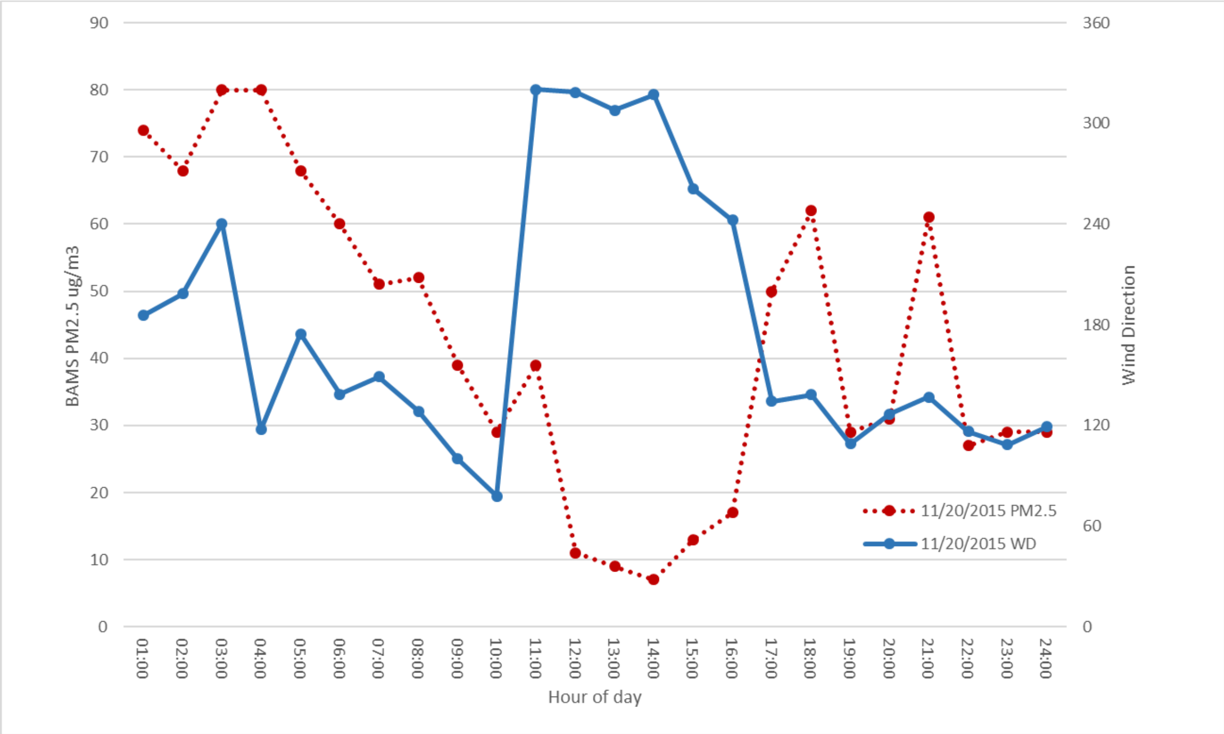


Fig. A-i. Nov. 20, 2015 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

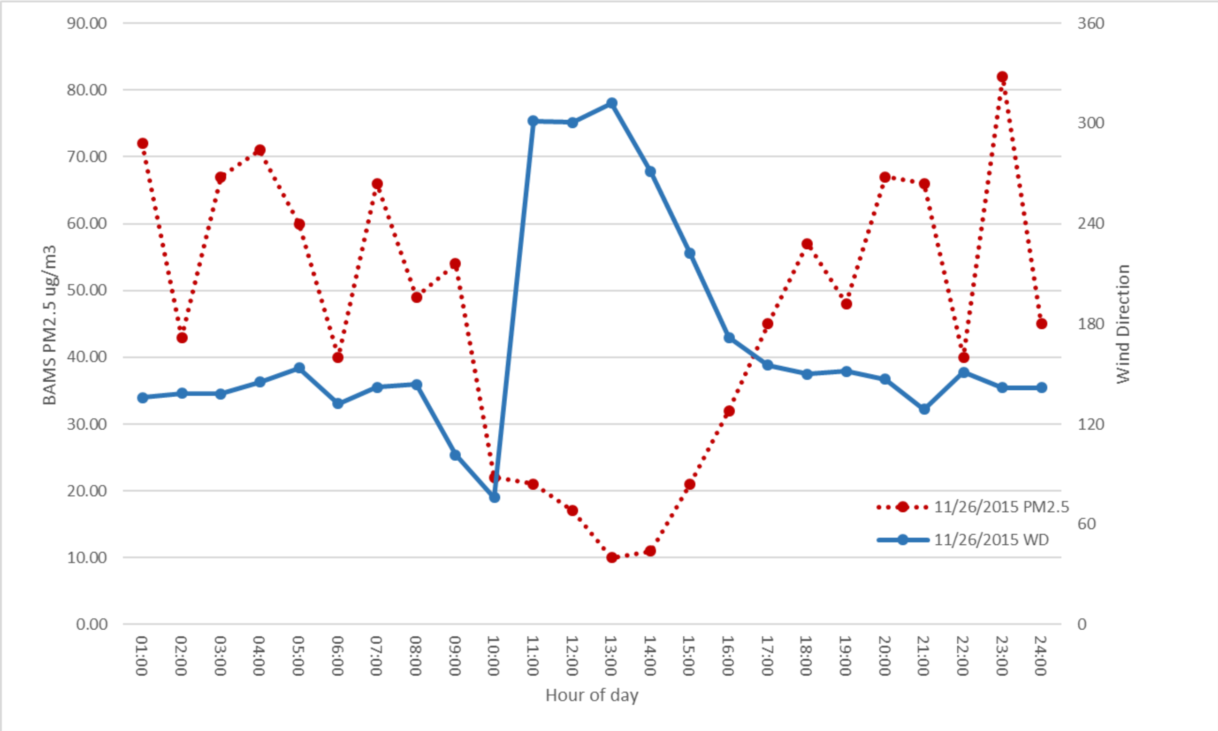


Fig. A-i. Nov. 26, 2015 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

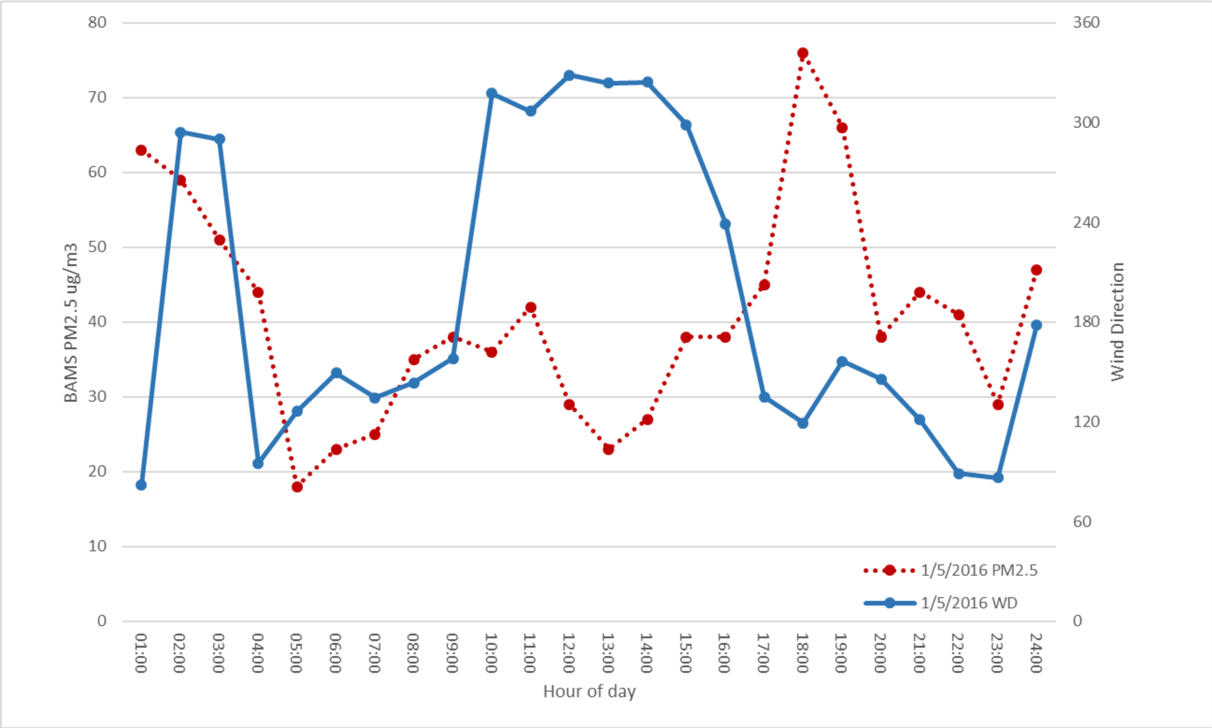


Fig. A-ii. Jan. 5, 2016 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

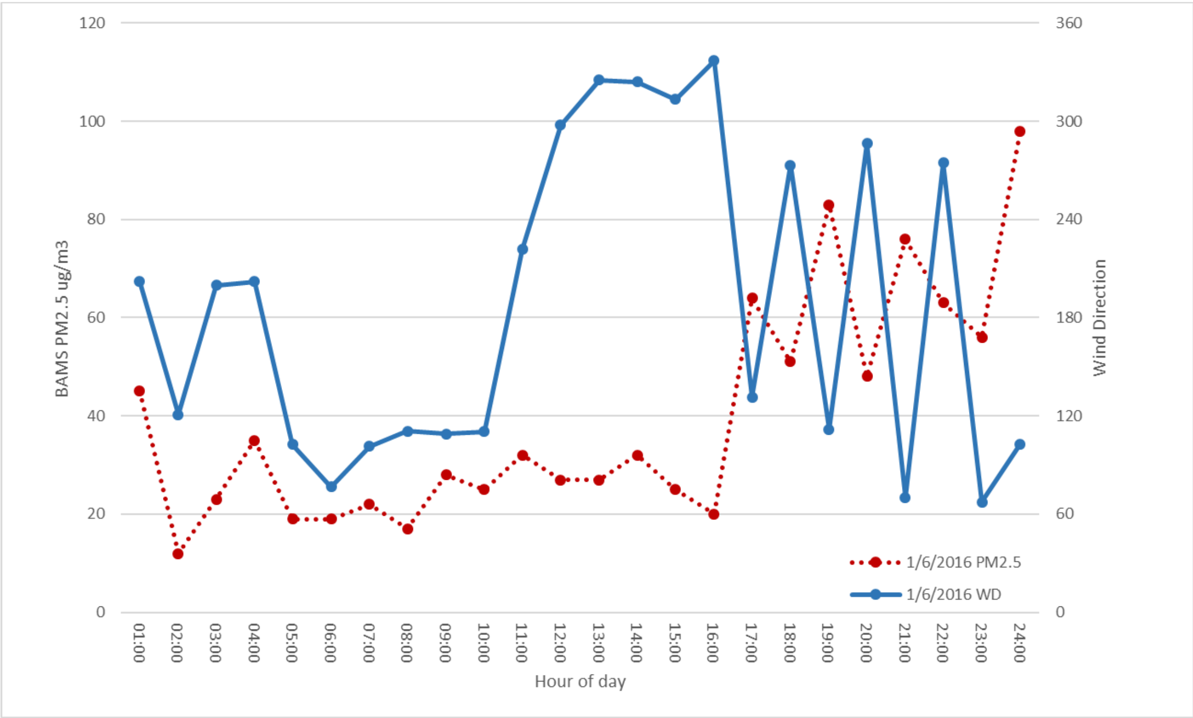


Fig.A- iii. Jan. 6, 2016 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

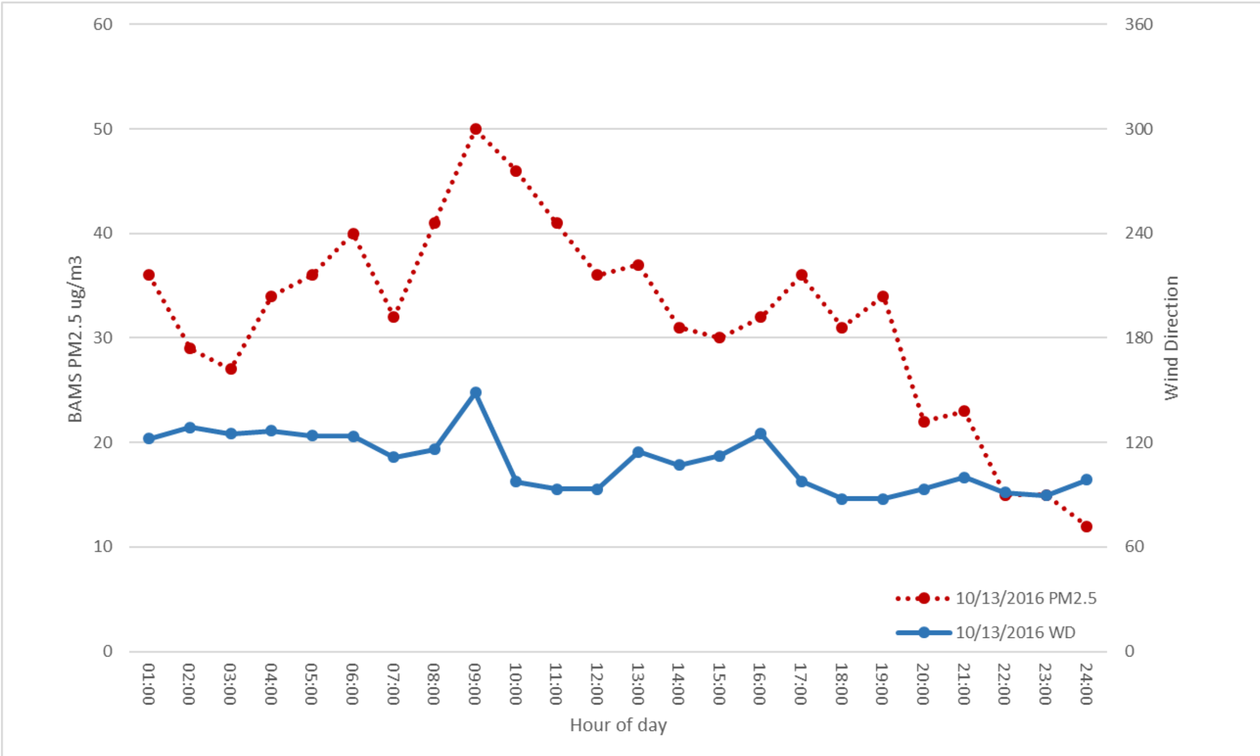


Fig. A-iv. Oct. 13, 2016 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

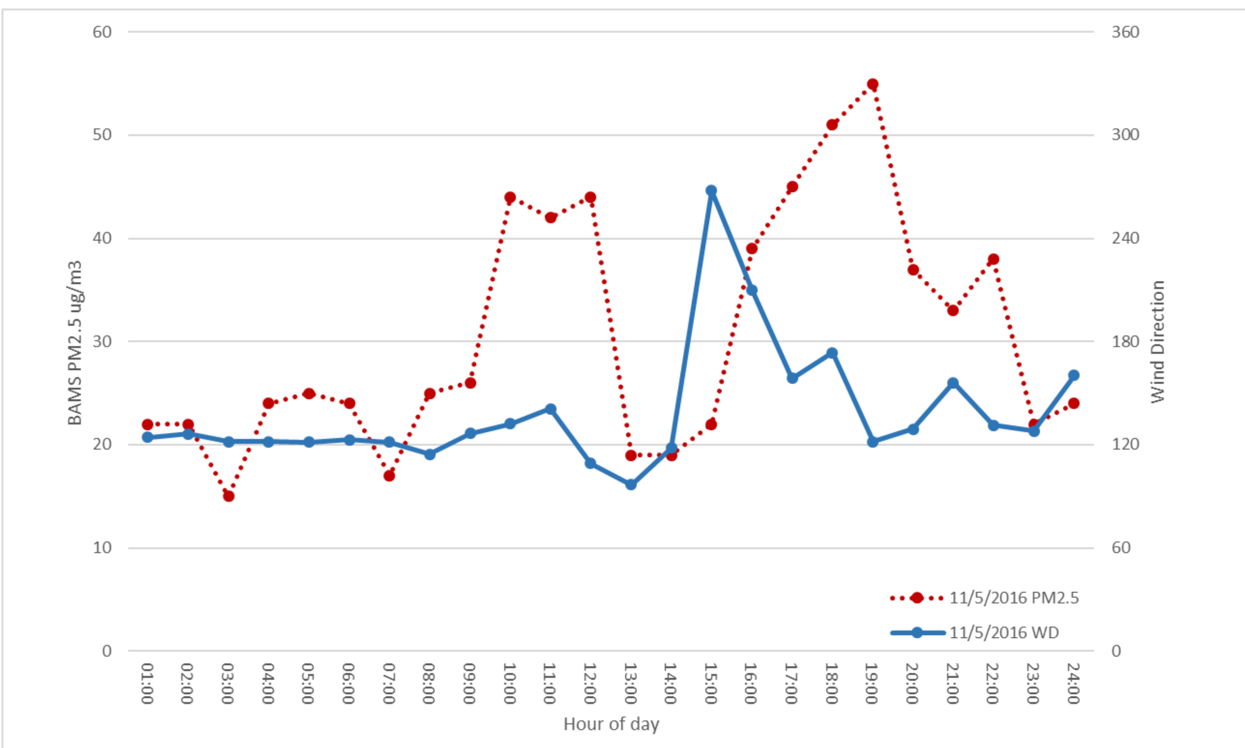


Fig. A- v. Nov. 5, 2016 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

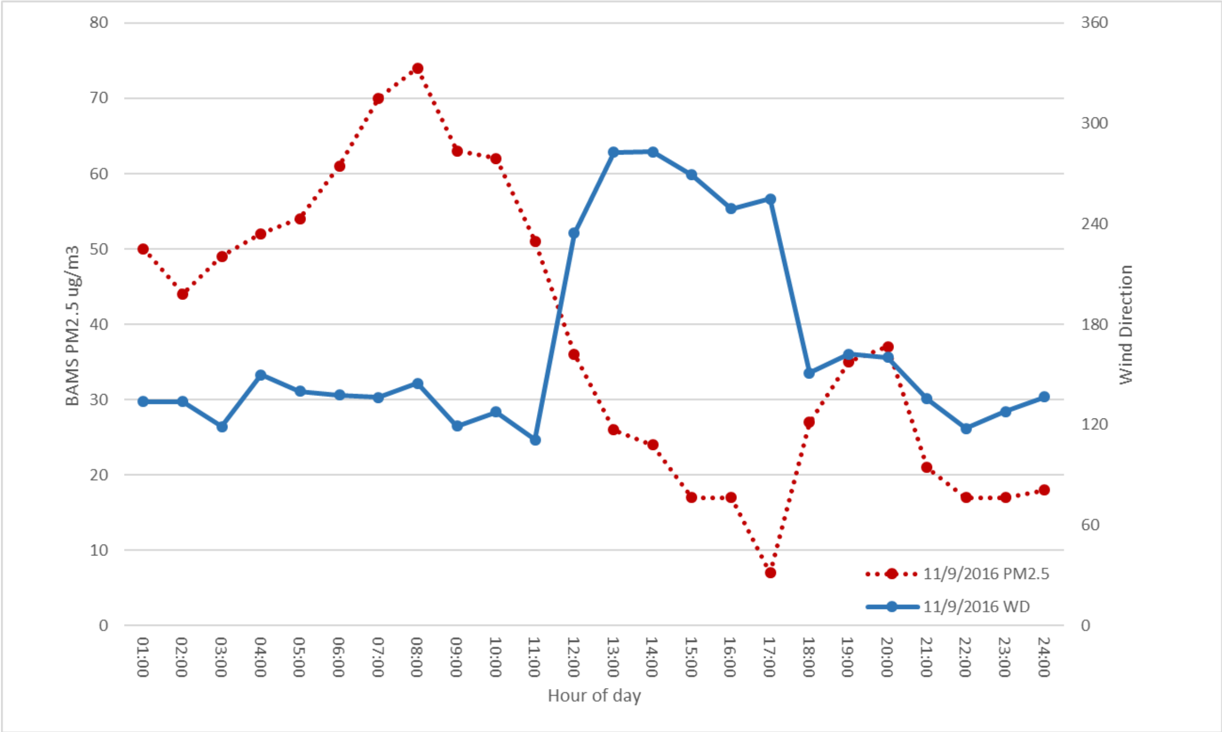


Fig. A-vi. Nov. 9, 2016 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

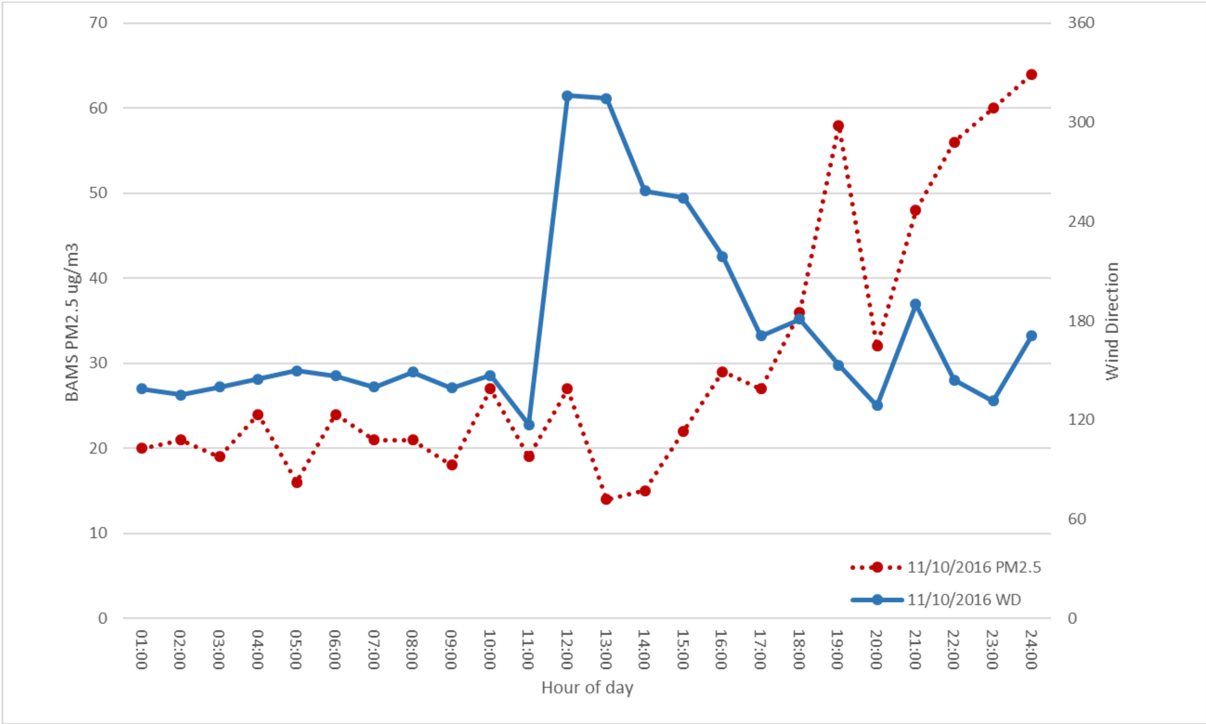


Fig. A-vii. Nov. 10, 2016 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

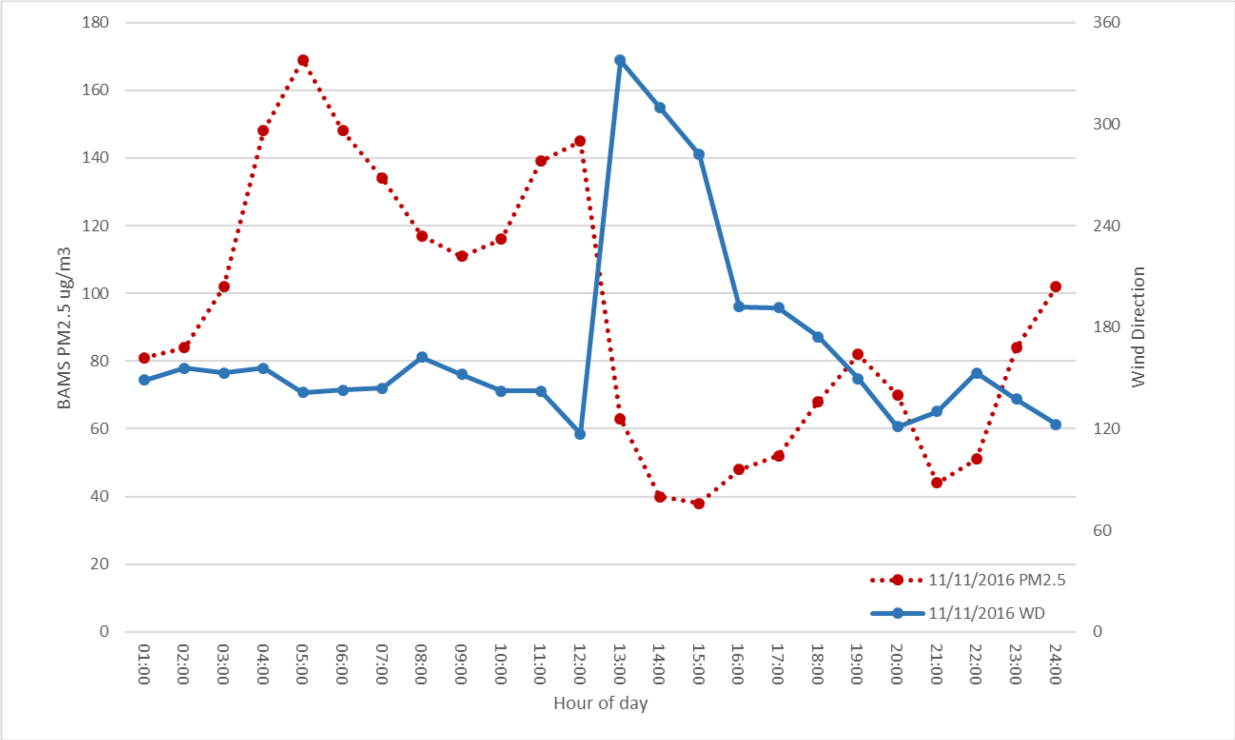


Fig. A-viii. Nov. 11, 2016 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

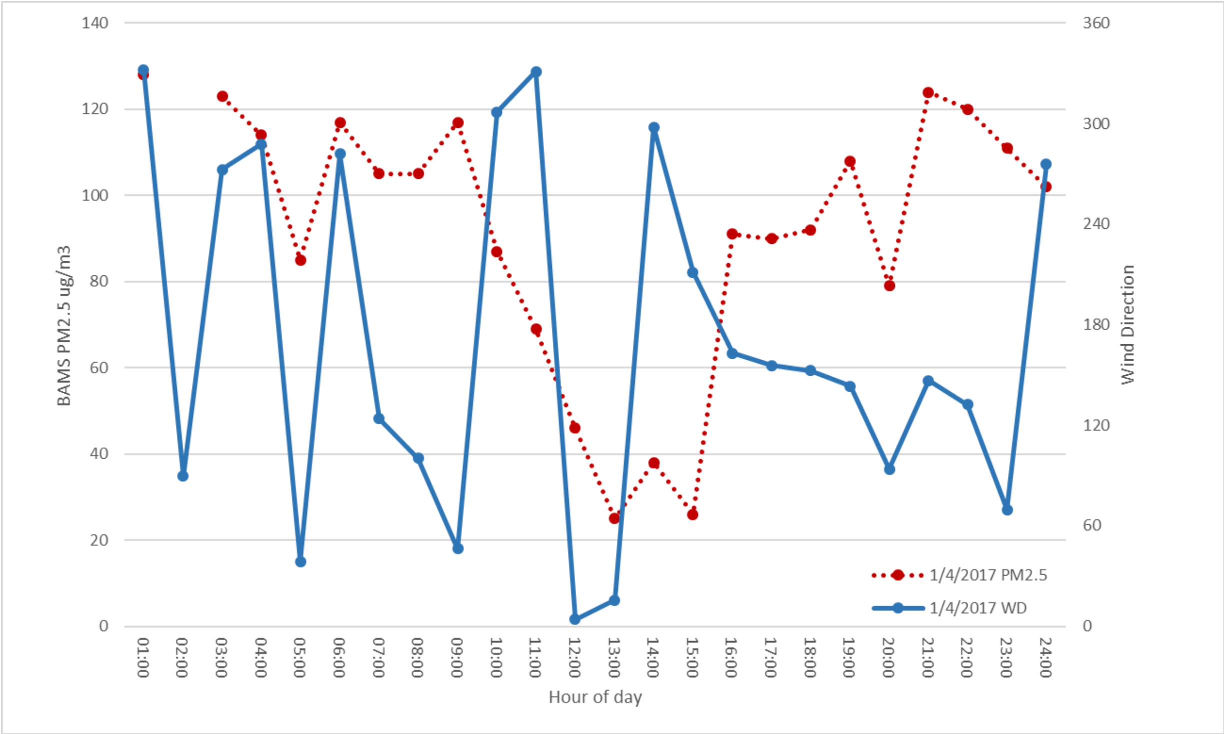


Fig. A-ix. Jan. 4, 2017 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

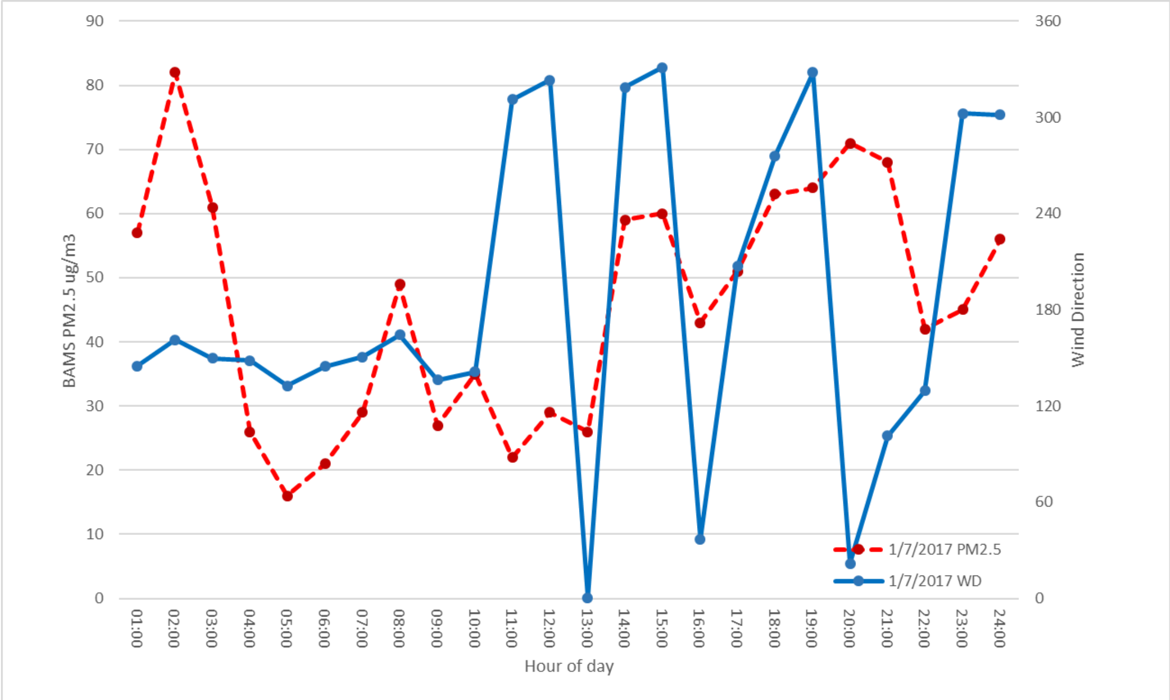


Fig. A-x. Jan. 7, 2017 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

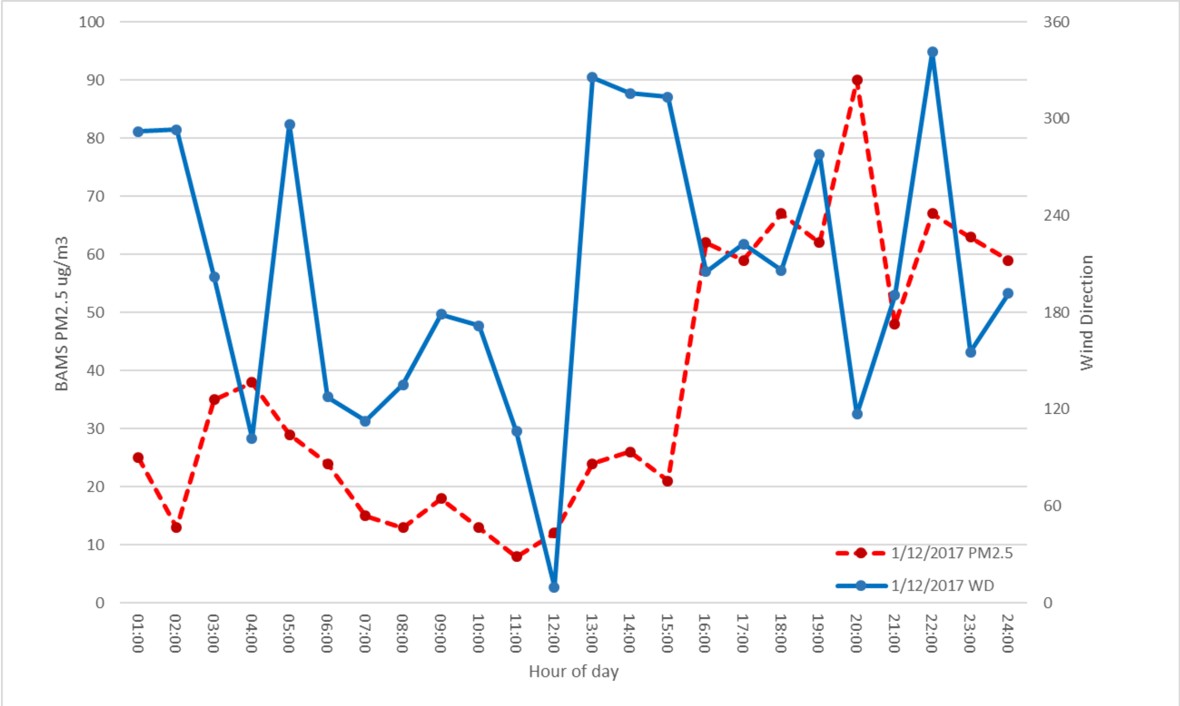


Fig. A-xi. Jan. 12, 2017 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

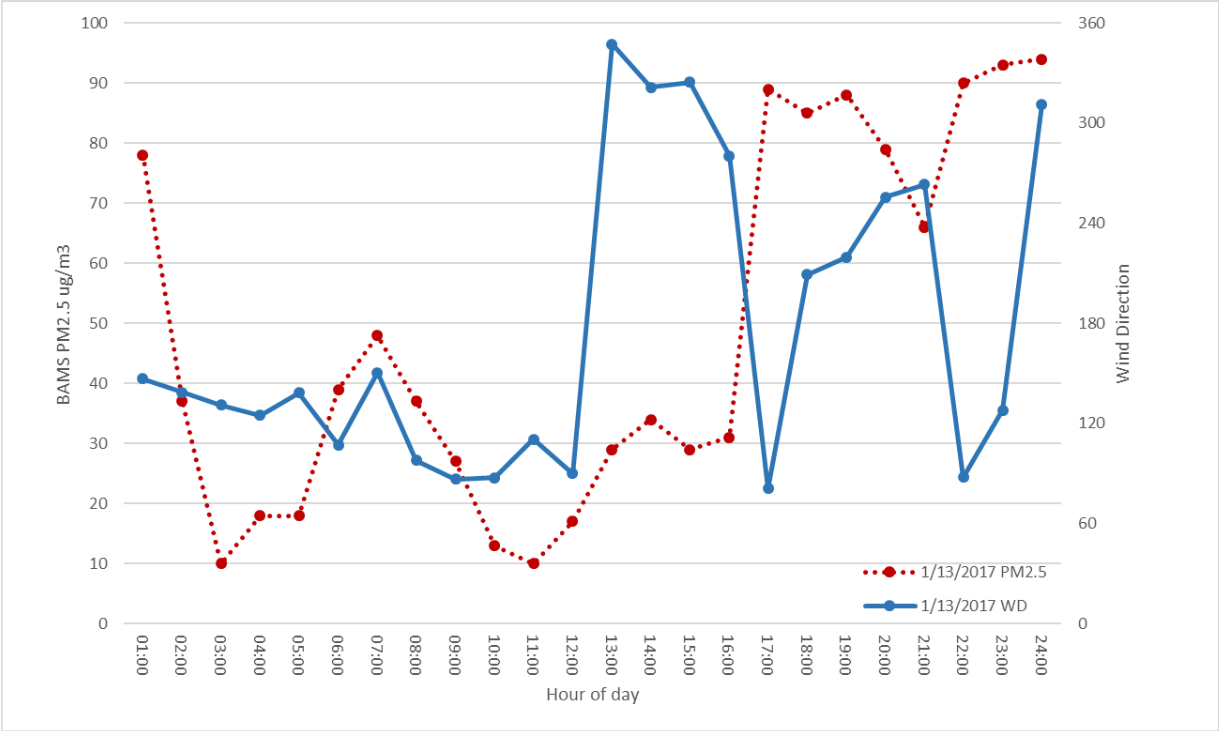


Fig. A-xii. Jan. 13, 2017 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

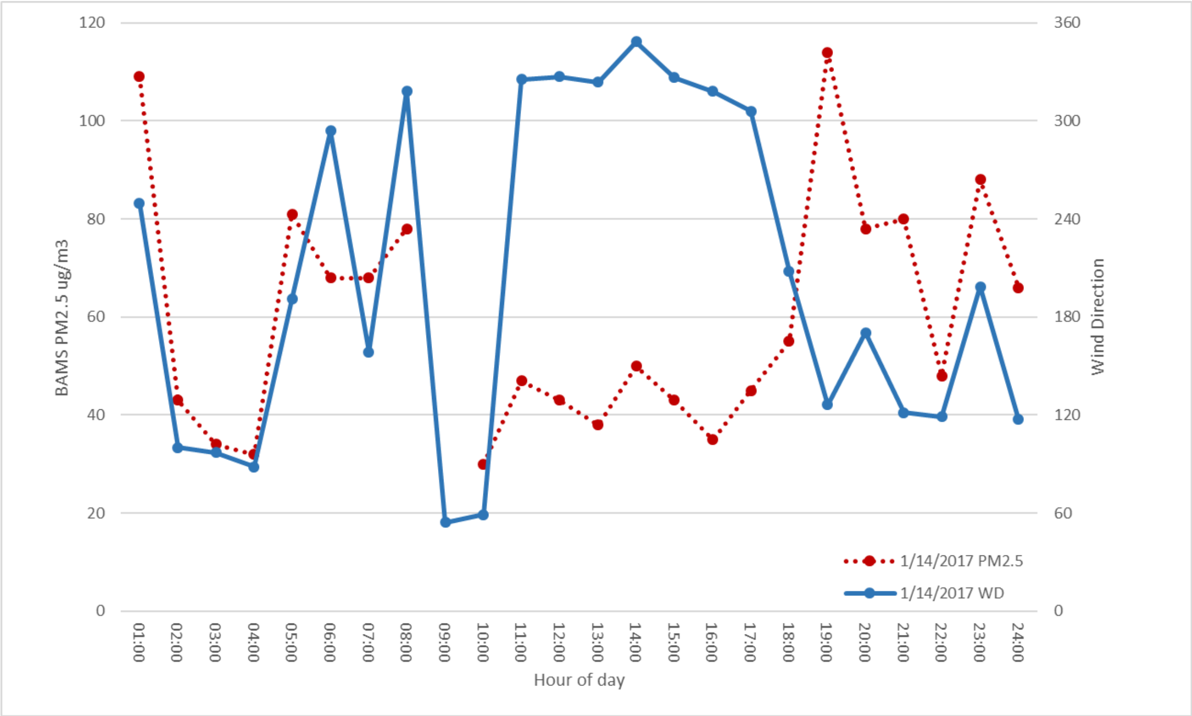


Fig. A-xiii. Jan. 14, 2017 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

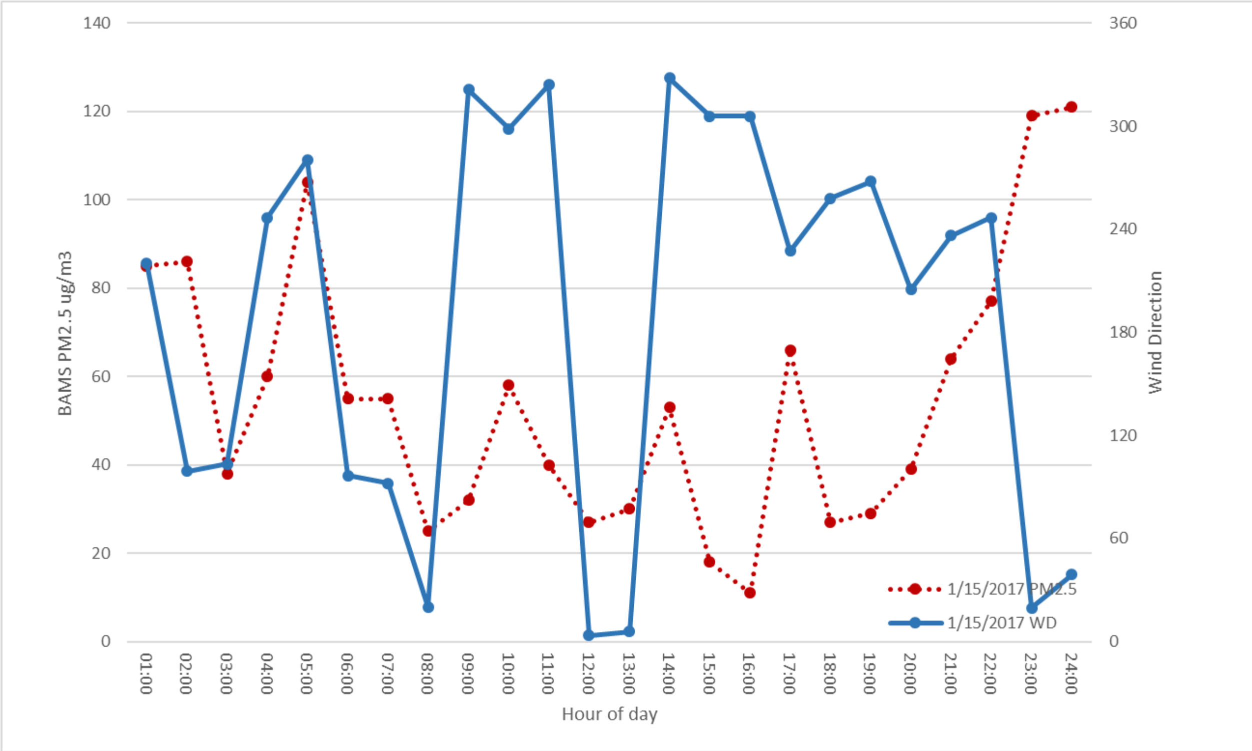


Fig. A- xiv. Jan. 15, 2017 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

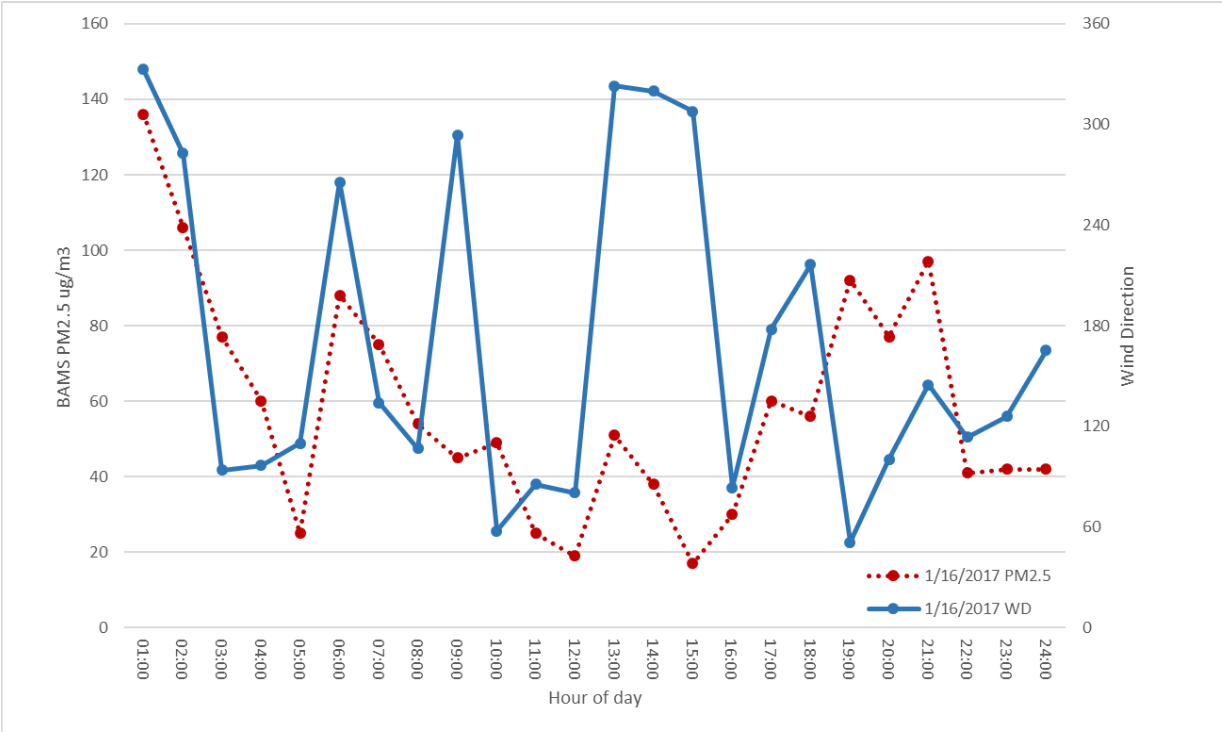


Fig. A- xv. Jan. 16, 2017 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

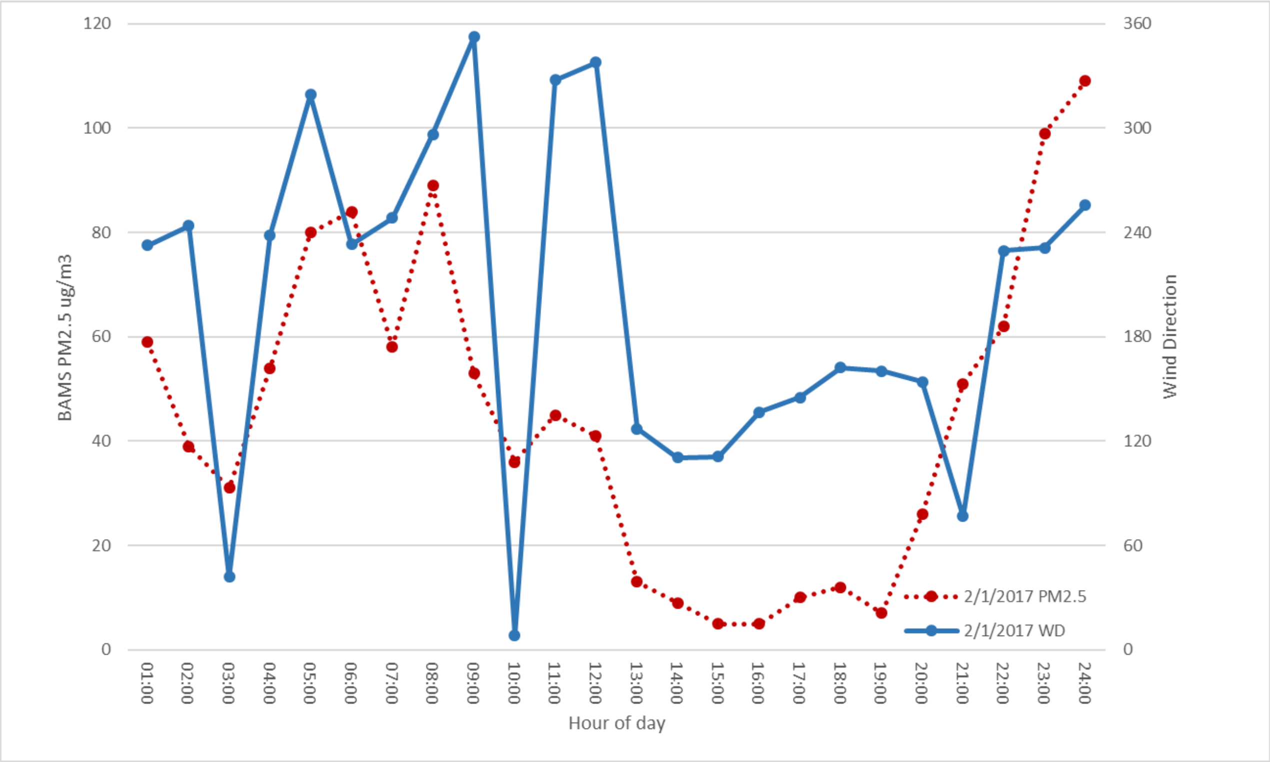


Fig. A-xvi. Feb. 1, 2017 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

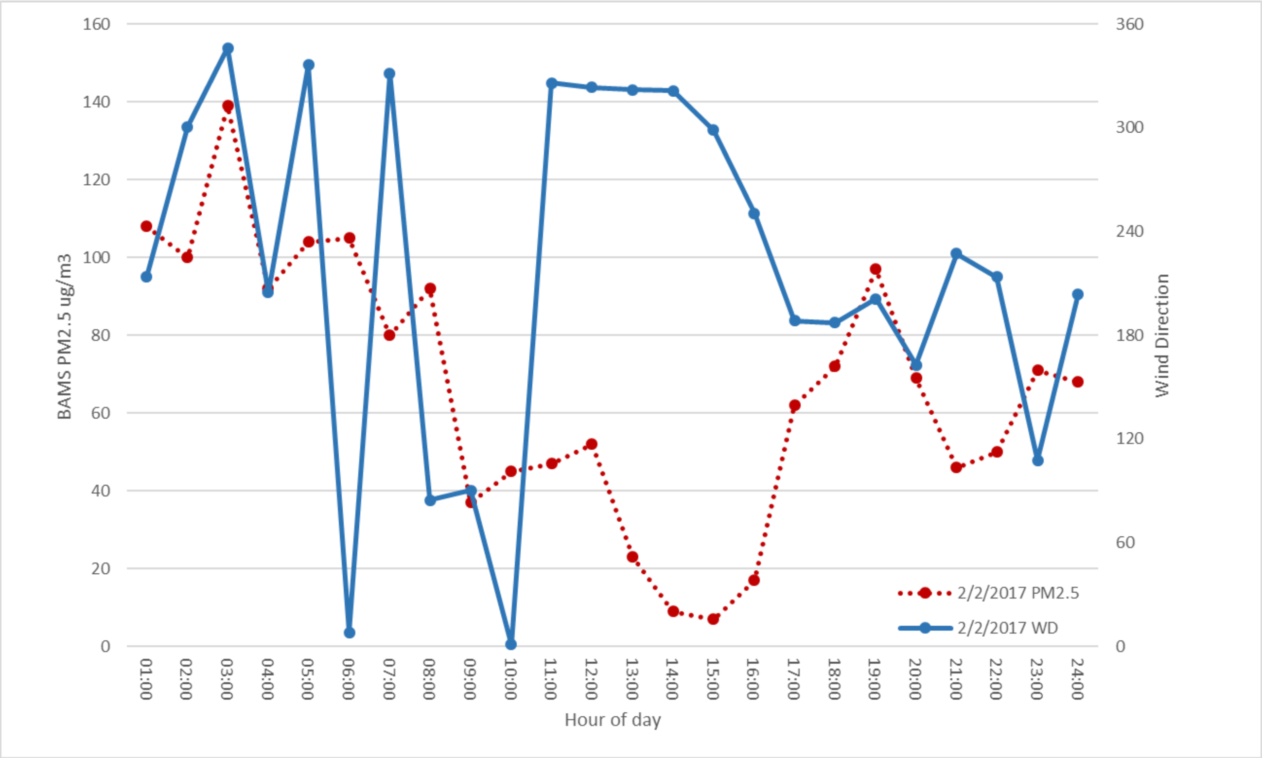


Fig. A- xvii. Feb. 2, 2017 time-series of hourly average $PM_{2.5}$ concentration and wind direction.

Appendix D

Calculation of PM2.5 Emission Factors and Pound-Per-Day and Ton-Per-Year Emission Limits Required to "Reduce or Mitigate Impacts" Resulting from the Project Based upon Air Quality Impact Analysis

Lumber Kiln No. 6 Project
PotlatchDeltic - St. Maries Complex

Permit Analysis
Minor NSR Permit No. R10TNSR01800

St. Maries, Idaho

Summary of PM2.5 Emission Factors and Pound-Per-Day and Ton-Per-Year Emission Limits Required to "Reduce or Mitigate Impacts" Resulting from Lumber Kiln No. 6 Project. Limits are Based upon an Air Quality Impact Analysis Conducted Pursuant to 40 CFR 49.151(e)(5), 154(d)(3), 155(a)(1)(ii) and Appendix W to 40 CFR part 51.

PotlatchDeltic performed an air quality impact analysis to demonstrate that the project would not cause or contribute to either a 24-hour or annual PM2.5 NAAQS violation. The following table identifies all of the emission generating activities that are a part of the project along with the emission factors and allowable emissions employed to conduct the AQIA. Derivations for all of the values in the table are provided in the pages that follow.

Emission Unit ID	Existing / New	Control Device / Process Unit	PM2.5 Emission Factor	24-Hour NAAQS AQIA		Annual NAAQS AQIA	Permit Annual Allowable Emissions[4] (tpy)
				Allowable Daily Emissions (lb/day)	Allowable Annual Emissions (tpy)	Allowable Annual Emissions (tpy)	
				[A]	[B] = [A] * X/2000	[C]	Lesser of [A] & [C]
Non-fugitive emissions							
1. LK-6	New	none	0.0510 lb/Mbf green lumber entering kiln	9.5200	1.7374	1.7374	1.7374
2. PB-1	Existing	MC1-ESP1	0.01488 lb/Mlb steam generated	15.3685	2.8047	**2.2811**	2.2811
3. PB-2	Existing	MC2-ESP2	0.00722 lb/Mlb steam generated	16.9814	**3.0991**	3.1940	3.0991
4. PCWR-PM-SH	Existing	BH-2	0.8229 lb/planer mill hour	19.7486	3.0808	3.0808	3.0808
5. PCWR-PM-SD	Existing	BH-3	0.7406 lb/BH-3 fan hour	17.7737	2.7727	2.7727	2.7727
6. PCWR-PM-PTB	Existing	BH-4	0.1646 lb/BH-4 fan hour	3.9497	0.6162	0.6162	0.6162
7. PCWR-PM-PSB	Existing	BH-5	0.1646 lb/planer mill hour	3.9497	0.6162	0.6162	0.6162
8. PCWR-SM-SD	Existing	BH-10	1.3280 lb/sawmill hour	31.8729	4.9722	4.9722	4.9722
9. PCWR-SM-SDB	Existing	BH-11	0.2907 lb/sawmill hour	6.9778	1.0885	1.0885	1.0885
10. PCWR-SM-CH	Existing	CY-02	1.0929 lb/sawmill hour	26.2286	4.0917	4.0916	4.0916
11. PT	Existing	Speed limit, sweeping & watering	0.8079 lb/sawmill hour	19.3897	3.0248	**2.5207**	2.52065

Allowable annual emissions derived from the 24-hour NAAQS AQIA are calculated by multiplying the daily allowable emissions (lb/day) by 365 day/yr and dividing by 2000 lb/ton, except for PCWR-PM-SH, PCWR-PM-SD, PCWR-PM-PTB, PCWR-PM-PSB, PCWR-SM-SD, PCWR-SM-SDB, PCWR-SM-CH and PT. For those units, allowable annual emissions derived from the 24-hour NAAQS AQIA are calculated by multiplying the daily allowable emissions (lb/day) by 312 day/yr and dividing by 2000 lb/ton. 312 day/yr = (7488 hr/yr) * (day/24 hr). In calculating the emission rates to employ in the annual NAAQS AQIA, PotlatchDeltic assumed 7488 operating hours per year.
Values appearing in **BOLD** font is the lesser of the two AQIA-based annual allowable emission values (if the values are not equal).

The lesser of the two AQIA-based annual allowable emission values appears in the permit as an emission limit. It is not necessary to list both limits in the permit when compliance with one demonstrates compliance with the other.
BH-2 and BH-5 fan hours are assumed equivalent to planer mill hours. BH-10, BH-11 and CY-2 fan hours are assumed equivalent to sawmill hours.
Emission limits and factors for the following emission units have not been presented here or carried forward into the permit because their contribution to ambient impacts is insignificant at emission rates reflecting potential to emit: BV-2, BV-3, DB, COS, WRD-SH, WRD-CH, WRD-SD, WRD-HF and HFP.

Calculation of PM2.5 Pound-Per-Day Emission Limits Required to "Reduce or Mitigate Impacts" Resulting from the Project Based upon 24-Hour NAAQS Air Quality Impact Analysis. See 40 CFR 49.151(e)(5), 154(d)(3), 155(a)(1)(ii)

1. Emission Unit: Lumber Dry Kiln No. 6 (new unit)

Emission Unit ID	Control Device
LK-6	None

Highest NAAQS-Compliant Emission Factor[1]: 0.0510 lb/Mbf green lumber entering kiln

Permit Allowable Daily Emissions	9.5200 lb/day
'16-'17 Actual Daily Emissions	- 0.0000 lb/day
24-hour NAAQS AQIA Emissions Increase	9.5200 lb/day

Permit Allowable Emissions (Daily)					
Daily Emissions (lb/day)	Average Dry Kiln Capacity (bf/charge)	Volume Unit Conversion Factor (Mbf/bf)	Drying Time[2] (hr/charge)	Highest NAAQS-Compliant Emission Factor (lb/Mbf)	Operating Hours Per Day (hr/day)
9.5200	280,000	0.001	36	0.0510	24

'16-'17 Actual Emissions (Daily)	
Daily Emissions (lb/day)	Emission unit is proposed. It does not exist. It is not replacing an existing emission unit.
0	

[1] Permittee proposed use of this emission factor. It is not based upon a valid test result for this unit or any other. It is a value based upon the emission rate (grams/second) employed in PotlatchDeltic's May 14, 2019 24-hr air quality impact analysis that demonstrates that the project will not cause or contribute to a 24-hr PM2.5 NAAQS violation.

[2] Drying time based upon dry kiln schedule for Grand Fir, White Fir and Western Hemlock.

Calculation of Daily Emissions Increase

Emissions Increase = Permit Allowable Emissions - ~~'16-'17 Actual Emissions~~ 0

Calculation of Permit Allowable Daily Emissions

Emissions = (Dry Kiln Capacity) * (Volume Unit Conversion Factor) / Drying Time * (Highest NAAQS-Compliant Emission Factor) * (Operating Hours Per Day)

Calculation of '16-'17 Actual Daily Emissions

Emissions = 0 lb/day. Emission unit is proposed. It does not exist. It is not replacing an existing emission unit.

2. Emission Unit: CE Boiler (existing unit)

Emission Unit ID	Control Device
PB-1	MC & ESP

Given Emission Factor[1]: 0.01488 lb/Mlb steam generated

Permit Allowable Daily Emissions	15.3685 lb/day
'16-'17 Actual Daily Emissions	- 11.0707 lb/day
24-hour NAAQS AQIA Emissions Increase	4.2978 lb/day

Permit Allowable Emissions (Daily)			
Daily Emissions (lb/day)	Maximum '16-'17 Daily Average Hourly Steaming Rate (Mlb steam/hr)	Operating Hours Per Day (hr/day)	Emission Factor (lb/Mlb steam)
15.3685	43.0345	24	0.01488

'16-'17 Actual Emissions (Daily)			
Daily Emissions (lb/day)	98th Percentile '16-'17 Daily Average Hourly Steaming Rate (Mlb steam/hr)	Operating Hours Per Day (hr/day)	Emission Factor (lb/Mlb steam)
11.0707	31.0000	24	0.01488

[1] Permittee proposed use of this emission factor. It is based, in part, upon Reference Method 5 testing of PB-1 exhaust at high steam load conditions and an assumed filterable PM2.5/RM5 PM ratio. Permittee is required to conduct source testing to determine up-to-date representative emission factor(s) to employ in daily emission calculations.

Calculation of Daily Emissions Increase

Emissions Increase = Permit Allowable Emissions - '16-'17 Actual Emissions

Calculation of Permit Allowable Daily Emissions

Emissions = (Maximum '16-'17 Daily Average Hourly Operating Rate) * (Operating Hours Per Day) * (Emission Factor)

Calculation of '16-'17 Actual Daily Emissions

Emissions = (98th Percentile '16-'17 Daily Average Hourly Operating Rate) * (Operating Hours Per Day) * (Emission Factor)

3. Emission Unit: Riley Boiler (existing unit)

Emission Unit ID	Control Device
PB-2	MC & ESP

Given Emission Factor[1]: 0.00722 lb/Mlb steam generated

Permit Allowable Daily Emissions	16.9814 lb/day
'16-'17 Actual Daily Emissions	- 15.0862 lb/day
24-hour NAAQS AQIA Emissions Increase	1.8953 lb/day

Permit Allowable Emissions (Daily)			
Daily Emissions (lb/day)	Maximum '16-'17 Daily Average Hourly Steaming Rate (Mlb steam/hr)	Operating Hours Per Day (hr/day)	Emission Factor (lb/Mlb steam)
16.9814	98.0000	24	0.00722

'16-'17 Actual Emissions (Daily)			
Daily Emissions (lb/day)	98th Percentile '16-'17 Daily Average Hourly Steaming Rate (Mlb steam/hr)	Operating Hours Per Day (hr/day)	Emission Factor (lb/Mlb steam)
15.0862	87.0625	24	0.00722

[1] Permittee proposed use of this emission factor. It is based, in part, upon Reference Method 5 testing of PB-2 exhaust at mid and high steam load conditions and an assumed filterable PM2.5/RM5 PM ratio. Permittee is required to conduct source testing to determine up-to-date representative emission factor(s) to employ in daily emission calculations.

Calculation of Daily Emissions Increase

Emissions Increase = Permit Allowable Emissions - '16-'17 Actual Emissions

Calculation of Permit Allowable Daily Emissions

Emissions = (Maximum '16-'17 Daily Average Hourly Operating Rate) * (Operating Hours Per Day) * (Emission Factor)

Calculation of '16-'17 Actual Daily Emissions

Emissions = (98th Percentile '16-'17 Daily Average Hourly Operating Rate) * (Operating Hours Per Day) * (Emission Factor)

4. Emission Unit: Planer shavings pneumatically conveyed to baghouse BH-2 (existing unit)

Emission Unit ID	Control Device
PCWR-PM-SH	BH-2

Calculated Emission Factor[1]: 0.8229 lb/BH-2 fan hour

Emission Factor Calculation				
Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
0.8229	0.0032	30,000	60	0.000142857

Permit Allowable Daily Emissions	19.7486 lb/day
'16-'17 Actual Daily Emissions	- 16.6217 lb/day
24-hour NAAQS AQIA Emissions Increase	3.1269 lb/day

Permit Allowable Emissions (Daily)		
Daily Emissions (lb/day)	Maximum Daily BH-2 Fan Hours (hr/day)	Emission Factor (lb/hr)
19.7486	24.0	0.8229

'16-'17 Actual Emissions (Daily)		
Daily Emissions (lb/day)	98th Percentile '16-'17 Daily BH-2 Fan Hours[2] (hr/day)	Emission Factor (lb/hr)
16.6217	20.2	0.8229

[1] Permittee proposed use of this emission factor. It is based upon Reference Method 5 PM testing of BH-2 and BH-3 exhaust (in 1996 while processing softwood lumber at rates of 23.2 and 23.8 Mbf/hr) and an assumed 50% filterable PM2.5/RM5 PM ratio. Note that the 2016-17 98th percentile rate of softwood lumber entering the Planer is approximately 64 Mbf/hr. Permittee is required to conduct source testing to determine up-to-date representative emission factor to employ in daily emission calculation.
[2] 98th percentile 2016-17 daily BH-2 fan hours assumed equal to 98th percentile 2016-17 planer mill shift hours.

Calculation of Emission Factor
Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)
Calculation of Daily Emissions Increase
Emissions Increase = Permit Allowable Emissions - '16-'17 Actual Emissions
Calculation of Permit Allowable Daily Emissions
Emissions = (Maximum Daily BH-2 Fan Hours) * (Emission Factor)
Calculation of '16-'17 Actual Daily Emissions
Emissions = (98th Percentile '16-'17 Daily BH-2 Fan Hours) * (Emission Factor)

---

5. Emission Unit: Planed lumber trimmer, trim ends chipper, breakdown hoist and infeed rolls dust generating activities (existing unit)

Emission Unit ID	Control Device
PCWR-PM-SD	BH-3

Calculated Emission Factor[1]: 0.7406 lb/BH-3 fan hour

Emission Factor Calculation				
Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
0.7406	0.0032	27,000	60	0.000142857

Permit Allowable Daily Emissions	17.7737 lb/day
'16-'17 Actual Daily Emissions	- 14.9595 lb/day
24-hour NAAQS AQIA Emissions Increase	2.8142 lb/day

Permit Allowable Emissions (Daily)		
Daily Emissions (lb/day)	Maximum Daily BH-3 Fan Hours (hr/day)	Emission Factor (lb/hr)
17.7737	24.0	0.7406

'16-'17 Actual Emissions (Daily)		
Daily Emissions (lb/day)	98th Percentile '16-'17 Daily BH-3 Fan Hours[2] (hr/day)	Emission Factor (lb/hr)
14.9595	20.2	0.7406

[1] Permittee proposed use of this emission factor. It is based upon Reference Method 5 PM testing of BH-2 and BH-3 exhaust (in 1996 while processing softwood lumber at rates of 23.2 and 23.8 Mbf/hr) and an assumed 50% filterable PM2.5/RM5 PM ratio. Note that the 2016-17 98th percentile rate of softwood lumber entering the Planer is approximately 64 Mbf/hr. Permittee is required to conduct source testing to determine up-to-date representative emission factor to employ in daily emission calculation.
[2] 98th percentile 2016-17 daily BH-3 fan hours assumed equal to 98th percentile 2016-17 planer mill shift hours.

Calculation of Emission Factor
Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)
Calculation of Daily Emissions Increase
Emissions Increase = Permit Allowable Emissions - '16-'17 Actual Emissions
Calculation of Permit Allowable Daily Emissions
Emissions = (Maximum Daily BH-3 Fan Hours) * (Emission Factor)
Calculation of '16-'17 Actual Daily Emissions
Emissions = (98th Percentile '16-'17 Daily BH-3 Fan Hours) * (Emission Factor)

---

6. Emission Unit: Ply trim and trim ends chipper pneumatic conveyance to ply trim bin (existing unit)

Emission Unit ID	Control Device
PCWR-PM-PTB	BH-4

Calculated Emission Factor[1]: 0.1646 lb/BH-4 fan hour

Permit Allowable Daily Emissions	3.9497	lb/day
'16-'17 Actual Daily Emissions	- 3.3243	lb/day
24-hour NAAQS AQIA Emissions Increase	0.6254	lb/day

Emission Factor Calculation

Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
0.1646	0.0032	6,000	60	0.000142857

Permit Allowable Emissions (Daily)

Daily Emissions (lb/day)	Maximum Daily BH-4 Fan Hours (hr/day)	Emission Factor (lb/hr)
3.9497	24.0	0.1646

'16-'17 Actual Emissions (Daily)

Daily Emissions (lb/day)	98th Percentile '16-'17 Daily BH-4 Fan Hours[2] (hr/day)	Emission Factor (lb/hr)
3.3243	20.2	0.1646

[1] Permittee proposed use of this emission factor. It is based upon Reference Method 5 PM testing of BH-2 and BH-3 exhaust (in 1996 while processing softwood lumber at rates of 23.2 and 23.8 Mbf/hr) and an assumed 50% filterable PM2.5/RM5 PM ratio. Note that the 2016-17 98th percentile rate of softwood lumber entering the Planer is approximately 64 Mbf/hr.

[2] 98th percentile 2016-17 daily BH-4 fan hours assumed equal to 98th percentile 2016-17 planer mill shift hours.

Calculation of Emission Factor

Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)

Calculation of Daily Emissions Increase

Emissions Increase = Permit Allowable Emissions - '16-'17 Actual Emissions

Calculation of Permit Allowable Daily Emissions

Emissions = (Maximum Daily BH-4 Fan Hours) * (Emission Factor)

Calculation of '16-'17 Actual Daily Emissions

Emissions = (98th Percentile '16-'17 Daily BH-4 Fan Hours) * (Emission Factor)

---

7. Emission Unit: Dust transfer from baghouses BH-2 and BH-3 to planer shavings bin (existing unit)

Emission Unit ID	Control Device
PCWR-PM-PSB	BH-5

Calculated Emission Factor[1]: 0.1646 lb/BH-5 fan hour

Permit Allowable Daily Emissions	3.9497	lb/day
'16-'17 Actual Daily Emissions	- 3.3243	lb/day
24-hour NAAQS AQIA Emissions Increase	0.6254	lb/day

Emission Factor Calculation

Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
0.1646	0.0032	6,000	60	0.000142857

Permit Allowable Emissions (Daily)

Daily Emissions (lb/day)	Maximum Daily BH-5 Fan Hours (hr/day)	Emission Factor (lb/hr)
3.9497	24.0	0.1646

'16-'17 Actual Emissions (Daily)

Daily Emissions (lb/day)	98th Percentile '16-'17 Daily BH-5 Fan Hours[2] (hr/day)	Emission Factor (lb/hr)
3.3243	20.2	0.1646

[1] Permittee proposed use of this emission factor. It is based upon Reference Method 5 PM testing of BH-2 and BH-3 exhaust (in 1996 while processing softwood lumber at rates of 23.2 and 23.8 Mbf/hr) and an assumed 50% filterable PM2.5/RM5 PM ratio. Note that the 2016-17 98th percentile rate of softwood lumber entering the Planer is approximately 64 Mbf/hr.

[2] 98th percentile 2016-17 daily BH-5 fan hours assumed equal to 98th percentile 2016-17 planer mill shift hours.

Calculation of Emission Factor

Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)

Calculation of Daily Emissions Increase

Emissions Increase = Permit Allowable Emissions - '16-'17 Actual Emissions

Calculation of Permit Allowable Daily Emissions

Emissions = (Maximum Daily BH-5 Fan Hours) * (Emission Factor)

Calculation of '16-'17 Actual Daily Emissions

Emissions = (98th Percentile '16-'17 Daily BH-5 Fan Hours) * (Emission Factor)

---

8. Emission Unit: Dust from vertical arbor gang, vertical arbor gang trimmer, quad band mill and edger (existing unit)

Emission Unit ID	Control Device
PCWR-SM-SD	BH-10

Calculated Emission Factor[1]: 1.3280 lb/sawmill quad band mill hour

Emission Factor Calculation				
Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
1.3280	0.0032	48,418	60	0.000142857

Permit Allowable Daily Emissions	31.8729	lb/day
'16-'17 Actual Daily Emissions	- 26.5607	lb/day
24-hour NAAQS AQIA Emissions Increase	5.31215	lb/day

Permit Allowable Emissions (Daily)		
Daily Emissions (lb/day)	Maximum Daily Sawmill Quad Band Mill Machine Hours (hr/day)	Emission Factor (lb/hr)
31.8729	24.0	1.3280

'16-'17 Actual Emissions (Daily)		
Daily Emissions (lb/day)	98th Percentile '16-'17 Daily Sawmill Quad Band Mill Machine Hours[2] (hr/day)	Emission Factor (lb/hr)
26.5607	20.0	1.3280

[1] Permittee proposed use of this emission factor. It is based upon Reference Method 5 PM testing of BH-2 and BH-3 exhaust (in 1996 while processing softwood lumber at rates of 23.2 and 23.8 Mbf/hr) and an assumed 50% filterable PM2.5/RM5 PM ratio. Note that the 2016-17 98th percentile rate of softwood lumber entering the Planer is approximately 64 Mbf/hr.

[2] 98th percentile 2016-17 daily Sawmill Quad Band Mill Machine hours assumed equal to 98th percentile 2016-17 sawmill shift hours.

Calculation of Emission Factor

Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)

Calculation of Daily Emissions Increase

Emissions Increase = Permit Allowable Emissions - '16-'17 Actual Emissions

Calculation of Permit Allowable Daily Emissions

Emissions = (Maximum Daily Sawmill Quad Band Mill Machine Hours) * (Emission Factor)

Calculation of '16-'17 Actual Daily Emissions

Emissions = (98th Percentile '16-'17 Daily Sawmill Quad Band Mill Machine Hours) * (Emission Factor)

---

9. Emission Unit: Sawdust from vertical arbor gang and hog fuel screen pneumatic conveyance to sawdust bin (existing unit)

Emission Unit ID	Control Device
PCWR-SM-SDB	BH-11

Calculated Emission Factor[1]: 0.2907 lb/sawmill quad band mill hour

Emission Factor Calculation				
Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
0.2907	0.0032	10,600	60	0.000142857

Permit Allowable Daily Emissions	6.9778	lb/day
'16-'17 Actual Daily Emissions	- 5.8149	lb/day
24-hour NAAQS AQIA Emissions Increase	1.1630	lb/day

Permit Allowable Emissions (Daily)		
Daily Emissions (lb/day)	Maximum Daily Sawmill Quad Band Mill Machine Hours (hr/day)	Emission Factor (lb/hr)
6.9778	24.0	0.2907

'16-'17 Actual Emissions (Daily)		
Daily Emissions (lb/day)	98th Percentile '16-'17 Daily Sawmill Quad Band Mill Machine Hours[2] (hr/day)	Emission Factor (lb/hr)
5.8149	20.0	0.2907

[1] Permittee proposed use of this emission factor. It is based upon Reference Method 5 PM testing of BH-2 and BH-3 exhaust (in 1996 while processing softwood lumber at rates of 23.2 and 23.8 Mbf/hr) and an assumed 50% filterable PM2.5/RM5 PM ratio. Note that the 2016-17 98th percentile rate of softwood lumber entering the Planer is approximately 64 Mbf/hr.

[2] 98th percentile 2016-17 daily Sawmill Quad Band Mill Machine hours assumed equal to 98th percentile 2016-17 sawmill shift hours.

Calculation of Emission Factor

Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)

Calculation of Daily Emissions Increase

Emissions Increase = Permit Allowable Emissions - '16-'17 Actual Emissions

Calculation of Permit Allowable Daily Emissions

Emissions = (Maximum Daily Sawmill Quad Band Mill Machine Hours) * (Emission Factor)

Calculation of '16-'17 Actual Daily Emissions

Emissions = (98th Percentile '16-'17 Daily Sawmill Quad Band Mill Machine Hours) * (Emission Factor)

---

10. Emission Unit: Green chips pneumatically conveyed from sawmill chipper screen to chip bin via cyclone CY-2 (existing unit)

Emission Unit ID	Process Unit
PCWR-SM-CH	CY-02

Calculated Emission Factor[1]: 1.0929 lb/sawmill quad band mill hour

Emission Factor Calculation				
Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
1.0929	0.015	8,500	60	0.000142857

Permit Allowable Daily Emissions	26.2286 lb/day
'16-'17 Actual Daily Emissions	- 21.8571 lb/day
24-hour NAAQS AQIA Emissions Increase	4.3714 lb/day

Permit Allowable Emissions (Daily)		
Daily Emissions (lb/day)	Maximum Daily Sawmill Quad Band Mill Machine Hours (hr/day)	Emission Factor (lb/hr)
26.2286	24.0	1.0929

'16-'17 Actual Emissions (Daily)		
Daily Emissions (lb/day)	98th Percentile '16-'17 Daily Sawmill Quad Band Mill Machine Hours[2] (hr/day)	Emission Factor (lb/hr)
21.8571	20.0	1.0929

[1] Permittee proposed use of this emission factor. The underlying PM2.5 concentration of 0.03 gr/dscf PM is presented in Table 10.4.1 of AP-42, February 1980, and it represents an average emission factor for large diameter cyclones in "woodworking waste collection systems." Range of emission factors is 0.001 to 0.16 gr/dscf and has an emission factor rating of "D." Based on Oregon DEQ's AQ-EF03, one-half of PM is PM2.5.

[2] 98th percentile 2016-17 daily Sawmill Quad Band Mill Machine hours assumed equal to 98th percentile 2016-17 sawmill shift hours.

Calculation of Emission Factor

Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)

Calculation of Daily Emissions Increase

Emissions Increase = Permit Allowable Emissions - '16-'17 Actual Emissions

Calculation of Permit Allowable Daily Emissions

Emissions = (Maximum Daily Sawmill Quad Band Mill Machine Hours) * (Emission Factor)

Calculation of '16-'17 Actual Daily Emissions

Emissions = (98th Percentile '16-'17 Daily Sawmill Quad Band Mill Machine Hours) * (Emission Factor)

---

11. Emission Unit: Plant traffic (existing units)

Emission Unit ID	Control Device
PT	Speed limit, sweeping & watering

Calculated Emission Factor[1]: 16.1580 lb/20-hr day of sawmill quad band mill operation
Equivalent to : 0.8079 lb/sawmill quad band mill hour

Emission Factor Calculation				
Emission Factor (lb/20-hr day)	'15-'16 Paved Areas Daily 20-hour Operating Day Uncontrolled Emissions (lb/20-hr day)	Sweeping & Watering Control Efficiency - Paved Areas (unitless)	'15-'16 Unpaved Areas Daily 20-hour Operating Day Uncontrolled Emissions (lb/20-hr day)	Vehicle Speed Restriction & Watering Control Efficiency - Unpaved Areas (unitless)
16.1580	20.147526	0.75	51.726340	0.785

Permit Allowable Daily Emissions	19.3897 lb/day
'16-'17 Actual Daily Emissions	- 16.1580 lb/day
24-hour NAAQS AQIA Emissions Increase	3.2316 lb/day

Permit Allowable Emissions (Daily)			
Daily Emissions (lb/day)	Maximum Daily Sawmill Quad Band Mill Machine Hours (hr/day)	Hours in a 20-hr Day (hr/20-hr day)	Emission Factor (lb/20-hr day)
19.3897	24.0	20.0	16.1580

'16-'17 Actual Emissions (Daily)			
Daily Emissions (lb/day)	98th Percentile '16-'17 Daily Sawmill Quad Band Mill Machine Hours[2] (hr/day)	Hours in a 20-hr Day (hr/20-hr day)	Emission Factor (lb/20-hr day)
16.1580	20.0	20.0	16.1580

[1] Permittee proposed use of this emission factor.

[2] 98th percentile 2016-17 daily Sawmill Quad Band Mill Machine hours assumed equal to 98th percentile 2016-17 sawmill shift hours.

Calculation of Emission Factor

Emission Factor = [(('15-'16 Paved Areas Daily 20-hour Day Uncontrolled Emissions) * (1 - Control Efficiency)) + (('15-'16 Unpaved Areas Daily 20-hour Day Uncontrolled Emissions) * (1 - Control Efficiency))]

Calculation of Daily Emissions Increase

Emissions Increase = Permit Allowable Emissions - '16-'17 Actual Emissions

Calculation of Permit Allowable Daily Emissions

Emissions = (Applicant Proposed Sawmill Quad Band Mill Machine Operating Hours) * (Hours Operating in a 20-hr day) * (Emission Factor)

Calculation of '16-'17 Actual Daily Emissions

Emissions = (98th Percentile '16-'17 Daily Sawmill Quad Band Mill Operating Hours) / (Hours Operating in a 20-hr Day) * (Emission Factor)

Calculation of PM2.5 Ton-Per-Year Emission Limits Required to "Reduce or Mitigate Impacts" Resulting from the Project Based upon Annual NAAQS Air Quality Impact Analysis. See 40 CFR 49.151(e)(5), 154(d)(3), 155(a)(1)(ii) and Appendix W to

1. Emission Unit: Lumber Dry Kiln No. 6 (new unit)

Emission Unit ID	Control Device
LK-6	None

Highest NAAQS-Compliant Emission Factor[1]: 0.0510 lb/Mbf green lumber entering kiln

Permit Allowable Annual Emissions	1.7374 ton/yr
'15-'16 Annual Actual Emissions	- 0.0000 ton/yr
Annual NAAQS AQIA Emissions Increase	1.7374 ton/yr

Permit Allowable Emissions (Annual)

Annual Emissions (ton/yr)	Average Dry Kiln Capacity (bf/charge)	Volume Unit Conversion Factor (Mbf/bf)	Drying Time[2] (hr/charge)	Highest NAAQS-Compliant Emission Factor (lb/Mbf)	Operating Hours Per Year (hr/yr)	Mass Unit Conversion Factor (ton/lb)
1.7374	280,000	0.001	36	0.0510	8,760	0.0005

15-'16 Actual Emissions (Annual)

Annual Emissions (ton/yr)	
0	Emission unit is proposed. It does not exist. It is not replacing an existing emission unit.

[1] Permittee proposed use of this emission factor. It is not based upon a valid test result for this unit or any other. It is a value based upon the emission rate (grams/second) employed in PotlatchDeltic's May 14, 2019 24-hr air quality impact analysis that demonstrates that the project will not cause or contribute to a 24-hr PM2.5 NAAQS violation.

[2] Drying time based upon dry kiln schedule for White Fir/Hem Fir.

Calculation of Annual Emissions Increase

Emissions Increase = Permit Allowable Emissions - ~~'15-'16 Actual Emissions~~ 0

Calculation of Permit Allowable Annual Emissions

Emissions = (Dry Kiln Capacity) * (Volume Unit Conversion Factor) / Drying Time * (Highest NAAQS-Compliant Emission Factor) * (Operating Hours Per Year) * (Mass Unit Conversion Factor)

Calculation of '15-'16 Actual Annual Emissions

Emissions = 0 ton/yr. Emission unit is proposed. It does not exist. It is not replacing an existing emission unit.

2. Emission Unit: CE Boiler (existing unit)

Emission Unit ID	Control Device
PB-1	MC & ESP

Given Emission Factor[1]: 0.01488 lb/Mlb steam generated

Permit Allowable Annual Emissions	2.2811 ton/yr
'15-'16 Annual Actual Emissions	- 0.7814 ton/yr
Annual NAAQS AQIA Emissions Increase	1.4997 ton/yr

Permit Allowable Emissions (Annual)

Annual Emissions (ton/yr)	Maximum Annual Average Hourly Steaming Rate (Mlb steam/hr)	Operating Hours Per Year (hr/yr)	Emission Factor (lb/Mlb steam)	Mass Unit Conversion Factor (ton/lb)
2.2811	35	8,760	0.01488	0.0005

'15-'16 Actual Emissions (Annual)

Annual Emissions (ton/yr)	'15-'16 Average Annual Steam Production (MMlb steam/yr)	Mass Unit Conversion Factor (Mlb/MMlb)	Emission Factor (lb/Mlb steam)	Mass Unit Conversion Factor (ton/lb)
0.7814	105.0305	1,000	0.01488	0.0005

[1] Permittee proposed use of this emission factor. It is based, in part, upon Reference Method 5 testing of PB-1 exhaust at high steam load conditions and an assumed filterable PM2.5/RM5 PM ratio. Permittee is required to conduct source testing to determine up-to-date representative emission factor(s) to employ in daily emission calculations.

Calculation of Annual Emissions Increase

Emissions Increase = Permit Allowable Emissions - '15-'16 Actual Emissions

Calculation of Permit Allowable Annual Emissions

Emissions = (Maximum Annual Average Hourly Steaming Rate) * (Operating Hours Per Year) * (Emission Factor) * (Mass Unit Conversion Factor)

Calculation of '15-'16 Annual Actual Emissions

Emissions = ('15-'16 Average Annual Steam Production) * (Mass Unit Conversion Factor) * (Emission Factor) * (Mass Unit Conversion Factor)

3. Emission Unit: Riley Boiler (existing unit)

Emission Unit ID	Control Device
PB-2	MC & ESP

Given Emission Factor[1]: 0.00722 lb/Mlb steam generated

Permit Allowable Annual Emissions	3.1940 ton/yr
'15-'16 Annual Actual Emissions	- 1.6617 ton/yr
Annual NAAQS AQIA Emissions Increase	1.5322 ton/yr

Permit Allowable Emissions (Annual)

Annual Emissions (ton/yr)	Maximum Annual Average Hourly Steaming Rate (Mlb steam/hr)	Operating Hours Per Year (hr/yr)	Emission Factor (lb/Mlb steam)	Mass Unit Conversion Factor (ton/lb)
3.1940	101	8,760	0.00722	0.0005

'15-'16 Actual Emissions (Annual)

Annual Emissions (ton/yr)	'15-'16 Average Annual Steam Production (MMlb steam/yr)	Mass Unit Conversion Factor (Mlb/MMlb)	Emission Factor (lb/Mlb steam)	Mass Unit Conversion Factor (ton/lb)
1.6617	460.3145	1,000	0.00722	0.0005

[1] Permittee proposed use of this emission factor. It is based, in part, upon Reference Method 5 testing of PB-2 exhaust at mid and high steam load conditions and an assumed filterable PM2.5/RM5 PM ratio. Permittee is required to conduct source testing to determine up-to-date representative emission factor(s) to employ in daily emission calculations.

Calculation of Annual Emissions Increase

Emissions Increase = Permit Allowable Emissions - '15-'16 Actual Emissions

Calculation of Permit Allowable Annual Emissions

Emissions = (Maximum Annual Average Hourly Steaming Rate) * (Operating Hours Per Year) * (Emission Factor) * (Mass Unit Conversion Factor)

Calculation of '15-'16 Annual Actual Emissions

Emissions = ('15-'16 Average Annual Steam Production) * (Mass Unit Conversion Factor) * (Emission Factor) * (Mass Unit Conversion Factor)

4. Emission Unit: Planer shavings pneumatically conveyed to baghouse BH-2 (existing unit)

Emission Unit ID	Control Device
PCWR-PM-SH	BH-2

Calculated Emission Factor[1]: 0.8229 lb/BH-2 fan hour

Permit Allowable Annual Emissions	3.0808 ton/yr
'15-'16 Annual Actual Emissions	- 1.7146 ton/yr
Annual NAAQS AQIA Emissions Increase	1.3661 ton/yr

Emission Factor Calculation				
Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
0.8229	0.0032	30,000	60	0.000142857

Permit Allowable Emissions (Annual)			
Daily Emissions (ton/yr)	Maximum Annual BH-2 Fan Hours[2] (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
3.0808	7,488	0.8229	0.0005

'15-'16 Actual Emissions (Annual)			
Daily Emissions (ton/yr)	'15-'16 Average Annual BH-2 Fan Hours (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
1.7146	4,167.5	0.8229	0.0005

[1] Permittee proposed use of this emission factor. It is based upon Reference Method 5 PM testing of BH-2 and BH-3 exhaust (in 1996 while processing softwood lumber at rates of 23.2 and 23.8 Mbf/hr) and an assumed 50% filterable PM2.5/RM5 PM ratio. Note that the 2016-17 98th percentile rate of softwood lumber entering the Planer is approximately 64 Mbf/hr. Permittee is required to conduct source testing to determine up-to-date representative emission factor to employ in daily emission calculation.

[2] Permittee assumed 7,488 hours per year operation of BH-2 fan.

<u>Calculation of Emission Factor</u>

Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)

<u>Calculation of Annual Emissions Increase</u>

Emissions Increase = Permit Allowable Emissions - '15-'16 Actual Emissions

<u>Calculation of Permit Allowable Annual Emissions</u>

Emissions = (Maximum Annual BH-2 Fan Hours) * (Emission Factor) * (Mass Unit Conversion Factor)

<u>Calculation of '15-'16 Annual Actual Emissions</u>

Emissions = ('15-'16 Average Annual BH-2 Fan Hours) * (Emission Factor) * (Mass Unit Conversion Factor)

---

5. Emission Unit: Planed lumber trimmer, trim ends chipper, breakdown hoist and infeed rolls dust generating activities (existing unit)

Emission Unit ID	Control Device
PCWR-PM-SD	BH-3

Calculated Emission Factor[1]: 0.7406 lb/BH-3 fan hour

Permit Allowable Annual Emissions	2.7727 ton/yr
'15-'16 Annual Actual Emissions	- 1.5522 ton/yr
Annual NAAQS AQIA Emissions Increase	1.2205 ton/yr

Emission Factor Calculation				
Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
0.7406	0.0032	27,000	60	0.000142857

Permit Allowable Emissions (Annual)			
Daily Emissions (ton/yr)	Maximum Annual BH-3 Fan Hours[2] (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
2.7727	7,488	0.7406	0.0005
'15-'16 Actual Emissions (Annual)			
Daily Emissions (ton/yr)	'15-'16 Average Annual BH-3 Fan Hours (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
1.5522	4,192.0	0.7406	0.0005

[1] Permittee proposed use of this emission factor. It is based upon Reference Method 5 PM testing of BH-2 and BH-3 exhaust (in 1996 while processing softwood lumber at rates of 23.2 and 23.8 Mbf/hr) and an assumed 50% filterable PM2.5/RM5 PM ratio. Note that the 2016-17 98th percentile rate of softwood lumber entering the Planer is approximately 64 Mbf/hr. Permittee is required to conduct source testing to determine up-to-date representative emission factor to employ in daily emission calculation.

[2] Permittee assumed 7,488 hours per year operation of BH-3 fan.

<u>Calculation of Emission Factor</u>

Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)

<u>Calculation of Annual Emissions Increase</u>

Emissions Increase = Permit Allowable Emissions - '15-'16 Actual Emissions

<u>Calculation of Permit Allowable Annual Emissions</u>

Emissions = (Maximum Annual BH-3 Fan Hours) * (Emission Factor) * (Mass Unit Conversion Factor)

<u>Calculation of '15-'16 Annual Actual Emissions</u>

Emissions = ('15-'16 Average Annual BH-3 Fan Hours) * (Emission Factor) * (Mass Unit Conversion Factor)

6. Emission Unit: Ply trim and trim ends chipper pneumatic conveyance to ply trim bin (existing unit)

Emission Unit ID	Control Device
PCWR-PM-PTB	BH-4

Calculated Emission Factor[1]: 0.1646 lb/BH-4 fan hour

Permit Allowable Annual Emissions	0.6162	ton/yr
'15-'16 Annual Actual Emissions	- 0.3412	ton/yr
Annual NAAQS AQIA Emissions Increase	0.2749	ton/yr

Emission Factor Calculation				
Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
0.1646	0.0032	6,000	60	0.000142857

Permit Allowable Emissions (Annual)			
Daily Emissions (ton/yr)	Maximum Annual BH-4 Fan Hours[2] (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
0.6162	7,488	0.1646	0.0005

'15-'16 Actual Emissions (Annual)			
Daily Emissions (ton/yr)	'15-'16 Average Annual BH-4 Fan Hours (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
0.3412	4,147.0	0.1646	0.0005

[1] Permittee proposed use of this emission factor. It is based upon Reference Method 5 PM testing of BH-2 and BH-3 exhaust (in 1996 while processing softwood lumber at rates of 23.2 and 23.8 Mbf/hr) and an assumed 50% filterable PM2.5/RM5 PM ratio. Note that the 2016-17 98th percentile rate of softwood lumber entering the Planer is approximately 64 Mbf/hr.
[2] Permittee assumed 7,488 hours per year operation of BH-4 fan.

<u>Calculation of Emission Factor</u>
Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)
<u>Calculation of Annual Emissions Increase</u>
Emissions Increase = Permit Allowable Emissions - '15-'16 Actual Emissions
<u>Calculation of Permit Allowable Annual Emissions</u>
Emissions = (Maximum Annual BH-4 Fan Hours) * (Emission Factor) * (Mass Unit Conversion Factor)
<u>Calculation of '15-'16 Annual Actual Emissions</u>
Emissions = ('15-'16 Average Annual BH-4 Fan Hours) * (Emission Factor) * (Mass Unit Conversion Factor)

7. Emission Unit: Dust transfer from baghouses BH-2 and BH-3 to planer shavings bin (existing unit)

Emission Unit ID	Control Device
PCWR-PM-PSB	BH-5

Calculated Emission Factor[1]: 0.1646 lb/BH-5 fan hour

Permit Allowable Annual Emissions	0.6162	ton/yr
'15-'16 Annual Actual Emissions	- 0.3412	ton/yr
Annual NAAQS AQIA Emissions Increase	0.2749	ton/yr

Emission Factor Calculation				
Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
0.1646	0.0032	6,000	60	0.000142857

Permit Allowable Emissions (Annual)			
Daily Emissions (ton/yr)	Maximum Annual BH-5 Fan Hours[2] (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
0.6162	7,488	0.1646	0.0005

'15-'16 Actual Emissions (Annual)			
Daily Emissions (ton/yr)	'15-'16 Average Annual BH-5 Fan Hours (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
0.3429	4,167.5	0.1646	0.0005

[1] Permittee proposed use of this emission factor. It is based upon Reference Method 5 PM testing of BH-2 and BH-3 exhaust (in 1996 while processing softwood lumber at rates of 23.2 and 23.8 Mbf/hr) and an assumed 50% filterable PM2.5/RM5 PM ratio. Note that the 2016-17 98th percentile rate of softwood lumber entering the Planer is approximately 64 Mbf/hr.
[2] Permittee assumed 7,488 hours per year operation of BH-5 fan.

<u>Calculation of Emission Factor</u>
Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)
<u>Calculation of Annual Emissions Increase</u>
Emissions Increase = Permit Allowable Emissions - '15-'16 Actual Emissions
<u>Calculation of Permit Allowable Annual Emissions</u>
Emissions = (Maximum Annual BH-5 Fan Hours) * (Emission Factor) * (Mass Unit Conversion Factor)
<u>Calculation of '15-'16 Annual Actual Emissions</u>
Emissions = ('15-'16 Average Annual BH-5 Fan Hours) * (Emission Factor) * (Mass Unit Conversion Factor)

8. Emission Unit: Dust from vertical arbor gang, vertical arbor gang trimmer, quad band mill and edger (existing unit)

Emission Unit ID	Control Device
PCWR-SM-SD	BH-10

Calculated Emission Factor[1]: 1.3280 lb/sawmill quad band mill hour

Permit Allowable Annual Emissions	4.9722 ton/yr
'15-'16 Annual Actual Emissions	- 2.7480 ton/yr
Annual NAAQS AQIA Emissions Increase	2.2241 ton/yr

Emission Factor Calculation				
Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
1.3280	0.0032	48,418	60	0.000142857

Permit Allowable Emissions (Annual)			
Daily Emissions (ton/yr)	Maximum Annual Sawmill Quad Band Mill Machine Hours[2,3] (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
4.9722	7,488	1.3280	0.0005

'15-'16 Actual Emissions (Annual)			
Daily Emissions (ton/yr)	'15-'16 Average Annual Sawmill Quad Band Mill Machine Hours[3] (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
2.7480	4,138.5	1.3280	0.0005

[1] Permittee proposed use of this emission factor. It is based upon Reference Method 5 PM testing of BH-2 and BH-3 exhaust (in 1996 while processing softwood lumber at rates of 23.2 and 23.8 Mbf/hr) and an assumed 50% filterable PM2.5/RM5 PM ratio. Note that the 2016-17 98th percentile rate of softwood lumber entering the Planer is approximately 64 Mbf/hr.
[2] Permittee assumed 7,488 hours per year operation of BH-10 fan.
[3] Region 10 assumes BH-10 fan operates concurrent with Sawmill Quad Band Mill Machine.

<u>Calculation of Emission Factor</u>
Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)
<u>Calculation of Annual Emissions Increase</u>
Emissions Increase = Permit Allowable Emissions - '15-'16 Actual Emissions
<u>Calculation of Permit Allowable Annual Emissions</u>
Emissions = (Maximum Annual Sawmill Quad Band Mill Machine Hours) * (Emission Factor) * (Mass Unit Conversion Factor)
<u>Calculation of '15-'16 Annual Actual Emissions</u>
Emissions = ('15-'16 Average Annual Sawmill Quad Band Mill Machine Hours) * (Emission Factor) * (Mass Unit Conversion Factor)

---

9. Emission Unit: Sawdust from vertical arbor gang and hog fuel screen pneumatic conveyance to sawdust bin (existing unit)

Emission Unit ID	Control Device
PCWR-SM-SDB	BH-11

Calculated Emission Factor[1]: 0.2907 lb/sawmill quad band mill hour

Permit Allowable Annual Emissions	1.0885 ton/yr
'15-'16 Annual Actual Emissions	- 0.6016 ton/yr
Annual NAAQS AQIA Emissions Increase	0.4869 ton/yr

Emission Factor Calculation				
Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
0.2907	0.0032	10,600	60	0.000142857

Permit Allowable Emissions (Annual)			
Daily Emissions (ton/yr)	Maximum Annual Sawmill Quad Band Mill Machine Hours[2,3] (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
1.0885	7,488	0.2907	0.0005

'15-'16 Actual Emissions (Annual)			
Daily Emissions (ton/yr)	'15-'16 Average Annual Sawmill Quad Band Mill Machine Hours[3] (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
0.6016	4,138.5	0.2907	0.0005

[1] Permittee proposed use of this emission factor. It is based upon Reference Method 5 PM testing of BH-2 and BH-3 exhaust (in 1996 while processing softwood lumber at rates of 23.2 and 23.8 Mbf/hr) and an assumed 50% filterable PM2.5/RM5 PM ratio. Note that the 2016-17 98th percentile rate of softwood lumber entering the Planer is approximately 64 Mbf/hr.
[2] Permittee assumed 7,488 hours per year operation of BH-11 fan.
[3] Region 10 assumes BH-11 fan operates concurrent with Sawmill Quad Band Mill Machine.

<u>Calculation of Emission Factor</u>
Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)
<u>Calculation of Annual Emissions Increase</u>
Emissions Increase = Permit Allowable Emissions - '15-'16 Actual Emissions
<u>Calculation of Permit Allowable Annual Emissions</u>
Emissions = (Maximum Annual Sawmill Quad Band Mill Machine Hours) * (Emission Factor) * (Mass Unit Conversion Factor)
<u>Calculation of '15-'16 Annual Actual Emissions</u>
Emissions = ('15-'16 Average Annual Sawmill Quad Band Mill Machine Hours) * (Emission Factor) * (Mass Unit Conversion Factor)

---

10. Emission Unit: Green chips pneumatically conveyed from sawmill chipper screen to chip bin via cyclone CY-2 (existing unit)

Emission Unit ID	Process Unit
PCWR-SM-CH	CY-02

Calculated Emission Factor[1]: 1.0929 lb/sawmill quad band mill hour

Permit Allowable Annual Emissions	4.0916 ton/yr
'15-'16 Annual Actual Emissions	- 2.2614 ton/yr
Annual NAAQS AQIA Emissions Increase	1.8302 ton/yr

Emission Factor Calculation

Emission Factor (lb/hr)	PM2.5 Concentration (gr/ft^3)	Fan Capacity (ft^3/min)	Time Unit Conversion Factor (min/hr)	Mass Unit Conversion Factor (lb/gr)
1.0929	0.015	8,500	60	0.000142857

Permit Allowable Emissions (Annual)

Daily Emissions (ton/yr)	Maximum Annual Sawmill Quad Band Mill Machine Hours[2,3] (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
4.0916	7,488	1.0929	0.0005

'15-'16 Actual Emissions (Annual)

Daily Emissions (ton/yr)	'15-'16 Average Annual Sawmill Quad Band Mill Machine Hours[3] (hr/yr)	Emission Factor (lb/hr)	Mass Unit Conversion Factor (ton/lb)
2.2614	4,138.5	1.0929	0.0005

[1] Permittee proposed use of this emission factor. The underlying PM2.5 concentration of 0.03 gr/dscf PM is presented in Table 10.4.1 of AP-42, February 1980, and it represents an average emission factor for large diameter cyclones in "woodworking waste collection systems." Range of emission factors is 0.001 to 0.16 gr/dscf and has an emission factor rating of "D." Based on Oregon DEQ's AQ-EF03, one-half of PM is PM2.5.

[2] Permittee assumed 7,488 hours per year operation of CY-02 fan.

[3] Region 10 assumes CY-02 fan operates concurrent with Sawmill Quad Band Mill Machine.

Calculation of Emission Factor

Emission Factor = (PM2.5 Concentration) * (Fan Capacity) * (Time Unit Conversion Factor) * (Mass Unit Conversion Factor)

Calculation of Annual Emissions Increase

Emissions Increase = Permit Allowable Emissions - '15-'16 Actual Emissions

Calculation of Permit Allowable Annual Emissions

Emissions = (Maximum Annual Sawmill Quad Band Mill Machine Hours) * (Emission Factor) * (Mass Unit Conversion Factor)

Calculation of '15-'16 Annual Actual Emissions

Emissions = ('15-'16 Average Annual Sawmill Quad Band Mill Machine Hours) * (Emission Factor) * (Mass Unit Conversion Factor)

---

11. Emission Unit: Plant traffic (existing units)

Emission Unit ID	Control Device
PT	Speed limit, sweeping & watering

Calculated Emission Factor[1]: 16.1580 lb/20-hr day of sawmill quad band mill operation

Equivalent to : 0.8079 lb/sawmill quad band mill hour

Permit Allowable Annual Emissions	2.52065 ton/yr
'15-'16 Annual Actual Emissions	- 2.08969 ton/yr
Annual NAAQS AQIA Emissions Increase	0.43097 ton/yr

Emission Factor Calculation

Emission Factor (lb/20-hr day)	'15-'16 Paved Areas Daily 20-hour Operating Day Uncontrolled Emissions (lb/20-hr day)	Sweeping & Watering Control Efficiency - Paved Areas (unitless)	'15-'16 Unpaved Areas Daily 20-hour Operating Day Uncontrolled Emissions (lb/20-hr day)	Vehicle Speed Restriction & Watering Control Efficiency - Unpaved Areas (unitless)
16.1580	20.147526	0.75	51.726340	0.785

Permit Allowable Emissions (Annual)

Annual Emissions (ton/yr)	Maximum Annual Sawmill Quad Band Mill Machine Operating Days[2] (day/yr)	Emission Factor (lb/20-hr day)	Mass Unit Conversion Factor (ton/lb)
2.52065	312	16.1580	0.0005

'15-'16 Actual Emissions (Annual)

Annual Emissions (ton/yr)	'15-'16 Average Annual Sawmill Quad Band Mill Machine Operating Hours (hr/yr)	Typical Duration of PT Working Day Presented by Applicant (hr/day)	Emission Factor (lb/20-hr day)	Mass Unit Conversion Factor (ton/lb)
2.08969	4,138.5	16	16.1580	0.0005

[1] Permittee proposed use of this emission factor.

[2] Permittee assumed 7,488 hours per year operation of Sawmill Quad Band Mill Machine. This is equivalent to 312 24-hr days.

Calculation of Emission Factor

Emission Factor = (('15-'16 Paved Areas Daily 24-hour Day Uncontrolled Emissions) * (1 - Control Efficiency)) + (('15-'16 Unpaved Areas Daily 24-hour Day Uncontrolled Emissions) * (1 - Control Efficiency))

Calculation of Annual Emissions Increase

Emissions Increase = Permit Allowable Emissions - '15-'16 Actual Emissions

Calculation of Permit Allowable Annual Emissions

Emissions = (Maximum Annual Sawmill Quad Band Mill Machine Operating Days) * (Emission Factor) * (Mass Unit Conversion Factor)

Calculation of '15-'16 Annual Actual Emissions

Emissions = ('15-'16 Average Annual Sawmill Quad Band Mill Machine Operating Hours) / (Typical Duration of a PT Working Day Presented by Applicant) * (Emission Factor) * (Mass Unit Conversion Factor)