REGIONAL HAZE – FOUR FACTOR ANALYSIS

Columbia Forest Products
Klamath Falls, Oregon

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Regional Haze – Four Factor Analysis

Prepared for:
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4949 Highway 97
Klamath Falls, Oregon 97603

This document has been prepared by SLR International Corporation (SLR). The material and data in this report were prepared under the supervision and direction of the undersigned.

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CONTENTS

ATTACHMENTS

ACRONYMS, ABBREVIATIONS AND TERMS

4FA	Four Factor Analysis
BACT	Best Available Control Technology
Btu	British thermal unit
CFP	Columbia Forest Products
CFR	Code of Federal Regulations
CO_2	Carbon dioxide
DEQ	Department of Environmental Quality
EPA	Environmental Protection Agency
ESP	Electrostatic precipitator
FGR	Fuel gas recirculation
GHG	Greenhouse gas
HAP	Hazardous air pollutants
IMPROVE	Interagency Monitoring of Protected Visual Environments
LAER	Lowest Achievable Emission Rate
LNB	Low NO_X burner
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO_X	Nitrogen Oxides
NSR	New Source Review
OFA	Overfire air
O&M	Operation and maintenance
PM	Particulate Matter
PM_{10}	Coarse Particle Matter or Particulate Matter; with an aerodynamic diameter of 10 microns or less
PSEL	Plant Site Emission Limit
RACT	Reasonably Available Control Technology
RBLC	RACT/BACT/LAER Clearinghouse
SCR	Selective Catalytic Reduction
SNCR	Selective Non-catalytic Reduction
SO_2	Sulfur Dioxide
tpy	Tons per year

1. INTRODUCTION

This Regional Haze Four Factor Analysis (4FA) was prepared on behalf of Columbia Forest Products Klamath Falls (the Facility) located at 4949 Highway 97 South, Klamath Falls, Oregon. The Facility manufactures plywood under Title V operating permit number 18-0014-TV-01. The Oregon Department of Environmental Quality (DEQ) identified the Facility as a significant source of regional haze precursor emissions to a Class I area in Oregon, thus triggering the need for a 4FA under the regional haze program.

DEQ is required to develop and implement air quality protection plans to reduce the pollution that causes haze at national parks and wilderness areas, known as Federal Class I areas. This requirement can be found at 40 CFR 51.308 and 42 U.S.C. §7491(b) and is implemented under the authority of ORS 468A.025.

Data from the Environmental Protection Agency (EPA) and National Park Service Visibility (IMPROVE) Program monitoring sites for Oregon's 12 Class I areas indicate that sulfates, nitrates, and coarse mass continue to be significant contributors to visibility impairment in these areas. The primary precursors of sulfates, nitrates, and coarse mass are emissions of sulfur dioxide (SO_2), nitrogen oxides (NO_X), and particulate matter less than 10-micron in diameter (PM_{10}).

The nearest Class I areas to the Facility are the Mountain Lakes Wilderness, located 13 miles northwest, and Crater Lake National Park, located about 40 miles north.

This 4FA provides a detailed evaluation of the Facility emission units that contribute emissions of precursor compounds. The purpose of the analysis is to determine whether additional specific control measures are reasonable for the control of precursor compounds. The four factors considered in this analysis are:

1. The costs of compliance.
2. The time necessary for compliance.
3. The energy and non-air quality environmental impacts of compliance.
4. The remaining useful life of any potentially affected major or minor stationary source or group of sources.

1.1 FACILITY OVERVIEW

The Facility is a hardwood and veneer plywood mill (NAICS codes 321211 and 221330) located just south of the City of Klamath Falls, Oregon, along the northwest bank of the Klamath River. The Facility operates under Title V operating permit number 18-0014-TV-01 issued by the Oregon DEQ on September 26, 2017 and which expires on October 1, 2022.

The Facility is required to have a Title V air operating permit because it has potential to emit more than 100 tons per year of a criteria pollutant. The Facility has taken a synthetic minor permit limit to limit their potential to emit hazardous air pollutants (HAP) to less than the major HAP source levels.

The main product of the plant is 4' x 8' x 3/4" thick hardwood faced panels. The hardwood veneer is brought in from other locations in a pre-dried condition. Most of the core panels consist of plywood manufactured from white fir veneer which is processed from the raw logs in the Facility. Some of the core panels to which the hardwood face veneer is glued are brought in from elsewhere and consist of veneer core or composite panels (e.g., medium density fiberboard) manufactured by other companies.

The raw logs are brought in by truck and stored until needed. The raw logs are then debarked in a ring de-barker. After the de-barker, the logs are cut to length by a set of large circular chop saws. These sections of peeler logs, called blocks, are transported by conveyor and automatically sorted into bins. The waste trim pieces of the logs known as lily pads are transported to the lily pad chipper. Front end loaders place the blocks into the vats (steam conditioning chests). The blocks are conditioned with hot water and steam to make them suitable for turning on a lathe to peel off veneer.

After conditioning, the blocks are placed on the in-feed conveyors to the lathe. At the lathe, the veneer ribbon travels down a conveyor, through a clipping station where defects are clipped out and to an automatic stacker which sorts the veneer pieces by size and moisture content. Veneer pieces are also pulled from the line after the stacker at the green chain. Reject pieces of veneer and trim pieces are carried by conveyor to the veneer chipper. The block cores left over after peeling are conveyed to the sorter. Some are stockpiled to be trucked offsite and sold while others are chipped for fuel.

The stacks of green veneer are transported by forklift to the B plant. The green veneer is dried in one of the two dryers to less than 24% moisture content. Veneer pieces which test out above the moisture specification after exiting the dryers are either re-dried or stored until they meet the required dryness specification. The two dryers are the Keller #1 & #2 (fired by natural gas).

The dried veneer is worked into solid sheets with a minimum of voids by plugging defects or edge gluing smaller pieces with hot melt glue.

The next activity in the plywood manufacturing process is that of spreading the glue on the veneer sheets, orienting the grain direction of the core veneers at right angles to each other, then placing the hardwood face veneers at the top and bottom of each assembly. After gluing, the stack of laid-up panels is initially placed in a cold press, then put into one of three hot presses.

The plywood panels exiting hot presses are moved to the panel saw for trimming. Any voids in the faces are filled with putty by hand in the patch line. Some oak faced panels are conditioned to prevent staining.

After the patch line, the panels are run through the sander, then inspected and packaged for shipment. The sander is ventilated by a separate sander dust ventilation system. Some of the panels have a coating applied in a UV coating line.

The byproducts or "residuals" are handled as four separate material streams: Wood chips, hogged fuel (mostly bark), plytrim, and sander dust. These residual streams are transported by such means as mechanical conveyor, truck load out bin, and pneumatic transfer through cyclones (C1 & C2). Steam for the presses and the vats is provided by the north and south boilers.

1.2 NESHAPs

The Facility boilers are subject to 40 CPR Part 63, Subpart JJJJJJ, *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Industrial, Commercial, and Institutional Boilers Area Sources*. The boilers are subject to two work practice requirements: conduct a one-time energy assessment and conduct a boiler tune-up every 2 years.

The Wood Building Products (surface coating) NESHAP (40 CFR, Part 63, Subpart QQQQ) that was promulgated on May 28, 2003 is applicable to the UV coating line.

In 2007, the Facility demonstrated that it is no longer a major source of HAPs, so the NESHAPs for Plywood and Composite Wood Products (40 CFR, Part 63, Subpart DDDD) and Industrial, Commercial and Institutional Boilers and Process Heaters (40 CFR, Part 63, Subpart DDDDD) at major sources are not applicable.

1.3 PRECURSOR COMPOUND EMISSIONS

The Facility emits three types of regional haze precursor compounds: nitrogen oxides, sulfur dioxide, and particulate matter less than 10 microns in diameter. Facility-wide emissions of these compounds for 2017 and the Facility's potential to emit for each compound are presented in Table 1-1. Detailed emission calculations are provided in Attachment B.

Table 1-1. Actual and Permitted Facility-wide Emissions for CFP Klamath Falls

Emission Unit	2017 Actual Emissions (tons per year)				Permitted Emissions (tons per year)			
	NO_X	SO_2	PM_{10}	Total Quantity	NO_X	SO_2	PM_{10}	Total Quantity
South Boiler	37.59	1.01	36.18	74.78	45.55	1.23	43.84	90.62
North Boiler	0.0	0.0	0.0	0.0	6.48	0.25	5.28	12.01
Veneer Dryers	5.03	--	15.09	20.12	9.75	--	29.26	39.01
Plywood Press	--	--	2.29	2.29	--	--	3.26	3.26
Storage Pile	--	--	1.72	1.72	--	--	2.44	2.44
Material Handling	--	--	1.92	1.92	--	--	2.73	2.73
Facility Wide	**43.18**	**1.02**	**57.71**	**101.91**	**65.0**	**39.0***	**87.0**	**191.0**

*Generic Plant Site Emission Limit (PSEL)

The two boilers, two veneer dryers, three press vents, a hog-fuel storage pile, and material handling equipment emit precursor compounds. The precursor compound emissions from each emission unit and the existing pollution control equipment are summarized in Table 1-2.

Table 1-2. Summary of Precursor Compounds Emitted by Emission Unit

Emission Unit	Emission Unit ID	Precursor Compounds Emitted	Installation Date	Existing Pollution Control Equipment
North Boiler	BLR-N	PM_{10}, SO_2, NO_X	1939	NA
South Boiler	BLR-S	PM_{10}, SO_2, NO_X	1944	Multiclone
Keller Dryer #1 (east)	V-N	PM_{10}, SO_2, NO_X	1984	NA
Keller Dryer #2 (west)	V-N	PM_{10}, SO_2, NO_X	1989	NA
Press Vent 1	PV-1	PM_{10}	1983	NA
Press Vent 2	PV-2	PM_{10}	Before 1978	NA
Press Vent 3	PV-3	PM_{10}	Before 1978	NA
Storage Piles	SP	PM_{10}	NA	NA
Material Handling	MH	PM_{10}	NA	Cyclone, Baghouse

The emissions of two boilers, two veneer dryers, and three press vents comprise 98.7% of NO_X, 99% of SO_2, 93% of PM_{10} emissions compared to 2017 facility-wide emissions. Therefore, only these emission units are included in this analysis and are presented in the following sections. Since the 2017 actual emissions of SO_2 are very low (1.02 tons per year [tpy]), SO_2 emissions are not reviewed further in this analysis.

1.3.1 NORTH AND SOUTH BOILERS

The North and South Boilers are capable of firing wood or bark. The South Boiler is a C & E Dutch oven boiler with a rated steam capacity of 35,000 pounds per hour (lb/hr). The South Boiler was installed in 1944. Particulate emissions are controlled by a multiclone installed in 1994.

The North Boiler is an E.F. Huffman Dutch oven boiler with a rated steam capacity of 12,500 lb/hr. The North Boiler was installed in 1939. Particulate emissions are uncontrolled. The North Boiler is currently not operating.

The 2017 annual emissions from these boilers are presented in Table 1-3.

Table 1-3. 2017 Annual Emissions – Boilers

Emission Unit	NO_X Emissions (tons/yr)	PM_{10} Emissions (tons/yr)	SO_2 Emissions (tons/yr)
North Boiler (BLR-N)	0.0	0.0	0.0
South Boiler (BLR-S)	37.59	36.18	1.01

1.3.2 VENEER DRYERS (V-N)

The Facility operates two veneer dryers. The primary species of wood dried are White Fir, Pine, and Douglas Fir. Dryer particulate emissions are uncontrolled.

Dryer 1 (east dryer) was manufactured by Keller. It is a four deck, three zone jet tube dryer heated by burning natural gas. The maximum throughput is 13,000 ft^2/hr on a 3/8" basis. The maximum heating capacity of the burners associated with the dryer is 36 MMBtu/hr. The dryer was installed in 1984.

Dryer 2 (west dryer) was also manufactured by Keller. It is a four deck, three zone jet tube dryer heated by burning natural gas. The maximum throughput as-installed was 9,000 ft^2/hr on a 3/8" basis. The dryer was installed in 1989 and was modified in 2005 by adding another zone to increase the capacity to that of Dryer 1. The current capacity of Dryer 2 is 13,000 ft^2/hr on a 3/8" basis. The maximum heating capacity of the burners associated with the dryer is 41 MMBtu/hr.

The 2017 total annual emissions from both of the dryers are presented in Table 1-4.

Table 1-4. 2017 Annual Emissions – Veneer Dryers

Emission Unit	NO_X Emissions (tons/yr)	PM_{10} Emissions (tons/yr)	SO_2 Emissions (tons/yr)
Dryer #1 (east)	5.03	15.09	0.0
Dryer #2 (west)			

1.3.3 PLYWOOD PRESSES (PV-1, PV-2, PV-3)

There are three steam heated presses which exhaust directly to the atmosphere. The #1 North Press was installed in 1983. The maximum hourly production rate is 20,000 ft^2/hr on a 3/8" basis.

The #2 Middle Press was installed before 1978. The maximum hourly production rate was 16,250 ft^2/hr - 3/8" basis. This press was modified in 2002 by adding six platens for a total of 30. This change increased the capacity from 16,250 to 20,000 ft^2/hr on a 3/8" basis.

The #3 South Press was installed before 1978. The maximum hourly production rate is 16,250 ft^2/hr - 3/8" basis. This press was modified in 2015 by adding six platens for a total of 30. This change increased the capacity from 16,250 to 20,000 ft^2/hr on a 3/8" basis.

The 2017 total annual emissions from all three presses are presented in Table 1-5.

Table 1-5. 2017 Annual Emissions – Plywood Presses

Emission Unit	PM_{10} Emissions (tons/yr)
#1 North Press	2.29
#2 Middle Press	
#3 South Press	

1.4 FOUR FACTOR ANALYSIS METHODOLOGY

As discussed previously, the analysis requires the following steps to identify the technologically feasible control options for each emission unit applicable to the four factor analysis:

- The cost of compliance;
- Time necessary for compliance;
- Energy and non-air environmental impacts; and
- Remaining useful life of the source.

The following steps must be followed in conducting the analysis:

- Identify all available control technologies
- Eliminate technically infeasible options; and
- Rank the remaining options based on effectiveness.

1.4.1 FACTOR 1 – COST OF COMPLIANCE

The basis for comparison in the economic analysis of the control scenarios is the cost effectiveness; that is, the value obtained by dividing the total net annualized cost by the tons of pollutant removed per year for each control technology. Annualized costs include the annualized capital cost plus the financial requirements to operate the control system on an annual basis, including operating and maintenance labor, and such maintenance costs as replacement parts, overhead, raw materials, and utilities. Capital costs include both the direct cost of the control equipment and all necessary auxiliaries as well as both the direct and indirect costs to install the equipment. Direct installation costs include costs for foundations, erection, electrical, piping, insulation, painting, site preparation, and buildings. Indirect installation costs include costs for engineering and supervision, construction expenses, start-up costs, and contingencies.

For each technically feasible control option, this analysis will summarize potential emission reductions, estimated capital cost, estimated annual cost, and cost-effectiveness (dollars per ton of pollutant). Per EPA guidance, SLR followed the methods in EPA's Air Pollution Control Cost Manual for this analysis.

1.4.2 FACTOR 2 – TIME NECESSARY FOR COMPLIANCE

Factor 2 involves the evaluation of the amount of time needed for full implementation of the different control strategies. The time for compliance will need to be defined and should include the time needed to develop and implement the regulations, as well as the time needed to install the necessary control equipment. The time required to install a retrofit control device includes time for capital procurement, device design, fabrication, and installation. The Factor 2 analysis should also include the time required for staging the installation of multiple control devices at a given facility if applicable.

1.4.3 FACTOR 3 – ENERGY AND OTHER IMPACTS

Energy and environmental impacts include the following but are not limited to and/or need to be included in the analysis:

Energy Impacts

- Electricity requirement for control equipment and associated fans
- Water required
- Fuel required

Environmental Impacts

- Waste generated
- Wastewater generated
- Additional carbon dioxide (CO_2) produced
- Reduced acid deposition
- Reduced nitrogen deposition
- Impacts to Regional Haze

Non-air environmental impacts (positive or negative) can include changes in water usage and waste disposal of spent catalyst or reagents. EPA recommends that the costs associated with non-air impacts be included in the Cost of Compliance (Factor 1). Other effects, such as deposition or climate change due to greenhouse gases (GHGs) do not have to be considered.

For this analysis, SLR evaluated the direct energy consumption of the emission control device, solid waste generated, wastewater discharged, acid deposition, nitrogen deposition, any offsetting negative impacts on visibility from controls operation, and climate impacts (e.g., generation and mitigation of greenhouse gas emissions).

In general, the data needed to estimate these energy and other non-air pollution impacts were obtained from the cost studies which were evaluated under Factor 1. These analyses generally quantify electricity requirements, increased water requirements, increased fuel requirements, and other impacts as part of the analysis of annual operation and maintenance (O&M) costs.

Costs of disposal of solid waste or otherwise complying with regulations associated with waste streams were included under the cost estimates developed under Factor 1 and were evaluated as to whether they could be cost-prohibitive or otherwise negatively affect the facility.

1.4.4 FACTOR 4 – REMAINING EQUIPMENT LIFE

Factor 4 accounts for the impact of the remaining equipment life on the cost of control. Such an impact will occur when the remaining expected life of a specific emission source is less than the lifetime of the pollution control device that is being considered. An appropriate useful life is selected and used to calculate emission reductions, amortized costs, and cost per ton of pollutant.

2. EMISSIONS CONTROL TECHNOLOGY ASSESSMENT

The emission control technology feasibility assessments were performed for the applicable units and pollutants in Table 2-1. Technical feasibility is demonstrated based on physical, chemical, or engineering principles.

Table 2-1. Applicable Unit

Emission Units	Pollutant(s)
South Boiler	PM_{10}, NO_X
North Boiler	PM_{10}, NO_X
Veneer Dryers	PM_{10}, NO_X
Plywood Press	PM_{10}

As outlined in the New Source Review (NSR) Workshop Manual (Draft), control technologies are technically feasible if either (1) they have been installed and operated successfully for the type of source under review under similar conditions or (2) the technology could be applied to the source under review.

2.1 SOUTH BOILER – WOOD/BARK FIRED

The South Boiler is a wood-fired dutch oven boiler with a maximum rated steam capacity of 35,000 lb/hr which is equivalent to approximately 49 MMBtu/hr of heat input. Actual NO_X emissions total 37.59 tons per year. The boiler was manufactured and installed in 1944, making it challenging to modify due to both its age and the dated dutch oven design. The boiler is considered an industrial boiler with a maximum heat input rate of less than 100 MMBtu/hr. As part of this analysis, the retrofit control technologies were identified by researching the U.S. EPA Reasonably Available Control Technology/Best Available Control Technology/Lowest Achievable Emission Rate (RACT/BACT/LAER) Clearinghouse (RBLC) database, engineering and permitting experiences, and surveying available literature.

2.1.1 NO_X CONTROL TECHNOLOGIES

In an industrial boiler, emissions of NO_X are formed in three ways: thermal, fuel bound, and prompt. Thermal NO_X is created by high flame temperature in the presence of oxygen. Fuel bound NO_X is inherent in fuel. Prompt NO_X is formed when nitrogen molecules in the air react with fuel during combustion. NO_x emission control technologies identified which may be available for use on the boiler are shown in Table 2-2.

Table 2-2. NO_X Control Technologies – South Boiler

Control Technology	Control Efficiency (%)	Technically Feasible
Good Combustion Practices	Base Case	Base Case – Feasible
Over Fire Air (OFA)	30-50	Infeasible
Low NO_X Burner (LNB)	30-60	Infeasible

Control Technology	Control Efficiency (%)	Technically Feasible
Flue Gas Recirculation	40-80	Infeasible
Selective Non-catalytic Reduction	25-50	Infeasible
Selective Catalytic Reduction	70-90	Infeasible

A description and evaluation of each of these control technologies is found in the following sections.

2.1.1.1 Good Combustion Practices

Good combustion practices can lower the emission of NO_X by using operational and design elements that optimize the amount and distribution of excess air in the combustion zone. Good combustion practices can be implemented by operating the boiler according to the manufacturer's recommendation, periodic inspections and maintenance, and periodic tuning of boilers to maintain excess air at optimum levels. Good combustion practices are currently used for the boiler and are considered technically feasible for this analysis.

2.1.1.2 Overfire Air

An overfire air (OFA) system is a combustion staging process that diverts a portion of the combustion air away from the primary combustion zone and creates an oxygen depleted zone that reduces the formation of NO_X. OFA systems have demonstrated NO_X reduction efficiencies of approximately 30% to 50%. Although OFA is commonly applied to wood-fired utility boilers, this system is not applied to dutch oven industrial boilers. OFA is also not listed as a control device for NO_X emissions from wood-fired boilers in the RBLC database. OFA retrofit is not considered technically feasible to install on the South Boiler due to the limited space between the top row of the burners and the convective pass. Therefore, OFA is removed from further consideration for the purpose for this analysis.

2.1.1.3 Low NO_X Burners

Low NO_X burners (LNBs) are a pre-combustion control technology that reduces combustion temperature and thus reduces the formation of thermal NO_X. The technology requires careful control of the fuel-air mixture during combustion. LNBs have demonstrated NO_X reduction efficiencies of approximately 30% to 60%. In order to apply an LNB in a wood fired boiler the technology generally requires pulverized fuel. The South Boiler is a dutch oven boiler which uses solid wood fuel in the burner. The solid fuel and the high moisture content in fuel would not create an appropriate environment needed for the effective operation of the LNB.

LNBs are also not listed as a control device for NO_X emissions from wood-fired boilers in the RBLC database. Therefore, LNBs are not considered a technically feasible control option for NO_X emissions from the combustion of solid wood fuel on the South Boiler.

2.1.1.4 Flue Gas Recirculation

Flue gas recirculation (FGR) requires recirculating a portion of relatively cool exhaust gases back into the combustion zone in order to lower the flame temperature and reduce NO_X formation. FGR has demonstrated NO_X reduction efficiencies of approximately 45%.

FGR technology in the boiler will require installing additional ductwork, combustion air fans, and additional structures to recirculate the flue gases from the boiler exhaust stack back into the combustion zone. Due to the extensive structural changes and addition of new equipment, FGR is difficult to retrofit on the existing boiler. The boiler is over 70 years old and the extensive structural changes required to install FGR are not feasible. The boiler also has extremely limited space for any new installation. Therefore, FGR is not considered technically feasible for the boiler.

2.1.1.5 Selective Non-Catalytic Reduction

Selective non-catalytic reduction (SNCR) is a post-combustion NO_X control technology in which a reagent (typically ammonia or urea) is injected into the exhaust gases to react chemically with NO_X, forming nitrogen and water. The success of this process in reducing NO_X emissions is highly dependent on the ability to uniformly mix the reagent into the flue gas at a zone in the exhaust stream at which the flue gas temperature is within a narrow range, typically from 1,700°F to 2,000°F. To achieve the necessary mixing and reaction, the residence time of the flue gas within this temperature window should be at least 0.5 to 1.0 seconds. The consequences of operating outside the optimum temperature range are severe. Outside the upper end of the temperature range, the reagent will be converted to NO_X. Below the lower end of the temperature range, the reagent will not react with the NO_X and discharge from the stack (ammonia slip). SNCR systems are capable of sustained NO_X removal efficiency in the range of approximately 25% to 50%.

The exhaust temperature from the South Boiler is approximately 370^{o}F based on the recent source test performed in 2018. However, as mentioned above, SNCR usually operates at gas temperatures ranging from 1,700°F to 2,000°F. In addition, there are also site-specific limitations (space requirement, age of the boilers) of installing all the necessary equipment required for this control technology. Therefore, SNCR is considered technically infeasible for the south boiler.

2.1.1.6 Selective Catalytic Reduction

Selective catalytic reduction (SCR) is a post-combustion technology that employs ammonia in the presence of a catalyst to convert NO_X to nitrogen and water. The function of the catalyst is to lower the activation energy of the NO_X decomposition reaction. Therefore, the chemical reduction reaction between ammonia and NO_X occurs at much lower temperatures than those required for SNCR systems. The necessary temperature range for the SCR system depends on the type of catalysts. Most SCR systems operate in the range of 550°F to 750°F. However, high-temperature catalysts can operate above 750°F. Typical catalysts include vanadium pentoxide, titanium dioxide, noble metals, and tungsten trioxide.

Technical factors related to this technology include the catalyst reactor design, optimum operating temperature, sulfur content of the fuel, de-activation due to aging, ammonia slip emissions, and the design of the ammonia injection system. When properly designed and operated, SCR systems can achieve NO_X removal efficiencies in the range of 70% to 90%.

The exhaust temperatures from the boiler is approximately 370°F which is below the operating range of 550°F to 750°F for SCR. Furthermore, the PM emissions from the south boiler would foul and poison the catalyst. The deactivation of the catalyst would eliminate the application for SCR to control NO_X emissions. Therefore, SCR is considered technically infeasible for the boiler.

2.1.2 PM_{10} CONTROL TECHNOLOGIES

Particulate matter (PM) emissions from wood-fired boiler consist of unburned carbon particles (soot), condensable vapors, and noncombustible materials (ash). PM_{10} emission control technologies identified which may be available for use on the boiler are shown in Table 2-3.

Table 2-3. PM_{10} Control Technologies – South Boiler

Control Technology	Control Efficiency (%)	Technically Feasible
Multiclone	Base Case	Base Case – Feasible
Venturi Scrubber	90%	Infeasible
Electrostatic Precipitator (ESP)	99%	Feasible
Fabric Filters (Baghouse)	99%	Infeasible

A description and evaluation of each of these control technologies is found in the following sections.

2.1.2.1 Multiclones

Multiclones are mechanical collectors which use centrifugal forces to separate particulate matter from an exhaust gas stream and recirculate back to the boiler. This technology works best when operating according to the maximum pressure drop identified in the design specification. The south boiler is already equipped with multiclones to control PM_{10} emissions.

2.1.2.2 Venturi Scrubber

A venturi scrubber removes PM from the gas stream by capturing the particles in liquid droplets and separating the droplets from the gas steam. The droplets act as conveyors of the particulate out of the gas stream.

A venturi scrubber consists of three sections: converging, throat, and diverging. The flue gas and the scrubbing liquid enter the converging and the throat sections, where the atomization of the scrubbing liquid takes place through the velocity of the flue gas. The atomized liquid provides an enormous number of tiny droplets for the dust particles to impact on. The gas liquid mixture decelerates in the diverging section and the liquid droplets incorporating the particulate matter are separated from the gas stream in a cyclonic separator with a mist eliminator. A venturi scrubber can be designed to achieve a PM removal efficiency of 90%.

Venturi Scrubbers are not listed as a control device for PM_{10} emissions from wood-fired boilers in the RBLC database. Therefore, a venturi scrubber is not considered technically feasible and is removed from further consideration for the purpose of this analysis.

2.1.2.3 Fabric Filters

Fabric filters, also referred to as baghouses, remove PM from a gas stream by passing the stream through porous fabrics. The efficiency of the fabric filter increases as the dust particles form a porous cake on the surface of the fabric. However, the dust particles need to be frequently removed from the fabric in order to maintain the optimum pressure drop across the system. Fabric filters can be in the form of sheets, cartridges, or bags, with a number of the individual fabric filter units housed together in a group. Bags are the most common type of fabric filter.

According to U.S. EPA-CICA Fact Sheet, operating conditions are important determinants of the choice of fabric filter. Some fabrics (e.g., polyolefins, nylons, acrylics, polyesters) are useful only at relatively low temperatures of 200°F to 300°F. For high temperature flue gas streams, more thermally stable fabrics such as fiberglass, Teflon®, or Nomex® must be used. Temperatures in excess of 550°F require special refractory mineral or metallic fabrics, which can be expensive. Fabric filter systems can be designed to have a PM removal efficiency in excess of 99%.

A fabric filter has the potential to experience filter clogging (blinding) for boilers that combust high moisture content fuels. In addition, according to US EPA's AP-42, Section 1.6, fabric filters also have the potential to catch and/or cause fire that arises "from the collection of combustible carbonaceous fly ash." Therefore, due to the risk associated with this technology, the fabric filter is not considered technically feasible for the South Boiler. Please note that there are no entries found in the RBLC that show fabric filters for wood-fired industrial boilers less than 100 MMBtu/hr.

2.1.2.4 Electrostatic Precipitator

Electrostatic precipitators (ESPs) use electrical forces to remove particulates from a gas stream and move them onto collector plates. PM in the gas stream is given an electrical charge when it passes through a corona, a region with gaseous ion flow. Electrodes are maintained at high voltage and generate the electrical field that forces PM to the collector walls. After PM is collected, it is knocked off or "rapped" by various mechanical means to dislodge the particulate for collection in hoppers. ESPs can be designed for a wide range of gas temperatures, and can handle temperatures up to 1300°F. ESPs are also capable of operating under high pressure (to 1,030 kPa (150 psi)) or vacuum conditions.

ESPs can be designed to have a PM removal efficiency of approximately 99%. Although, there are site-specific limitations (space requirement, age of the boilers), an ESP is considered technically feasible for the purpose of this analysis.

2.2 NORTH BOILER

The North Boiler is also a wood-fired dutch oven boiler with a maximum rated steam capacity of 12,500 lb/hr which is equivalent to approximately 17 MMBtu/hr of heat input. The emissions control technologies reviewed for the South Boiler are also applicable to the North Boiler. However, the North Boiler is rarely operated and the permitted emissions are extremely low. Due to the low emissions from this boiler and the high cost of any feasible control options identified for the South Boiler, application of good combustion practices are the only technically feasible control option for the North Boiler.

Table 2-4. Control Technology – North Boiler

Control Technology	Control Efficiency (%)	Technically Feasible
Good Combustion Practices	Base Case	Base Case – Feasible

2.3 VENEER DRYERS

CFP operates two veneer dryers (Dryer 1 and Dryer 2) equipped with natural gas burners. Dryer 1 and Dryer 2 have a maximum throughput of 13,000 ft^2/hour and 9,000 ft^2/hour, respectively. PM_{10} emissions from veneer dryers are the result of fuel combustion and condensable PM associated with higher weight gaseous organic compounds. NO_X emissions are associated with the natural gas combustion. The emissions from the veneer dryers are currently minimized by implementing best management practices which include operating the dryers in accordance with manufacturers' recommendations.

2.3.1 PM_{10} CONTROL TECHNOLOGIES

Multiple cyclones, electrified filter beds, wet scrubbers, and wet ESPs can be used to control PM_{10} emissions from the dryers. However, these control technologies are not commonly used for veneer dryers. There is only one entry found in the RBLC database that lists multiclones as a control technology for PM emission from a veneer dryer. The veneer dryers each include a heating zone and a cooling zone and each zone is equipped with several exhaust stacks. Due to multiple stacks associated with the dryers, it would be difficult to install add-on controls, such as a multiclone to successfully control emissions of PM. Therefore, for the purpose of this analysis, multiclones are not considered technically feasible for the veneer dryers.

Table 2-5. PM_{10} Control Technologies – Veneer Dryers

Control Technology	Control Efficiency (%)	Technically Feasible
Best Management Practice	Base case	Base Case – Feasible
Multiclone	10-40	Infeasible

2.3.2 NO_X CONTROL TECHNOLOGIES

LNBs are the only control technology identified in the RBLC database for veneer dryers. As mentioned previously, LNBs have demonstrated NO_X reduction efficiencies of approximately 30% to 60%. For the purpose of this analysis, LNBs are considered a technically feasible control option for NO_X emissions from the natural gas burners associated with the veneer dryers.

Table 2-6. NO_X Control Technologies – Veneer Dryers

Control Technology	Control Efficiency (%)	Technically Feasible
Best Management Practice	Base case	Base Case – Feasible
LNB	30-60	Feasible

2.4 PLYWOOD PRESSES

CFP operates three steam heated presses each with a maximum production of 20,000 ft^2 per hour. PM_{10} emissions from these presses consist of very fine wood materials and condensable PM from organic compounds. As shown in Table 1-5 the total permitted PM_{10} emissions from the presses are only 2.5 tpy. Due to the extremely low emissions from these presses and the high cost of any add-on emission controls, additional PM_{10} controls would not be feasible. The emissions from the presses are currently minimized by implementing best management practices which include operating the presses in accordance with manufacturers' recommendations.

Table 2-7. Control Technology – Plywood Presses

Control Technology	Control Efficiency (%)	Feasibility
Best Management Practice	Base Case	Base Case – Feasible

3. FOUR FACTOR ANALYSIS

This section addresses the following four factors for the technologically feasible control options identified in Section 2 as requested by Oregon DEQ.

- Cost of compliance
- Time necessary for compliance
- Energy and non-air environmental impacts
- Remaining useful life of the source

For these four factors, this analysis followed EPA guidance[1] as well as EPA's Air Pollution Cost Manual.

3.1 FACTOR 1 – COST OF COMPLIANCE

The cost of compliance analysis estimated the capital cost, annual cost, and cost-effectiveness of each control option identified as technically feasible according to the methods and recommendations in the U.S. EPA's Air Pollution Control Cost Manual. The capital cost includes the equipment cost and the installation costs (direct and indirect). The annual cost includes O&M costs. The cost-effectiveness (dollar per ton of pollutant removed) is calculated using the total net annualized costs of control, divided by the actual tons of pollutant removed per year, for each control technology. The 2017 actual emissions for each applicable emission unit are used as baseline emissions for this analysis. The capital recovery factor applied in this analysis is 0.0786, based on a 20-year equipment life and 4.75% interest rate as noted in Oregon DEQ's *Fact Sheet – Regional Haze: Four Factor Analysis (December 5, 2019)*. The costs are adjusted to 2020 dollar values due to inflation. The detailed cost calculations are provided in Attachment A.

3.1.1 ESP – SOUTH BOILER

The capital and O&M costs for an ESP are based on the average cost data provided in U.S. EPA's *Air Pollution Control Technology – Fact Sheet (EPA 452/F-03-024)* and the design flowrate of the clay handling system. According to U.S. EPA document (EPA/452/B-02-001), the useful life of an ESP varies between 4 to 30 years and the typical useful life is about 20 years. Therefore, a useful life of 20 years was used for this analysis. Table 3-1 summarizes the costs of an ESP for the South Boiler. The cost effectiveness value of approximately $11,400 per ton of PM_{10} removed is clearly excessive and indicates that the installation of an ESP is not cost effective for the South Boiler.

[1] *Guidance on Regional Haze State Implementation Plans for the Second Implementation Period (August 2019)*

Table 3-1. Cost Effectiveness – ESP for South Boiler

Parameter	Value
Design Flowrate (scfm)	9,762
Total Capital Cost Total O&M Cost Total Annualized Cost	$395,058 $385,794 $416,826
Control Efficiency (%)	99
PM_{10} Emissions Reduction (tons/yr)	36.43
Cost Effectiveness ($/ton PM_{10} removed)	**11,441**

3.1.2 LNB – VENEER DRYERS

The capital and O&M costs for the LNB are based on the average cost data provided in Table 14 of U.S. EPA's *Technical Bulletin – Nitrogen Oxides (NO_x), Why and How They Are Controlled (EPA 456/F-99-006R, November 1999)* and the maximum heat rates of the dryers. Table 3-2 summarizes the costs of LNBs for the dryers. The cost effectiveness value of approximately $70,000 per ton of NO_X removed is clearly excessive and indicates that the installation of LNBs is not cost effective for each dryer.

Table 3-2. Cost Effectiveness – LNB for Veneer Dryer

Parameter	Dryer 1	Dryer 2
Maximum Heat Rate (MMBtu/hr)	36	41
Total Capital Cost Total O&M Cost Total Annualized Cost	$291,600 $59,940 $82,845	$332,100 $68,265 $94,352
Control Efficiency (%)	45	45
NO_x Emissions Reduction (tons/yr)	1.13	1.13
Cost Effectiveness ($/ton NO_X removed)	**73,201**	**83,368**

3.2 FACTOR 2 – TIME NECESSARY FOR COMPLIANCE

This factor addresses the estimated time needed for the design and installation of the technically feasible control options. Per U.S. EPA's Technical document[2], the installation of LNBs may require up to 8 months. Due to the site specific constraints and age of the applicable units, installation of LNBs will be complex and may require additional time than provided by U.S. EPA guidance. A similar timeline is proposed for an ESP. The projected time for compliance is provided in Table 3-3. Although these control options have are already been deemed as not cost effective, the following information is provided per U.S. EPA guidance.

[2] *Assessment of Non-EGU NOx Emission Controls, Cost of Controls, and Time for Compliance (November 2015)*

Table 3-3. Time for Compliance

Control Options	Time Necessary for Compliance
LNB (for Veneer Dryer)	12 Months (approx.)
ESP (for South Boiler)	12 Months (approx.)

3.3 FACTOR 3 – ENERGY AND NON-AIR ENVIRONMENTAL IMPACTS

This subsection addresses the energy and non-air environmental impacts associated with the installation and operation of the technically feasible control options. These impacts are based on the information from standard resources (e.g., U.S. EPA Technical documents) and professional experience and judgement.

3.3.1 ESP – SOUTH BOILER

The installation of an ESP for the South Boiler would increase the annual electric consumption of the facility. Electricity is required for the operation of a fan, electric field generation, and cleaning. The power required for a fan is dependent on the pressure drop across the ESP, the flowrate, and the operating time. The annual electricity cost is included in the O&M costs of the cost analyses summarized in Table 3-1. The non-environmental impacts include landfilling of solid waste generated in the form of the collected dust from operation of the ESP.

3.3.2 LNB – VENEER DRYERS

The energy impacts from the application of LNBs are expected to be minimal. However, the lower flame temperature associated with an LNB will decrease the efficiency and the performance of the burners. Therefore, to maintain the same amount of heat required for the dryers, the burners will be required to burn more fuel.

LNBs are not expected to have any non-air environmental impacts.

3.4 FACTOR 4 – REMAINING USEFUL LIFE OF SOURCE

Per EPA guidance, the useful life of the control equipment will be less than the useful life of the facility itself. Although most of the applicable units are more than 50 years old, CFP has no plan of shutting down any of the equipment currently. Therefore, the remaining useful life of the sources is assumed to be 20 years, which is the typical useful life of the control equipment.

4. CONCLUSIONS

At the request of the Oregon DEQ, a four factor analysis was prepared for CFP. The analysis identified technically feasible control options for applicable emission units and evaluated the technology for the following four statutory factors:

1. The costs of compliance;
2. The time necessary for compliance;
3. The energy and non-air quality environmental impacts of compliance; and
4. The remaining useful life of any potentially affected major or minor stationary source or group of sources.

Based on the above evaluation, SLR has determined that it is not technically feasible or cost effective to implement additional emission controls for the emission units at CFP.

5. REFERENCES

United States Environmental Protection Agency (USEPA). 2017. Office of Air Quality Planning and Standards Control Cost Manual. Office of Air Quality Planning and Standards, Economic Analysis Branch, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina. November. (Chapter 2, updated November, 2017)

USEPA. Guidance on Regional Haze State Implementation Plans for the Second Implementation Period (August 2019)

USEPA. Assessment of Non-EGU NOx Emission Controls, Cost of Controls, and Time for Compliance (November 2015)

USEPA. Technical Bulletin – Nitrogen Oxides (NOx), Why and How They Are Controlled (EPA 456/F-99-006R, November 1999)

Oregon Department of Environmental Quality (DEQ). Fact Sheet – Regional Haze: Four Factor Analysis (December 5, 2019)

ATTACHMENT A

COST ANALYSIS

Table 1. ESP Retrofit Cost Effectiveness - South Boiler
Columbia Forest Products
Klamath Falls, Oregon

Parameter	Value	Reference
Design Flowrate (scfm)	9,762	2018 Source Test Data (1)
Capital Cost ($/scfm) in 2002 dollars	21.5	EPA-452/F-03-028 (Fact Sheet) - Average of Range (2)
O&M Cost ($/scfm) in 2002 dollars	21	EPA-452/F-03-028 (Fact Sheet) - Average of Range (2)
Capital Cost ($/scfm) in 2020 dollars	31.13	Adjusted for Inflation - CPI Inflation Calculator (3)
O&M Cost ($/scfm) in 2020 dollars	30.4	Adjusted for Inflation - CPI Inflation Calculator (3)
Total Capital Cost ($)	395,058	Design Rate (scfm) x 2020 Capital Cost ($/scfm) x Retrofit Factor (1.3) (4)
Total O&M Cost ($)	385,794	Design Rate (scfm) x 2020 O&M Cost ($/scfm) x Retrofit Factor (1.3) (4)
i, Interest Rate (%)	4.75	DEQ's Regional Haze; Four Factor Analysis - Fact Sheet (12/5/2019)
n, Equipment Life	20	EPA Cost Control Manual (4)
Capital Recovery Factor (CRF) =	0.08	i (1+ i)n/(1+ i)n - 1
Total Capital Investment (TCI) =	31,032	Total Capital Cost ($) x CRF
Total Annualized Cost ($) =	416,826	Total O&M Cost ($) + TCI ($)
Baseline PM_{10} Emissions (tons/yr)	36.80	2017 Annual Emissions
Control Efficiency (%)	99	Assumed
PM_{10} Reduction (tons/yr)	36.43	Baseline emissions x Control Efficiency/100
Cost Effectiveness ($/ton)	**11,441**	**Total Annual Cost/PM_{10} Removed/year**

Notes:

scfm = standard cubic feet per minute (flow rate)

O&M = Operations and Maintenance

1) Source Test Report - 2018 Compliance Testing - Columbia Forest Products - South Boiler (EU BLR-S), Klamath Falls, Oregon - Prepared by Montrose Air Quality Services, LLC (October 23, 2018)
2) U.S. EPA, Air Pollution Control Technology Fact Sheet, Dry Electrostatic Precipitator (ESP) - Wire-Plate Type (EPA-452/F-03-028)
3) CPI Inflation Calculator - Bureau of Labor Statistics - https://data.bls.gov/cgi-bin/cpicalc.pl
4) U.S. EPA, Cost Control Manual, Section 6, Chapter 3 - EPA/452/B-02-001, 2002. https://www3.epa.gov/ttncatc1/dir1/c_allchs.pdf

Table 2. Low NO_X Burner (LNB) Retrofit Cost Effectiveness - Veneer Dryers

Columbia Forest Products

Klamath Falls, Oregon

Parameter	Dryer 1	Dryer 2	Reference
Maximum Heat Input Rate (MMBtu/hr)	36	41	Design Specifications
Capital Cost ($/MMBtu) in 1993 dollars	4475	4475	Table 14. EPA-456/F-99-00R (November 1999) - Average of Range (1)
O&M Cost ($/MMbtu) in 1993 dollars	920	920	Table 14. EPA-456/F-99-00R (November 1999) - Average of Range (1)
Capital Cost ($/MMBtu) in 2020 dollars	8100	8100	Adjusted for Inflation - CPI Inflation Calculator (2)
O&M Cost ($/MMBtu) in 2020 dollars	1665	1665	Adjusted for Inflation - CPI Inflation Calculator (2)
Total Capital Cost ($)	291,600	332,100	Design Rate (MMBtu/hr) x 2020 Capital Cost ($/MMBtu)
Total O&M Cost ($)	59,940	68,265	Design Rate (MMBtu/hr) x 2020 O&M Cost ($/MMBtu)
i, Interest Rate (%)	4.75	4.75	DEQ's Regional Haze; Four Factor Analysis - Fact Sheet (12/5/2019)
n, Equipment Life	20	20	EPA Cost Control Manual (3)
Capital Recovery Factor (CRF) =	0.08	0.08	i (1+ i)n/(1+ i)n - 1
Total Capital Investment (TCI) =	22,905	26,087	Total Capital Cost ($) x CRF
Total Annualized Cost ($) =	82,845	94,352	Total O&M Cost ($) + TCI ($)
Baseline NO_X Emissions (tons/yr)	2.52	2.52	2017 Annual Emissions
Control Efficiency (%)	45	45	Chemical Engineering Progress (CEP), Magazine, January 1994 (4)
NO_X Reduction (tons/yr)	1.13	1.13	Baseline emissions x Control Efficiency/100
Cost Effectiveness ($/ton)	**73,201**	**83,368**	**Total Annual Cost/NO_X Removed/year**

Notes:

O&M = Operations and Maintenance

1) U.S. EPA, Technical Bulletin on Nitrous Oxides (Nox), Why and How They are Controlled, EPA-465/F-99-00R, 1999
https://www3.epa.gov/ttncatc1/dir1/fnoxdoc.pdf

2) CPI Inflation Calculator - Bureau of Labor Statistics - https://data.bls.gov/cgi-bin/cpicalc.pl

3) U.S. EPA, Cost Control Manual, EPA/452/B-02-001, 2002. https://www3.epa.gov/ttncatc1/dir1/c_allchs.pdf

4) Chemical Engineering Progress (CEP) Magazine, January 1994; ClearSign Combustion Corporation, May 2013

ATTACHMENT B

SUPPORTING DOCUMENTS

Table 1. Emissions Details
Regional Haze Four Factor Analysis
Columbia Forest Products - Klamath Falls. Oregon

Emissions Source	2017 Throughput	Permitted Throughput	Throughput Unit	Pollutant(s)	Emission Factor	Emission Factor Unit	Reference	2017 Emissions (tons/yr)	Permitted Emissions (tons/yr)
South Boiler (BLR-S)	144,588,000	175,200,000	lbs steam/yr	PM_{10}	0.50	lb/1000 lb steam	94% of PM -1994 ST	36.18	43.84
				SO_2	0.01	lb/1000 lb steam	DEQ factor	1.01	1.23
				NO_X	0.52	lb/1000 lb steam	Avg. of all valid ST	37.59	45.55
Noth Boiler (BLR-N)	0	35,040,000	lbs steam/yr	PM_{10}	0.30	lb/1000 lb steam	86% of PM - 1994 ST	0.00	5.28
				SO_2	0.01	lb/1000 lb steam	DEQ factor	0.00	0.25
				NO_X	0.37	lb/1000 lb steam	Avg. of all valid ST	0.00	6.48
Veneer Dryers (V-N)	83,829	162,540	MSF/yr	PM_{10}	0.36	lb/MSF	Avg. of all valid ST	15.09	29.26
				NO_X	0.12	lb/MSF	DEQ factor	5.03	9.75
Plywood Press (PV)	114,402	162,790	MSF/yr	PM_{10}	0.04	lb/MSF	2000 ST	2.29	3.26
Storage Pile (SP)	114,402	162,790	MSF/yr	PM_{10}	0.03	lb/MSF	EPA Fire factor (emission factors based on plywood production)	1.72	2.44
Material handling (cyclones, target box, baghouses)	114,402	162,790	MSF/yr	PM10	0.033	lb/MSF	EPA Fire factor (emission factors based on plywood production)	1.92	2.73

Table 1. RBLC Search - Wood-Fired Industrial Boilers less than 100 MMBtu/hr - PM_{10}

Permit Date Between 01/01/2010 And 05/14/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Primary Fuel	Throughput	Throughput Unit	Control Method Description	Emission Limit	Emission Limit Unit	Case-by-Case Basis
*WI-0276	LOUISIANA-PACIFIC CORPORATION	WI	14-DCF-189	4/2/2015	B11 & B12 Boilers	Wood Waste	19.4	mmBTU/hr	Cyclone, Wet Electrostatic Precipitator, and Thermal Oxidizer in series	6.1	LB/HR	BACT-PSD
*WI-0276	LOUISIANA-PACIFIC CORPORATION	WI	14-DCF-189	4/2/2015	B21 & B22 Boilers	Wood Waste	23.8	mmBTU/hr	Cyclone, Wet Electrostatic Precipitator, and Thermal Oxidizer in series	6.1	LB/HR	BACT-PSD

Table 2. RBLC Search - Wood-Fired Industrial Boilers less than 100 MMBtu/hr - NO_X
Permit Date Between 01/01/2010 And 05/14/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Primary Fuel	Throughput	Throughput Unit	Control Method Description	Emission Limit	Emission Limit Unit	Case-by-Case Basis
*WI-0276	LOUISIANA-PACIFIC CORPORATION	WI	14-DCF-189	4/2/2015	B11 & B12 Boilers	Wood Waste	19.4	mmBTU/hr	Good Combustion Practices	8.9	LB/HR	BACT-PSD
*WI-0276	LOUISIANA-PACIFIC CORPORATION	WI	14-DCF-189	4/2/2015	B21 & B22 Boilers	Wood Waste	23.8	mmBTU/hr	Good Combustion Practices	16.2	LB/HR	BACT-PSD

Table 1. RBLC Search - Natural Gas-Fired Veneer Dryer - PM_{10}
Permit Date Between 1/1/2000 And 05/14/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Throughput	Throughput Unit	Control Method Description	Emission Limit	Emission Limit Unit	Case-by-Case Basis
MT-0021	PLUM CREEK MANFACTURING, EVERGREEN FACILITY	MT	2602-08	8/10/2002	PLYWOOD VENEER DRYERS				12.6	LB/H	BACT-PSD
TX-0292	TEMPLE INLAND PINELAND MANUFACTURING COMPLEX	TX	PSD-TX-924	8/6/2000	REJECT VENEER DRYER, EPN19A/B	25000	SQ FT/H	CYCLONE A & B	1.5	LB/H	Other Case-by-Case

Table 2. RBLC Search - Natural Gas-Fired Veneer Dryer - NO_X
Permit Date Between 1/1/2000 And 05/14/2020

RBLCID	Facility Name	Facility State	Permit Number	Permit Issuance Date	Process Name	Throughput	Throughput Unit	Control Method Description	Emission Limit	Emission Limit Unit	Case-by-Case Basis
LA-0259	FLORIEN PLYWOOD PLANT	LA	PSD-LA-755	1/31/2012	Veneer Dryer No. 1- 4 Heated Zones			Low NOx Burners	8.49	LB/H	BACT-PSD
LA-0125	WILLAMETTE INDUSTRIES, INC.	LA	PSD-LA-627 (M-1)	1/7/2002	VENNER DRYER NO.2 COOLING ZONE				0.88	LB/H	BACT-PSD
LA-0125	WILLAMETTE INDUSTRIES, INC.	LA	PSD-LA-627 (M-1)	1/7/2002	VENEER DRYERS, HOT ZONES			RTO/RCO	10.27	LB/H	BACT-PSD
LA-0125	WILLAMETTE INDUSTRIES, INC.	LA	PSD-LA-627 (M-1)	1/7/2002	VENNER DRYER NO.1 COOLING ZONE				0.37	LB/H	BACT-PSD