DEPARTMENT ORDER

Woodland Pulp LLC	**Departmental**
Washington County	**Findings of Fact and Order**
Baileyville, Maine	**New Source Review**
A-215-77-18-A	**NSR #18**

FINDINGS OF FACT

After review of the air emission license application, staff investigation reports, and other documents in the applicant's file in the Bureau of Air Quality, pursuant to 38 Maine Revised Statutes (M.R.S.) § 344 and § 590, the Maine Department of Environmental Protection (the Department) finds the following facts:

I. REGISTRATION

A. Introduction

FACILITY	Woodland Pulp LLC
LICENSE TYPE	06-096 C.M.R. ch. 115, Major Modification
NAICS CODES	322121
NATURE OF BUSINESS	Pulp and Paper Mill
FACILITY LOCATION	144 Main Street, Baileyville, Maine 04694

B. NSR License Description

Woodland Pulp LLC (Woodland Pulp or Woodland) has requested a New Source Review (NSR) license to upgrade the air system of the #3 Recovery Boiler to increase the maximum firing rate of black liquor solids, upgrade the Smelt Dissolving Tank to accommodate the increased firing rate of the #3 Recovery Boiler, and to remove #6 fuel oil as an allowable fuel for the #3 Recovery Boiler, #9 Power Boiler, and Lime Kiln. Woodland Pulp has also requested the certification of offset credits for nitrogen oxides (NO_x) resulting from the permanent shutdown of two other facilities in Maine, to be utilized as part of this project.

C. Emission Equipment

The following equipment is addressed in this NSR license:

Fuel Burning Equipment

Equipment	Maximum Capacity (MMBtu/hr)	Maximum Firing Rate (gal/hr)	Fuel Type	Stack #
#3 Recovery Boiler (#3 RB)	1,233 MMBtu/hr	5.35 MMlb BLS/day	Black liquor solids Natural gas Propane Synthetic natural gas*	#3 Recovery Boiler

*Synthetic natural gas is propane cut with air to mimic natural gas.

Process Equipment

Equipment	Production Rate	Pollution Control Equipment	Stack #
Smelt Dissolving Tank (SDT)	5.35 MMlb BLS/day	Dynamic wet scrubber	#3 Smelt Dissolving Tank Vent

D. Project Description

Woodland Pulp has proposed upgrading the #3 Recovery Boiler (#3 RB) air system to allow the unit to operate at a nominal maximum combustion rating of 5.35 million pounds of as-fired black liquor solids (BLS) per day (MMlbs/day), equivalent to 1,233 MMBtu/hr. The #3 RB was installed in 1989 and licensed with a maximum black liquor solids firing rate of 5.2 MMlb/day, equivalent to 1,207 MMBtu/hr. The #3 RB was installed with an air system design that was typical of other units of the same vintage. Since that time, kraft recovery boiler technology has improved, and upgraded air systems are available to improve boiler safety, reliability and environmental performance.

The firing capacity of the #3 RB was previously listed as 5.2 MMlb/day (Air Emission License A-215-70-I-R/A, issued November 18, 2011) and was increased to 6.0 MMlb/day in NSR license A-215-77-13-A (September 29, 2017) based on black liquor firing trials in 2017; however, the #3 RB has never been able to sustain operation at those firing rates for more than a few days at a time without significant plugging in the upper furnace.

The #3 RB air system upgrade will include present-day technology with the installation of new primary, secondary, and tertiary air port closure plates; a new second level of tertiary air (also known as quaternary air), located 10 to 20 feet above the existing tertiary air ports; new secondary and tertiary air ports and registers; two new black liquor openings and six

new black liquor stations; and high-volume low-concentration (HVLC) gas collection system modifications.
Woodland Pulp has also proposed modifications to the Smelt Dissolving Tank (SDT) in order to accommodate the future sustained firing rate of the #3 RB. The SDT has been in operation since the startup of the #3 RB in 1989 and the smelt spout system will be upgraded to present-day technology which consists of the installation of new shatter jets. The new shatter jets will use less steam improving the energy efficiency of the system and more effectively treating the smelt flow, minimizing the smelt/water reaction and improving safety. In addition a new mist eliminator will be installed downstream of the wet scrubber which can provide further particulate emission control, but is not required to operate for Woodland to achieve compliance with SDT emission limits.

The increase in sustained #3 RB firing capacity will not lead to an increase in pulp or tissue production. Increasing the capacity of the #3 RB will allow Woodland Pulp to further take advantage of a black liquor swap arrangement that it currently holds with the Irving Forest Products (Irving) kraft pulp mill in St. John, New Brunswick. At present, Woodland receives black liquor from Irving by truck and returns green liquor from the SDT to Irving by truck, allowing Woodland to make use of the fuel benefit of the imported black liquor. This air system upgrade project, once completed, will allow Woodland to receive greater quantities of black liquor from Irving, further increasing the fuel benefit to this facility.

E. Application Classification

All rules, regulations, or statutes referenced in this air emission license refer to the amended version in effect as of the issued date of this license.

The application for the #3 Recovery Boiler air system upgrade does not violate any applicable federal or state requirements and does not reduce monitoring, reporting, testing, or recordkeeping requirements. However, this application does seek to modify the #3 RB and the SDT which requires Best Available Control Technology (BACT) analyses to be performed in accordance with New Source Review.

The modification of a major source is considered a major or minor modification based on whether or not expected emissions increases exceed the "Significant Emission Increase" levels as given in *Definitions Regulation*, 06-096 Code of Maine Rules (C.M.R.) ch. 100. For a major stationary source, the expected emissions increase from each new, modified, or affected unit may be calculated as equal to the difference between the post-modification projected actual emissions and the baseline actual emissions for each NSR regulated pollutant. Affected equipment includes any new or physically modified equipment as well as any affected upstream or downstream activities.

1. Baseline Actual Emissions

Baseline actual emissions (BAE) are equal to the average annual emissions from any consecutive 24-month period within the ten years prior to submittal of a complete license application. Woodland Pulp has proposed using 1/2016 – 12/2017 as the 24-month baseline period from which to determine baseline actual emissions for all pollutants for emission units affected as part of this project.

BAE for existing modified and affected equipment are based on actual annual emissions reported to the Department through *Emissions Statements*, 06-096 C.M.R. ch. 137 with the following exceptions:

a. Emissions of PM are not collected in the annual emissions report. PM emissions from all equipment were determined in a similar matter as the filterable portions of the PM_{10} emissions.

b. Emissions of PM_{10} and $PM_{2.5}$ in the annual emissions report are for the filterable portion only. Reported emissions of PM_{10} and $PM_{2.5}$ were adjusted to include emissions of condensable particulate matter (CPM).

The results of this baseline analysis are presented in the table below.

Baseline Actual Emissions (1/2016 – 12/2017 Average)

Equipment	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	NO_x (tpy)	CO (tpy)	VOC (tpy)
#3 Recovery Boiler	138.8	125.8	103.4	100.9	536.0	654.1	18.5
Smelt Dissolving Tank	41.2	47.2	47.2	6.56	0.0	0.0	0.0
Total	**180.0**	**173.0**	**150.6**	**107.5**	**536.0**	**654.1**	**18.5**

2. Projected Actual Emissions

Projected actual emissions (PAE) are the maximum actual annual emissions anticipated to occur in any one of the five years (12-month periods) following the date existing units resume regular operation after the project or any one 12-month period in the 10 years following if the project involves increasing the unit's design capacity or its potential to emit of a regulated pollutant.

a. #3 Recovery Boiler

PAE for the #3 Recovery Boiler are based on operating at the post-project maximum continuous rating of 5.35 MMlb/day BLS and operating for 350 days per year, which is consistent with historic levels of daily operation considering downtime for fall and spring outages. Post-project natural gas use was estimated by scaling historic natural gas use to the post-project #3 Recovery Boiler firing rate. Emission factors for BLS firing were derived from emission estimates and guarantees provided by the air upgrade project vendor; emission factors for natural gas combustion were obtained from AP-42 Chapter 1.

b. Smelt Dissolving Tank

PAE for the Smelt Dissolving Tank were calculated based on the #3 Recovery Boiler operating at the post-project maximum continuous rating of 5.35 MMlb/day BLS and operating for 350 days per year, which is consistent with historic levels of daily operation considering downtime for fall and spring outages. Emission factors are based on results of source testing.

Projected actual emissions from the affected equipment are shown below.

Projected Actual Emissions

Equipment	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	NO_x (tpy)	CO (tpy)	VOC (tpy)
#3 Recovery Boiler	198.4	172.1	140.0	153.5	700.4	1,456.5	21.7
Smelt Dissolving Tank	48.7	55.7	55.7	6.6	0.0	0.0	0.0
Total	**247.1**	**227.8**	**195.7**	**160.1**	**700.4**	**1,456.5**	**21.7**

3. Emissions Increases

Emissions increases are calculated by subtracting BAE and excludable emissions from the PAE. The emission increase is then compared to the significant emissions increase levels.

Pollutant	Baseline Actual Emissions 1/16 – 12/17 (ton/year)	Projected Actual Emissions (ton/year)	Emissions Increase (ton/year)	Significant Emissions Increase Levels (ton/year)
PM	180.0	247.1	67.1	25
PM_{10}	173.0	227.8	54.8	15
$PM_{2.5}$	150.6	195.7	45.1	10
SO_2	107.5	160.1	52.6	40
NO_x	536.0	700.4	164.4	40

Pollutant	Baseline Actual Emissions 1/16 – 12/17 (ton/year)	Projected Actual Emissions (ton/year)	Emissions Increase (ton/year)	Significant Emissions Increase Levels (ton/year)
CO	654.1	1,456.5	802.4	100
VOC	18.5	21.7	3.2	40

4. Classification

Since emissions increases exceed significant emissions increase levels, this NSR License is determined to be a major modification for PM, PM_{10}, $PM_{2.5}$, SO_2, NO_x, and CO under *Minor and Major Source Air Emission License Regulations,* 06-096 C.M.R. ch. 115. Woodland Pulp has submitted an application to incorporate the requirements of this NSR license into the facility's Part 70 air emission license.

II. CERTIFICATION OF OFFSET CREDITS

A. Introduction

Woodland Pulp has requested to certify offset credits for nitrogen oxides (NO_x) resulting from the permanent shutdown of biomass-fired Boiler #1, formerly located at ReEnergy Fort Fairfield LLC, in Fort Fairfield, Maine and biomass-fired Boiler #1, formerly located at ReEnergy Ashland LLC, in Ashland, Maine. Section 1 (A)(3) of *Growth Offset Regulation*, 06-096 C.M.R. ch. 113, states the following:

> In cases where emission reductions have occurred through facility shutdown and for which the certification process has not been initiated by either the licensee or the Department, an applicant proposing a major new source or major modification in Maine may request certification of those reductions for use as offset credits in the licensing of the major new source or major modification through the applicable process as established in this Chapter.

Because the two ReEnergy boilers were permanently shut down and their air emission licenses surrendered, and Woodland Pulp is an applicant proposing a major modification in Maine, Woodland Pulp has requested certification of NO_x reductions from the two ReEnergy boilers for use as offset credits in the licensing of this major modification.

Although the entire State of Maine is currently classified as in attainment, it is also considered part of the Ozone Transport Region (OTR). Facilities located in the OTR are subject to the same permitting requirements as those located in ozone non-attainment areas. Therefore, certified emission reductions (offset credits) are required to be obtained for NO_x emissions increases from this major modification.

B. Offset Generation Details

The Department's *Growth Offset Regulation*, 06-096 C.M.R. ch. 113 sets forth the requirements for obtaining and generating offset credits. Offset credits are regulatory allowances and do not constitute property rights or an investment security or commodity. Offset credits generated in Maine may not be used unless certified by the Department through the procedures found in 06-096 C.M.R. ch. 113.

The following sections address the requirements for credit generation and certification under Section 4 of 06-096 C.M.R. ch. 113.

1. Base Case Quantification: 06-096 C.M.R. ch. 113, § (4)(A)

   The offset credits must be based on actual emissions occurring in a consecutive 24-month period after May 31, 1995, and must be quantifiable and calculated according to the same method and averaging time for the base case and future case. Since both ReEnergy Fort Fairfield LLC and ReEnergy Ashland LLC have permanently shut down all equipment and surrendered their air emission licenses, there are no emissions in the future case. NO_x offset credits have been requested based on the following baseline emission periods:

Baseline Emissions

Offset Generating Unit	NO_x Baseline Emissions (tpy)	Baseline Period	Method of Measurement
Boiler #1 ReEnergy Fort Fairfield	111.3	Jan 1, 2017 – Dec 31, 2018	CEMS
Boiler #1 ReEnergy Ashland	145.8	Jan 1, 2017 – Dec 31, 2018	CEMS

   The information used to calculate the baseline emissions listed in the table above can be found in the submitted application, file records, and Department records of emissions inventories.

2. Allowable Emissions Compliance: 06-096 C.M.R. ch. 113, § (4)(B)

   Only those emission reductions below the licensed or otherwise allowable emissions for the existing sources are creditable as offset credits. NO_x emissions from Boiler #1 at ReEnergy Fort Fairfield and Boiler #1 at ReEnergy Ashland remained in compliance with all federal and state NO_x emission requirements and license limits in the identified baseline years. Therefore, all NO_x emission reductions qualify for use as offset credits.

3. Required Reductions: 06-096 C.M.R. ch. 113, § (4)(C)

   Offset credits are not allowed for reductions in emissions that were required by any federally enforceable license conditions, requirements of the Clean Air Act, or other applicable federal or state law or requirement.

   The emission reductions from Boiler #1 at ReEnergy Fort Fairfield and Boiler #1 at ReEnergy Ashland are due to the voluntary decommissioning of both facilities and did not occur for compliance purposes. Therefore, the NO_x reductions resulting from the shutdowns are eligible for certification as offset credits.

4. Surplus Emissions: 06-096 C.M.R. ch. 113, § (4)(F)

   a. For emission reductions to be certified as offset credits, they must be surplus to the objective of attaining the standard. Although considered part of the OTR, Maine's Washington County (including Baileyville, where Woodland Pulp is located) and Aroostook County (including Fort Fairfield and Ashland, where the two permanently shut-down units were located) have never been classified as non-attainment under the 1990, 1997, 2008, and 2015 ozone standards. In addition, per computer simulation modeling for ozone attainment projections performed by EPA, no emissions sources located in Maine have a significant impact on any non-attainment area either in Maine or elsewhere in the country. No emission reductions are necessary in this part of the State to meet the ozone standard as it is already in attainment. Therefore, all emission reductions from the Fort Fairfield and Ashland facilities are surplus to the requirement of attaining the standard.

   b. Emission reductions are eligible as offset credits only if they are in excess of any reductions required by federal or state law, either existing or reasonably foreseeable. There have been no new regulations that would have applied to NO_x emissions from the ReEnergy biomass boilers since the timeframe selected as the base case.

5. Federally Enforceable Conditions: 06-096 C.M.R. ch. 113, § (4)(G)

   Emission reductions may qualify as offset credits only if they are made federally enforceable. The permanent shutdown of the equipment and surrender of the air emission licenses is considered federally enforceable.

6. Licensed and Actually Operated: 06-096 C.M.R. ch. 113, § (4)(H)

   To qualify for use as offset credits, emission reductions must be generated by a source that has been licensed or otherwise allowed to emit and has been actually operating and emitting the pollutant for at least two years. As demonstrated by historic 06-096 C.M.R.

ch. 137 emission inventory reports submitted by ReEnergy Fort Fairfield and ReEnergy Ashland, the biomass boilers at each facility operated for at least two years.

7. Shutdown Conditions: 06-096 C.M.R. ch. 113, § (4)(I)

   To qualify as offset credits, shutdowns or curtailments of plant production resulting in reduced emissions must demonstrate that the demand for the services or products will not shift to other similar sources in the state causing a failure of the expected decrease in emissions to occur. There are no new or expanding biomass-to-energy facilities located in the State of Maine that are undergoing construction or expansion due to the permanent shutdown of the two ReEnergy facilities.

8. Ozone Season Considerations: 06-096 C.M.R. ch. 113, § (4)(J)

   Offset credits used during the ozone season must be proportional to emission reductions during the ozone season. According to monthly biomass firing rates for each of the ReEnergy biomass boilers, operation of the boilers did not vary seasonally. Therefore, there is no significant fluctuation in NO_x emissions throughout the year.

9. Quantification: 06-096 C.M.R. ch. 113, § (5)(A-D)

   Quantification of offset credits for credit generators includes quantification of the base credit and adjustment of the base credit for compliance assurance. The compliance assurance multiplier used for emissions determined from CEMS data is 0.95. Therefore, the available certified offset credits from the shutdown of ReEnergy Fort Fairfield and ReEnergy Ashland are as follows:

NO_x Offsets Generating Unit	NO_x Baseline Emissions (tpy)	Compliance Assurance Multiplier	NO_x Offsets (tpy)
Boiler #1 ReEnergy Fort Fairfield	111.3	0.95	105.7
Boiler #1 ReEnergy Ashland	145.8	0.95	138.5
Total Available NO_x Credits			**244.2**

Because the quantity of NO_x offsets available for certification is greater than the quantity of NO_x offsets required for this project, Woodland has requested that only the quantity of NO_x offsets required for this major modification project be certified for use.

III. BEST PRACTICAL TREATMENT (BPT)

A. Introduction

In order to receive a license, the applicant must control emissions from each unit to a level considered by the Department to represent Best Practical Treatment (BPT), as defined in *Definitions Regulation*, 06-096 C.M.R. ch. 100. Separate control requirement categories exist for new and existing equipment as well as for those sources located in designated non-attainment areas.

BPT for new sources and modifications requires a demonstration that emissions are receiving Best Available Control Technology (BACT), as defined in 06-096 C.M.R. ch. 100. BACT is a top-down approach to selecting air emission controls considering economic, environmental, and energy impacts.

B. Nonattainment New Source Review

The proposed project results in a significant emission increase for NO_x, a ground-level ozone precursor pollutant. Although Maine is classified as in attainment for ozone, the project is required to be reviewed under Nonattainment New Source Review (NNSR) due to Maine's inclusion in the Ozone Transport Region. NNSR requirements for ozone include obtaining offsets for each ton of pollutant increase as described in *Growth Offset Regulation*, 06-096 C.M.R. ch. 113 and applying Lowest Achievable Emission Rate (LAER) instead of BACT for these pollutants.

1. Emission Offset Credits

   The proposed NO_x emissions increase for this project is 164.4 tpy. Pursuant to the requirements of 06-096 C.M.R. ch. 113, an offset ratio of 1.15 has been applied resulting in an offset requirement of 189.1 tpy. As described above, 189.1 tpy of certified offset credits resulting from the permanent shutdown of the ReEnergy Fort Fairfield and ReEnergy Ashland facilities shall be applied to this project to satisfy the offset requirements.

2. #3 Recovery Boiler

   a. Best Available Control Technology

      The following is a summary of the BACT determination for the #3 Recovery Boiler, by pollutant.

(1) Particulate Matter: $PM/PM_{10}/PM_{2.5}$

The majority of PM emissions (including PM_{10} and $PM_{2.5}$) from kraft recovery boilers are sodium salts, with about 80 percent of the PM_{10} being sodium sulfate with small amounts of potassium sulfate, sodium carbonate, and sodium chloride. These salts are primarily caused by the carryover of solids and sublimation and condensation of inorganic chemicals within the black liquor. The PM emissions of these salts are small in size with 50 to 100 percent of the particulate emissions being $PM_{2.5}$. Potential control technologies for PM emissions include add-on pollution control equipment such as bag houses/fabric filters, cyclones/multiclones, wet scrubbers, and electrostatic precipitators (ESP).

Baghouses/fabric filters remove particulates from exhaust streams by drawing the air through a series of filter bags suspended in a housing structure, collecting filterable particulates on the upstream side. The dust collected is periodically removed and disposed of. Baghouses encounter serious operational difficulties when used to control emissions from fuels with high moisture contents, especially BLS, which result in emissions of hydroscopic particulate salts. Condensation of moisture on the fabric of baghouses will cause clogging of the fabric. Therefore, baghouses are considered technologically infeasible for this application.

Cyclones consist of one or more conically shaped vessels in which the gas stream follows a circular potion prior to outlet. Particles enter the cyclone suspended in the gas stream which is forced into a vortex by the shape of the cyclone, and centrifugal force separates larger PM from the gas stream. Cyclones are not highly effective in controlling condensable PM emissions or particulates less than 5 micrometers in size. Because the majority of PM emissions from a recovery boiler have diameters less than 2.5 micrometers in size, cyclones do not have the ability to effectively capture and remove the type of PM associated with recovery boilers. Therefore, cyclones are considered technically infeasible for this application.

Wet scrubbers used for particulate matter control include spray towers, cyclonic spray towers, dynamic scrubbers, tray towers, and venturi scrubbers. A separator or demister section, used to remove entrained water droplets from the exhaust downstream of the scrubbing section, is a critical component of any wet scrubber. Common demisters include simple cyclonic chambers, mesh pads, packing media, and chevron baffles. Wet scrubbers are most often applied to exhaust streams with high moisture contents or entrained with combustible, corrosive, and/or explosive materials. While wet scrubbers offer high removal efficiencies for larger particulate matter, control efficiencies drop with particle size. Disadvantages of wet scrubbers include high pressure drops, additional waste generated by the removal of pollutants, and potentially high plume visibility.

ESP systems remove particulates from exhaust streams by passing the exhaust stream through a direct current corona, collecting the charged particles on a grounded plate, and removing the collected particulates from the plate. Collection efficiency is affected by several factors, including particle resistivity, gas temperature, chemical composition of both particles and gas, and particle size distribution. Wet ESP systems utilize water flushing to remove collected particulates, whereas dry ESPs utilize a mechanical process. Dry ESPs are the dominant type of particulate matter control device used on modern recovery boiler systems.

Of the technically feasible control options (wet scrubbers and ESPs), ESPs were identified as the most effective with PM/PM_{10}/$PM_{2.5}$ control efficiencies exceeding 99%. Woodland Pulp has proposed the use of a dry ESP and the current PM emission limit of 0.021 gr/dscf at 8% O_2 as BACT for the #3 RB.

The Department finds that BACT for particulate emissions from the #3 RB is the use of a dry ESP and a PM emission limit of 0.021 gr/dscf at 8% O_2.

(2) Sulfur Compounds (SO_2 and TRS)

Reduced sulfur compounds (TRS), the most common of which are hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide, are emitted from kraft recovery boilers. In kraft recovery boilers, secondary air provides oxygen for burning organics and raises the lower furnace temperature. Tertiary and quaternary air supply oxygen to completely combust all the volatile organics and reduced sulfur gases. As a result, in passing through the various combustion air zones, much of the H_2S present is oxidized to sulfur dioxide (SO_2). Any H_2S not oxidized at this point will not be oxidized in the cooling flue gases and will form the main component of TRS emissions from the recovery boiler. The use of non-direct contact evaporators minimizes TRS from recovery boilers. Potential control strategies for sulfur emissions include flue gas desulfurization, acid gas scrubbers, the use of alternative fuels, and good combustion practices.

Flue gas desulfurization (FGD) typically uses a calcium- or sodium-based alkaline reagent contacted with the flue gas. The sulfur compounds are absorbed, neutralized, and/or oxidized into a solid compound (either calcium sulfate or sodium sulfate) and removed from the gas stream. FGD systems can be categorized as wet, semi-dry, or dry. In wet systems, the flue gas is contacted with an aqueous sorbent slurry most often in a spray tower. The sulfur compounds dissolve into the slurry droplets, react with the alkaline agent, and fall out. Semi-dry systems also inject an aqueous sorbent slurry but at a much higher sorbent concentration. As the hot flue gas mixes with the slurry solution, the reaction forms an entirely dry waste product which is collected in an ESP or baghouse downstream. Dry sorbent injection systems pneumatically inject powdered sorbent directly into the furnace, economizer, or downstream ductwork. As with semi-dry systems, the dry waste product is collected in an ESP or baghouse downstream. Control efficiencies can reach 90% and are dependent upon sulfur concentration of the inlet stream, temperature, and flowrate.

Acid gas scrubbers are a form of wet scrubber that control SO_2 emissions by contacting the exhaust stream with recirculated liquid caustic in a packed bed tower. A mist eliminator is typically also used to remove water droplets from the gas stream before it is released to the atmosphere. A typical packed bed tower contains many layers of packing material to provide a large amount of surface area for liquid-particle contact. Caustic scrubbing liquid is evenly introduced above the packing and flows down through the bed, countercurrent to the exhaust gas flow. The liquid establishes a thin film on the packing on which sulfur compounds are absorbed and neutralized. Usual inlet gas temperatures range from 300 to 700 °F with greater than 90 percent abatement of sulfur compounds possible. Control efficiencies depend on the sulfur compound concentrations in the gas stream and properties of the liquid solvent, temperature, and contacting surface.

Emissions of SO_2 from fuel combustion result almost entirely from the oxidation of sulfur compounds present in the fuel. Emissions of TRS are most often the result of an incomplete thermal reaction of sulfur to SO_2. Accordingly, the sulfur content of the fuel burned in a combustion source is directly related to its potential SO_2 emissions. The less sulfur in the fuel stream to begin with, the less SO_2 and TRS will be emitted. The sulfur content of black liquor fired in #3 RB is the unavoidable result of the kraft pulping process and is one of the primary targets of the chemical recovery efforts in the furnace. The other fuel streams – natural gas, propane/synthetic natural gas and non-condensable gases – are minimal with negligible sulfur contents. The #3 RB is no longer equipped to burn fuel oil or any other fuel that could have an elevated sulfur content. Therefore, there are no alternative fuels available, and this approach has been determined to be technically infeasible and eliminated from further consideration.

Woodland Pulp reviewed the RBLC and found no known applications demonstrating FGD systems or acid gas scrubber systems to be safe, effective, and reliable on recovery boilers in the US. FGD systems and acid gas scrubbers are most often deployed to control exhaust gas streams with sulfur loadings greater than 500 ppm and flow rates less than 100,000 acfm. At steady state conditions, recovery boiler sulfur emissions can be as low as 5 ppm with airflows exceeding 700,000 acfm. The low concentration combined with the high airflows render any application of FGD systems or acid gas scrubbers to recovery boilers as economically prohibitive.

Woodland Pulp has proposed the use of good combustion practices through an upgraded air system as BACT for SO_2 and TRS emissions from #3 RB. Woodland Pulp proposes an SO_2 limit of 150 ppmvd at 8 percent O_2 on a 1-hr block average basis as BACT, based on its guarantee with the recovery boiler vendor, which is equivalent to 392 lb/hr when the #3 RB is operating at its maximum combustion rate. Woodland Pulp proposes to maintain the TRS limit of 5 ppmvd at 8 percent O_2 on a 12-hour block average basis as BACT.

The Department finds that BACT for SO_2 and TRS emissions from the #3 RB is good combustion practices using an upgraded air system; an SO_2 limit of 150 ppmvd at 8 percent O_2 on a 30-day rolling average basis with compliance demonstrated through use of the existing CEMS; a limit of 392 lb/hr on a 1-hour basis with compliance demonstrated through use of the existing CEMS; and a TRS limit of 5 ppmvd at 8 percent O_2 on a 12-hour block average basis.

(3) Carbon Monoxide (CO)

Emissions of CO from recovery boilers are attributable to the incomplete combustion of organic compounds contained in black liquor and in supplemental fuels. Potential control strategies for CO include use of an oxidation catalyst and good combustion practices.

An oxidation catalyst completes the final oxidation step over a precious metal catalyst bed. Platinum group metal catalysts are the current standard for oxidation catalysts, typically platinum, palladium, and/or rhodium. Most systems employ a monolith honeycomb substrate coated with the metal compounds with many small parallel channels, offering a high catalytic contact area to the exhaust gases. Oxidation catalysts typically operate on exhaust gases in the 600 to 1,200 °F range, depending on configuration. Oxidation catalyst systems are typically installed directly into the exhaust streams where the optimal temperature zone exists. As with any catalyst system, poisoning of the catalyst bed over time via exhaust stream contaminants can be the limiting factor in applying this technology. Catalyst poisoning concerns could be abated by installing the catalyst system downstream of the ESP, but at that point, gas stream temperatures are too low. Even with extensive heat recovery efforts, increasing the temperature of over 700,000 acfm of flue gas by several hundred degrees to the optimal temperature range would require millions of cubic feet of supplemental natural gas combustion. Temperature considerations aside, particulate emissions from recovery furnaces, even after ESP control, are primarily sodium sulfate along with heavy metals (zinc, lead, mercury, copper, potassium, magnesium, arsenic, and vanadium), all of which are exceptionally effective catalyst poisons. Therefore, the use of an oxidation catalyst has been determined to be technically infeasible and eliminated from further consideration.

Recovery boilers listed in the RBLC use good combustion practices to control CO emissions to between 200 and 960 ppmvd at 8 percent O_2.

Woodland Pulp has proposed the use of good combustion practices through an upgraded air system as BACT for CO emissions from the #3 RB. Woodland Pulp has also proposed as BACT a CO limit of 300 ppmvd at 8 percent O_2 on a 30-day rolling average basis, based on its guarantee with the recovery boiler vendor, which is equivalent to 342 lb/hr when the #3 RB is operating at its maximum combustion rate. In addition, Woodland Pulp proposes a 1-hour CO limit of 2,200 lb/hr. This will allow the #3 RB to maintain compliance with the 30-day average while accommodating short-term spikes in CO emissions due to startup, shutdown, fuel transfers, precipitator maintenance, and other maintenance activities that cause short-term spikes.

The Department finds that BACT for CO emissions from the #3 RB is good combustion practices using an upgraded air system, a limit of 300 ppmvd at 8 percent O_2 on a 30-day rolling average basis, 429.0 lb/hr on a 24-hour block average basis with no 1-hour block period to exceed 2,200 lb/hr.

(4) Volatile Organic Compounds (VOC)

VOC are emitted in small amounts from recovery boilers. The source of these compounds is mainly from incomplete combustion or from black liquor itself when it comes into contact with combustion gases. Potential control strategies for VOC include oxidation catalysts, biofiltration, VOC recovery, thermal incineration, and good combustion practices.

Oxidation catalysts are described above for the control of CO and can also be used for VOC control based on the same principles. When oxidation catalysts are designed to remove both CO and VOC emissions, though, the control efficiencies for both the CO and VOC drop to about 60%, as the catalyst can only be designed to remove certain types of VOC. The use of an oxidation catalyst is considered technically infeasible for the same reasons as presented previously in the section addressing CO emissions.

Biofiltration is based on the biodegradation of exhaust stream constituents as the exhaust passes through a biologically active filter material. Naturally occurring microorganisms are used. Biofiltration is most successful when treating low molecular weight and highly soluble organic compounds with simple structures. Compounds with complex bond structures generally require more energy to break down than naturally occurring microorganisms can provide. Pre-conditioning of the gas stream is often required to control temperatures, moisture content, and particulate matter. Gas streams with high levels of particulate matter may also cause the biofilter media to clog, thus reducing the control efficiency of the system. The bacteria commonly used in biofiltration are highly temperature sensitive and are susceptible to damage by broadly varying process conditions. High exhaust temperatures may kill the microorganisms, and low temperatures may slow or stop bioactivity. Biofiltration systems may also require the addition of nutrients to support microbial growth. Furthermore, biofiltration systems require substantial operating space and system monitoring. There are no known applications demonstrating biofiltration systems to be safe, effective, and reliable on recovery boilers. The low VOC concentrations combined with the high airflows from a recovery boiler render biofiltration technically infeasible.

VOC recovery technologies take various forms. Adsorption is the process by which molecules collect on and adhere to the surface of an adsorbent solid due to physical and/or chemical forces. Activated carbon is typically used as an adsorbent because of its large surface area, a critical factor in the adsorption process. With absorption systems, in contrast, certain constituents of a gas stream are selectively removed by a liquid solvent. The control of gas-phase VOC using absorption relies on contact between the contaminated gas and a liquid in which the contaminants are soluble or with which it will chemically react. The degree of control depends on gas solubility, throughput rates, contact time, and contact mechanism. Absorption systems are most effective for gas streams with pollutant concentrations between 250 and 10,000 ppm. Finally, condensing systems utilize a refrigeration source to cool the exhaust stream to convert VOC from a gaseous phase to a liquid phase for eventual recovery. Condensing systems are most effective for gas streams with VOC concentrations between 5,000 and 10,000 ppm. There are no known applications demonstrating VOC Recovery systems to be safe, effective, and reliable on recovery boilers. All three VOC recovery technologies (adsorption, absorption, and condensing) require exhaust streams heavily laden with VOC. The low VOC concentration of the recovery boiler exhaust (under 10 ppm) combined with the high airflow rates make VOC recovery technically infeasible for this application.

Thermal incineration refers to the combustion of organic compounds at a sufficiently high temperature and adequate residence time. Thermal incineration systems can be categorized according to the type of heat recovery employed and whether a catalyst is used. Regenerative systems (with or without a catalyst) use direct contact heat exchangers made from a ceramic material which can operate at the high temperatures needed to achieve ignition of the exhaust gas. The exhaust gas enters the first bed where the gas is heated to a desired combustion temperature, then subsequently enters the second bed where heat from combustion is recovered and stored in the bed. The beds alternate so the exhaust gas can utilize the stored heat in order to raise the incoming exhaust gas to the desired temperature. Recuperative systems (also with or without a catalyst) achieve largely the same result using indirect heat exchange whereby a primary heat exchanger preheats the incoming vent stream with recovered heat from the exiting stream. Both systems can achieve 90 percent VOC destruction with up to 90 percent heat recovery. There are no known applications demonstrating thermal incineration systems to be safe, effective, and reliable on recovery boilers. Thermal incineration is most often deployed to control exhaust gas streams with VOC greater than 500 ppm and flow rates less than 150,000 acfm. At steady-state conditions, recovery boiler VOC emissions can be as low as 10 ppm with airflows exceeding 700,000 acfm. The exceedingly low VOC concentrations combined with the exceptionally high airflows render any application of thermal incineration to recovery boilers as economically prohibitive.

Woodland has proposed the use of good combustion practices through an upgraded air system and the current VOC limit of 40.2 lb/hr as BACT for the #3 RB.

The Department finds that BACT for VOC emissions from the #3 RB is good combustion practices using an upgraded air system and a limit of 40.2 lb/hr.

(5) Greenhouse Gases (GHGs)

GHG emissions from recovery boilers are attributable to the combustion of black liquor and supplemental fuels. The GHG constituents produced include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) and are measured by carbon dioxide equivalents (CO_2e). The conversion of fuel carbon to CO_2 during combustion is relatively independent of combustion design and firing configuration. The formation of CH_4 and N_2O are highest during periods of low-temperature or incomplete combustion. These periods are expected to be minimal in a recovery boiler due to the various combustion controls that are integral to boiler operation. CO_2 is an unavoidable product of the chemical reaction between fuel and oxygen that occurs during combustion. Potential control strategies for GHGs include carbon capture and sequestration (CCS), fuel/raw material substitution, and good combustion practices.

CCS is a three-step process that includes capturing CO_2 from exhaust streams, compressing the CO_2 into liquid form, and transporting it to a sequestration site. CCS has not yet been demonstrated as ready for widespread implementation, and therefore there exists considerable uncertainty associated with commercial deployment of CCS. Furthermore, there are no CCS sequestration sites in or near Maine. Based on these considerations, CCS has been deemed technically infeasible, and has been eliminated from further consideration.

Fuel/raw material substitution with lower-emitting materials may help reduce GHG emissions. However, based on the nature of recovery boiler operations, substitution of raw materials or fuels would fundamentally alter the nature of the recovery boiler process. Therefore, fuel/raw material substitution has been eliminated from further consideration.

Woodland Pulp has proposed the use of good combustion practices through an upgraded air system as BACT for the #3 RB. Continued use of good combustion practices shall be demonstrated by meeting all emission limits associated with the #3 RB.

b. Lowest Achievable Emission Rate (LAER)

The following is a summary of the LAER analysis and determination for NO_x emissions from the #3 RB.

NO_x is generated in one of three mechanisms: fuel NO_x, thermal NO_x, and prompt NO_x. Fuel NO_x is produced by oxidation of nitrogen in the fuel. Combustion of fuels with high nitrogen content produces greater amounts of NO_x than those with low nitrogen content such as distillate fuel and natural gas. Thermal NO_x is formed by the fixation of nitrogen (N_2) and oxygen (O_2) at temperatures greater than 3,600 °F. Prompt NO_x forms from the oxidation of hydrocarbon radicals near the combustion flame and produces an insignificant amount of NO_x.

Fuel NO_x is the primary mechanism for the formation of NO_x emissions from recovery boilers. Nitrogen in black liquor ranges from about 0.05 to 0.25 percent of the liquor solids content, typically averaging about 0.1 percent. During black liquor combustion, nearly 75 percent of the liquor nitrogen is released during pyrolysis or devolatilization, partly as ammonia (NH_3) and partly as N_2. The NH_3 released partly oxidizes to NO and partly reduces to N_2. The remaining liquor nitrogen will be bound in the char residue, mostly as a reduced species in the salt residue or smelt. While NO_x generation within kraft recovery boilers is generally agreed upon as a purely "fuel NO_x" phenomenon, temperatures within a boiler, particularly in the upper furnace, can have a significant effect on the extent of oxidation of the NH_3 released during pyrolysis to NO.

Modifications resulting in significant emission increases of nonattainment pollutants, such as NO_x, are required to meet the Lowest Achievable Emission Rate (LAER). LAER is defined in 06-096 Ch. 100 to mean "*the most stringent emission* *limitation which is contained in the implementation plan of any State for that class or category of source, unless the owner or operator of the proposed source demonstrates that those limitations are not achievable; or the most stringent emission limitation which is achieved in practice by that class or category of source, whichever is more stringent. In no event may LAER result in emissions of any pollutant in excess of those standards and limitations promulgated pursuant to Section 111 or 112 of the United States Clean Air Act as amended, or any emission standard established by the Department.*"

In evaluating LAER, Woodland reviewed State Implementation Plan (SIP) limits for the appropriate class or category of sources, pre-construction or operating permits issued in non-attainment areas, and the RACT/BACT/LAER Clearinghouse (RBLC). Woodland identified several potential control strategies that include selective catalytic reduction (SCR), selective noncatalytic reduction (SNCR), water/steam injection, and combustion modifications.

SCR systems inject an ammonia-based reagent into the exhaust stream just prior to passing over a catalyst bed. The reagent and the catalyst work together to convert NO_x to elemental nitrogen, carbon dioxide, and water vapor. The optimum temperature range for the highest reduction efficiencies (up to 90%) is between 700 and 750 °F. The catalyst will lose its effectiveness over time for a number of reasons, including poisoning, thermal sintering, binding/plugging, and erosion. Some degree of ammonia slip (i.e., unreacted ammonia exiting the stack) is unavoidable but with modern SCR systems can be kept under 5 ppm. On #3 RB, catalyst poisoning concerns would require the installation of the system downstream of the ESP where exhaust stream temperatures are far below the optimum temperature range for effective use of the catalyst. Particulate emissions from recovery furnaces even after ESP control are primarily sodium sulfate along with heavy metals, all of which are effective catalyst poisons. For these reasons, use of SCR is not considered technically feasible for this application.

SNCR systems also inject an ammonia-based reagent into the exhaust stream to convert NO_x to elemental nitrogen, carbon dioxide, and water vapor but do so without a catalyst. Because SNCR systems do not require a catalyst bed and reactor, this technology can be better suited for applications with higher levels of particulate and catalyst poisoning agents in the exhaust gas stream. SNCR can achieve NO_x reductions up to 50 percent. The key to the SNCR process is optimization of reagent injection within a specific temperature window. For urea, this window is approximately 1,800 to 2,100 °F (slightly lower for ammonia). The location of this temperature window in a recovery boiler would require injecting the ammonia or urea reagent directly into the radiant and convection regions of the furnace. A recovery boiler is a chemical recovery unit first and a steam generating unit second. The injection of a urea solution or ammonia gas could upset the sulfur and sodium chemistry inside of a recovery boiler as well as potentially lead to a smelt-water explosion. There are no known applications demonstrating SNCR systems to be safe, effective, and reliable on recovery boilers. Therefore, SNCR is not considered technically feasible for this application.

Water/Steam Injection utilizes the injection of water or steam into the combustion zone. Adding water or steam to the combustion zone can lower peak flame temperatures and suppress NO_x formation by up to 25 percent. A disadvantage of this technology is that the temperature is not only reduced at the flame but also at the periphery of the combustion chamber, potentially causing CO and VOC emission increases. Further, the injection of water or steam anywhere inside a recovery furnace is not acceptable given the potential for a smelt-water explosion. There are no known applications demonstrating Water/Steam Injection systems to be safe, effective, and reliable on recovery boilers. Therefore, water/steam injection is not considered technically feasible for this application.

Combustion modifications to lower flame temperature is the most effective approach to minimize NO_x emissions. Combustion modifications are technically feasible as a NO_x control option for recovery boilers. The combustion modification known as "quaternary air/staged combustion" involves four stages of combustion air supplied at successively higher points in the body of the recovery furnace. Quaternary Air/Staged Combustion minimizes NO_x emissions by maintaining the minimum combustion temperature possible at each successive stage in the furnace to combust the black liquor solids while maintaining high sulfur reduction efficiencies, good bed stability, and uniform velocities after the furnace to minimize high temperatures and fouling. Primary air is used for bed stability, efficient carbon burnout, and high sulfur reduction efficiencies. Secondary (low and high) air ensures even air distribution over the char bed for pyrolysis and burning of volatiles. Non-condensable gases (NCGs) can be mixed with high secondary air, which provides air to the start-up burners. Tertiary air is the over-fire air over black liquor sprays and provides combustion air to load-carrying burners. Finally, quaternary air is the air staging register at the upper furnace for NO_x reduction.

Woodland has proposed the use of a quaternary air system as part of LAER for the #3 RB. Woodland has also proposed a NO_x LAER limit of 166 lb/hr, based on the emission guarantee provided by its vendor of 85 ppmvd at 8% O_2, measured by CEMS and based on a 24-hour block average. This proposed limit is more stringent than the 06-096 C.M.R. ch. 138 NO_x RACT limit; therefore, Woodland Pulp has requested streamlining to this LAER limit.

The Department finds that LAER for NO_x emissions from the #3 RB is use of a quaternary air system; a limit of 85 ppmvd at 8% O_2 and 166 lb/hr on a 24-hour block average basis with compliance demonstrated through use of the existing CEMS; and a limit of 200 lb/hr on a 1-hour basis with compliance demonstrated by stack testing upon request by the Department.

c. Annual Capacity Factor Limitation

Woodland Pulp was previously limited to a federally enforceable license requirement stipulating that use of #6 fuel oil in the #3 RB shall not exceed an annual capacity factor of 10% based on a 12-month rolling total. With this licensing action, #6 fuel oil has been removed as an allowed fuel for the #3 RB, and therefore this fuel limit is no longer relevant. However, Woodland Pulp has requested the addition of an annual capacity factor limit of 10% or less for the firing of natural gas in the #3 RB.

Annual capacity factor is defined as the ratio between the actual heat input to a steam generating unit from applicable fuels during a calendar year and the potential heat input to the steam generating unit had it been operated or 8,760 hours during a calendar year at the maximum steady state design heat input capacity.
[40 C.F.R. § 60.41b]

Woodland Pulp shall not exceed an annual capacity factor of 10% (1,080,108 MMBtu/yr) for natural gas in the #3 RB on a 12-month rolling total basis. Compliance with this annual capacity factor shall be demonstrated by fuel use records showing the quantity and heating value of natural gas fired, and calculations of the total heat input updated on a monthly and 12-month rolling total basis. [40 C.F.R. § 60.49b(d)(1) and 06-096 C.M.R. ch. 115, BACT]

d. Emission Limits

The BACT emission limits for the #3 RB are the following:

Unit	Limit Units	PM	PM_{10}	$PM_{2.5}$	SO_2	CO	VOC	TRS
#3 RB	lb/hr (1-hr basis unless otherwise noted)	49.0	49.0	49.0	392.0	429.0[a]	40.2	--
	gr/dscf @ 8% O_2	0.021	0.021	0.021	--	--	--	--
	ppmvd @ 8% O_2	--	--	--	150[b]	300[b]	--	5[c]

[a] On a 24-hr block average basis, with no single hour to exceed 2,200 lb/hr.
[b] On a 30-day rolling average basis.
[c] On a 12-hr block average basis.

The LAER NO_x emission limits for the #3 RB are the following:

Unit	NO_x
#3 RB	85 ppmvd @ 8% O_2 on a 24-hr block average basis
	166 lb/hr on a 24-hr block average basis
	200 lb/hr on a 1-hr basis

Visible emissions from the #3 RB shall not exceed 20% opacity on a 6-minute block average basis. Compliance shall be demonstrated by use of a continuous opacity monitoring system (COMS). [40 C.F.R. §§ 60.282a(a)(1)(ii) and 60.284a(a)(1)]

e. New Source Performance Standards (NSPS)

The #3 RB was previously subject to 40 C.F.R. Part 60, Subpart BB, *Standards of Performance for Kraft Pulp Mills*. Because this project results in a modification the unit as defined in 40 C.F.R. § 60.2, the #3 RB will now instead be subject to 40 C.F.R. Part 60, Subpart BBa, *Standards of Performance for Kraft Pulp Mill Affected Sources for Which Construction, Reconstruction, or Modification Commenced After May 23, 2013*. The applicable requirements of this Subpart are presented in section 4 below.

The #3 RB is subject to 40 C.F.R. Part 60, Subpart Db, *Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units* because it is a steam generating unit as defined in 40 C.F.R. § 60.41b, and has a heat input capacity greater than 100 MMBtu/hr. Applicability of the following Subpart Db requirements is being altered by this project:

(1) Emission Limits

(i) The #3 RB was previously subject to an SO_2 emission limit when firing #6 fuel oil of 0.5 lb/MMBtu on a 30-day rolling average basis or a 0.5% fuel sulfur content limit, by weight. Because the #3 RB will no longer be licensed to fire #6 fuel oil, these limits are no longer applicable and have been removed.

(ii) The #3 RB is subject to a NO_x emission limit pursuant to 40 C.F.R. § 60.44b(e) which establishes a NO_x limit for affected steam generating units that simultaneously combust only coal, oil, or natural gas with byproduct/waste. “Byproduct/waste” includes black liquor per the definition provided in 40 C.F.R. § 60.41b(b). However, Woodland Pulp was previously subject to a federally enforceable annual capacity factor limit of 10% or less for fuel oil, which exempted the #3 RB from this NO_x limit while burning oil. Fuel oil has been removed from this license as an allowed fuel for the #3 RB, and therefore this is no longer applicable. Woodland Pulp has requested the addition of a federally enforceable annual capacity factor limit of 10% for the use of natural gas in the #3 RB, resulting in the unit remaining exempt from the otherwise applicable NO_x emission limit in 40 C.F.R. § 60.44b(e). [40 C.F.R. § 60.44b(e)]

(2) Recordkeeping Requirements

(i) General Requirements

All records required under 40 C.F.R. Part 60, Subpart Db shall be maintained for a period of two years following the date of such record.
[40 C.F.R. § 60.49b(o)]

Please note that Standard Condition (6) of Woodland Pulp's Part 70 air emission license (A-215-70-I-R/A, issued 11/18/2011) requires that records of monitoring data and supporting information be retained for at least six years from the date of the monitoring sample, measurement, report, or application.

(ii) Annual Capacity Factor

Woodland Pulp shall record and maintain records of the amounts of each fuel combusted during each day and calculate the annual capacity factor for natural gas for the reporting period. The annual capacity factor is determined on a 12-month rolling average basis with a new annual capacity factor calculated at the end of each calendar month.
[40 C.F.R. § 60.49b(d)(1)]

3. Smelt Dissolving Tank

a. Best Available Control Technology

The following is a summary of the BACT determination for the Smelt Dissolving Tank, by pollutant.

(1) Particulate Matter: $PM/PM_{10}/PM_{2.5}$

Smelt exiting the #3 RB is shattered as it enters the SDT by high-pressure steam or shatter sprays of recirculated green liquor. The steam or shatter sprays break the smelt flow into small droplets and cools the smelt before it reacts with the liquid in the SDT to form green liquor. Large volumes of steam are generated when the molten smelt and liquid mix. The vapor space above the liquid level in the SDT provides an opportunity for water vapor and PM, resulting from the quenching of smelt, to settle out of suspension and into the green liquor. An induced-draft fan constantly draws the vapor and entrained PM through an add-on PM control device. Woodland currently employs the use of a dynamic fan wet scrubber to control PM emissions. Scrubbing medium consisting of weak wash,clean condensate and/or fresh water is sprayed through the scrubber and allowed to drain directly into the SDT, where it reacts with smelt to form green liquor. Potential control strategies for PM emissions include baghouses/fabric filters, ESP systems, wet scrubbers, and cyclones/multiclones. These control technologies are described in detail in the #3 RB BACT analysis.

Baghouses/fabric filters encounter serious operational difficulties when used to control emissions from exhaust streams with high moisture content. Condensation of moisture on the fabric of baghouses will cause clogging of the fabric. Consequently, upset conditions would likely occur as the collected PM could not be removed by reverse air, shaker, or pulse-jets, causing the pressure across the baghouse to increase to an extremely high level. The exhaust stream from the SDT has a high moisture content, and review of the RBLC database indicates that no baghouse has been deemed BACT for smelt dissolving tanks. For these reasons, a baghouse is considered technically infeasible for the SDT.

Wet scrubbers and ESPs are both technically feasible control options for the Smelt Dissolving Tank. There are several types of wet scrubbers used for PM control, including venturi scrubbers and dynamic scrubbers. ESPs and venturi scrubbers can both achieve control efficiencies for PM, PM_{10}, and $PM_{2.5}$ of greater than 99%. Dynamic scrubbers can achieve control efficiencies for PM, PM_{10}, and $PM_{2.5}$ of 99%. Woodland already employs the use of a dynamic wet scrubber to control particulate emissions from the Smelt Dissolving Tank. Because of the minimal incremental emission control offered by the venturi scrubber or ESP and the high capital costs associated with removing the existing scrubber system and constructing a new system for PM control, both a venturi scrubber and ESP are considered not economically viable.

Woodland Pulp has proposed the use of the existing dynamic wet scrubber as BACT for the SDT. All smelt dissolving tanks listed in the RBLC use venturi scrubbers to control PM emissions to between 0.12 and 0.18 lb/ton BLS. Woodland proposes to maintain its current PM emission limit of 0.127 lb/ton, or approximately 14.2 lb/hr at the new maximum firing rate of the #3 RB, as BACT. PM_{10} emissions will be limited to 14.2 lb/hr and $PM_{2.5}$ emissions will be limited to 13.5 lb/hr.

The Department finds that BACT for particulate emissions from SDT is use of the existing dynamic wet scrubber and the following limits:

PM	0.127 lb/ton BLS and 14.2 lb/hr
PM_{10}	14.2 lb/hr
$PM_{2.5}$	13.5 lb/hr

(2) Sulfur Compounds (SO_2 and TRS)

TRS emissions from smelt dissolving tanks primarily arise from the sulfides present in smelt and in weak wash. H_2S is the main compound present in gases produced from smelt dissolution itself, with typical concentrations measured in the range of 5 to 20 ppm. It is believed that H_2S is generated by the shattering of smelt; however, if condensates containing reduced sulfur compounds are used in the recausticizing area, these reduced sulfur compounds could be present in the weak wash, providing greater potential for flashing off of these compounds during smelt dissolution. Methyl mercaptan, dimethyl sulfide, and dimethyl disulfide can be present in smelt dissolving tank vent gases if they are present in the weak wash as a result of condensate reuse. Small amounts of SO_2 are also emitted from smelt dissolving tanks, potentially from oxidation of the sulfur in the smelt during the smelt-water explosions.

Woodland Pulp identified acid gas scrubbers as a potential control technology. Acid gas scrubbers are a form of wet scrubber that control TRS emissions by contacting the exhaust stream with recirculated liquid caustic. In a pulp mill setting, weak wash, which is a weak white liquor formed from the washing of lime mud, and clean condensate are often used as the scrubbing medium in the smelt dissolving tank wet scrubber that is used for particulate control. A review of the RBLC indicated that wet scrubbers with weak wash are typically used for TRS control, and good operating practices are used to manage SO_2 emissions.

Woodland Pulp already employs the use of the identified control technology and has demonstrated compliance in the past using a dynamic wet scrubber utilizing weak wash and/or fresh wateras the scrubbing medium for control of TRS emissions. The continued use of the wet scrubber and good operating practices have been proposed as BACT for sulfur control from the SDT. Woodland Pulp proposes its current TRS emission limit of 0.033 lb/ton BLS as BACT, which equates to an emission rate of 3.7 lb/hr at the increased #3 RB firing rate. This BACT limit is equivalent to the TRS limit imposed by 40 C.F.R. Part 60, Subpart BBa and 06-096 C.M.R. Ch. 124 of 0.033 lb/ton BLS. Woodland Pulp also proposes an SO_2 limit of 7.0 lb/hr which is based on its current SO_2 emission limit and scaled in accordance with the increased #3 RB capacity.

The Department finds that BACT for SO_2 and TRS emissions from SDT is use of the existing dynamic wet scrubber utilizing weak wash and condensate as the scrubbing medium and the following limits:

TRS 0.033 lb/ton BLS and 3.7 lb/hr
SO_2 7.0 lb/hr

b. Emission Limits

The BACT emission limits for the Smelt Dissolving Tank are the following:

Unit	Limit Units	PM (lb/hr)	PM_{10} (lb/hr)	$PM_{2.5}$ (lb/hr)	SO_2 (lb/hr)	TRS (lb/hr)
Smelt Dissolving Tank	lb/hr	14.2	14.2	13.5	7.0	3.7
	lb/ton BLS	0.127	--	--	--	0.033

Visible emissions from the Smelt Dissolving Tank shall not exceed 20% opacity on a six-minute block average basis. [06-096 C.M.R. ch. 101, § 3 B (4)]

c. New Source Performance Standards (NSPS)

The Smelt Dissolving Tank was previously subject to 40 C.F.R. Part 60, Subpart BB, *Standards of Performance for Kraft Pulp Mills*. Because this project results in a modification of the unit as defined in 40 C.F.R. § 60.2, the Smelt Dissolving Tank will now instead be subject to 40 C.F.R. Part 60, Subpart BBa, *Standards of Performance for Kraft Pulp Mill Affected Sources for Which Construction, Reconstruction, or Modification Commenced After May 23, 2013*. The applicable requirements of this Subpart are presented in section 4 below.

4. New Source Performance Standards (NSPS): 40 C.F.R. Part 60, Subpart BBa

Woodland shall comply with all requirements of 40 C.F.R. Part 60, Subpart BBa applicable to the #3 RB and Smelt Dissolving Tank including, but not limited to, the following:

a. Standards

(1) Particulate Matter (PM)

The #3 RB and Smelt Dissolving Tank are subject to the following PM standards:

Unit	Standard	Citation
#3 RB	0.044 gr/dscf @ 8% O_2	40 C.F.R. § 60.282a(a)(1)(i)
Smelt Dissolving Tank	0.2 lb/ton BLS	40 C.F.R. § 60.282a(a)(3)

These standards are less stringent than the BACT limits described above. Woodland Pulp shall meet Subpart BBa PM emission standards by complying the established BACT limits.

(2) Visible Emissions

Visible emissions from the #3 RB shall not exceed 20% on a 6-minute block average basis. Compliance with the visible emission limit shall be demonstrated with a continuous opacity monitoring system (COMS). The span of the COMS must be set at 70% opacity. The COMS shall be installed, certified, and operated in accordance with Performance Specification (PS) 1 in appendix B to 40 C.F.R. Part 60. [40 C.F.R. § 60.282a(a)(1)(ii) and 60.284a(a)(1)]

(3) Total Reduced Sulfur (TRS)

The #3 RB and Smelt Dissolving Tank are subject to the following TRS standards:

Unit	Standard	Citation
#3 RB	5 ppmvd @ 8% O_2	40 C.F.R. § 60.283a(a)(2)
Smelt Dissolving Tank	0.033 lb/ton BLS as H_2S	40 C.F.R. § 60.283a(a)(4)

b. Testing Requirements

(1) #3 RB

(i) Within 60 days after achieving the maximum production rate at which the #3 RB will be operated, but no later than 180 days after initial startup following the modification, Woodland Pulp shall conduct an initial performance test to measure PM concentration using Method 5 of 40 C.F.R. Part 60, Appendix A-3. During the performance test, Woodland Pulp shall also measure condensable particulate matter using Method 202 of appendix M of 40 C.F.R. Part 51. [40 C.F.R. §§ 60.8 and 60.285a(b)]

(ii) Within 60 days after achieving the maximum production rate at which the #3 RB will be operated, but no later than 180 days after initial startup following the modification, Woodland Pulp shall conduct an initial performance test to measure TRS concentration using Method 16 of 40 C.F.R. Part 60, Appendix A-6. The TRS concentration must be corrected to the appropriate oxygen concentration using the procedure in 40 C.F.R. § 60.284a(c)(1)(iii). The sampling time must be at least 3 hours, but no longer than 6 hours.

The oxygen concentration must be determined over the same time period as the TRS samples using the procedure of Method 3B of 40 C.F.R. Part 60, Appendix A-2.

[40 C.F.R. §§ 60.8 and 60.285a(d)]

(iii) Woodland Pulp shall conduct repeat performance tests for filterable particulate matter and TRS on the #3 RB at intervals no longer than 5 years following the previous performance test. During the performance test for filterable PM, Woodland Pulp shall also measure condensable particulate matter using Method 202 of appendix M of 40 C.F.R. Part 51.
[40 C.F.R. §§ 60.285a(b)(4) and 60.285a(d)(4)]

(2) Smelt Dissolving Tank

(i) Within 60 days after achieving the maximum production rate at which the Smelt Dissolving Tank will be operated, but no later than 180 days after initial startup following the modification, Woodland Pulp shall conduct an initial performance test to measure PM concentration using Method 5 of 40 C.F.R. Part 60, Appendix A-3. Woodland Pulp shall calculate the emission rate of filterable particulate matter using the procedures found in 40 C.F.R. § 60.285a(c). Woodland Pulp shall also measure condensable particulate matter using Method 202 of appendix M of 40 C.F.R. Part 51.
[40 C.F.R. §§ 60.8 and 60.285a(c)]

(ii) Within 60 days after achieving the maximum production rate at which the Smelt Dissolving Tank will be operated, but no later than 180 days after initial startup following the modification, Woodland Pulp shall conduct an initial performance test to compute the emission rate of TRS in lb/ton of BLS. Woodland Pulp shall use Method 16 of 40 C.F.R. Part 60, Appendix A-6 to determine the average combined concentration of TRS in ppm, and Method 2 of 40 C.F.R. Part 60, Appendix A-1 to determine the volumetric flow rate of the effluent gas. The emission rate shall be calculated using the following formula:

$E = C_{TRS} \times F \times Q_{SD}/P$

Where:

E = emission rate of TRS, g/kg (lb/ton) of BLS.

C_{TRS} = average combined concentration of TRS in ppm.

F = conversion factor, 0.001417 g H_2S/m^3-ppm
(8.846×10^{-8} lb H_2S/ft^3-ppm).

Q_{SD} = volumetric flow rate of stack gas, dscm/hr (dscf/hr)

P = black liquor solids feed rate, kg/hr (ton/hr)

[40 C.F.R. §§ 60.8 and 60.285a(e)]

(iii) Woodland Pulp shall conduct repeat performance tests for filterable particulate matter and TRS on the Smelt Dissolving Tank at intervals no longer than 5 years following the previous performance test. During the performance test for filterable PM, Woodland Pulp shall also measure condensable particulate matter using Method 202 of appendix M of 40 C.F.R. Part 51.
[40 C.F.R. § 60.285a(c)(4)]

c. Monitoring Requirements

(1) Woodland Pulp shall maintain and operate a continuous opacity monitoring system (COMS) and record the opacity of the gases discharged into the atmosphere from the #3 RB. The span of this system shall be set at 70% opacity. The COMS must be installed, certified, and operated in accordance with Performance Specification 1 in appendix B to 40 C.F.R. Part 60. [40 C.F.R. § 60.284a(a)(1)]

(2) Woodland Pulp shall maintain and operate continuous emission monitoring systems (CEMS) to monitor and record the concentration of TRS emissions on a dry basis and the percent oxygen by volume on a dry basis in the gases discharged into the atmosphere from the #3 RB. The CEMS must be installed, certified, and operated in accordance with Performance Specification 3 in appendix B to 40 C.F.R. Part 60. The CEMS must be located downstream of the ESP. The range of the CEMS must encompass all expected concentration values, including the zero and span values used for calibration. The span of the TRS CEMS must be set at a concentration of 30 ppm. The span of the oxygen CEMS must be set at 21% oxygen. [40 C.F.R. § 60.284a(a)(2)]

Woodland Pulp shall calculate and record on a daily basis 12-hour average TRS concentrations for the two consecutive periods of each operating day. Each 12-hour average must be determined as the arithmetic mean of the appropriate 12 contiguous 1-hour average TRS concentrations provided by the continuous monitoring system. [40 C.F.R. § 60.284a(c)(1)(i)]

Woodland Pulp shall calculate and record 12-hour average oxygen concentrations corresponding to the 12-hour average TRS concentrations. The 12-hour averages shall be determined as an arithmetic mean of the appropriate 12 contiguous 1-hour average oxygen concentrations provided by the continuous monitoring system. [40 C.F.R. § 60.284a(c)(1)(ii)]

All 12-hour average TRS concentrations shall be corrected to 8% oxygen by volume according to the following equation:

$$C_{corr} = C_{meas} \times [13/(21-Y)]$$

Where:

C_{corr} = the concentration corrected for oxygen.

C_{meas} = the 12-hour average of the measured concentrations uncorrected for oxygen.

Y = the 12-hour average of the measured volumetric oxygen concentration.

[40 C.F.R. § 60.284a(c)(1)(iii)]

(3) Woodland Pulp shall monitor and record the secondary voltage and secondary current of each collection field of the #3 RB ESP. Alternatively, Woodland may calculate the secondary power as the product of the secondary voltage and secondary current of each ESP collection field as a means of demonstrating compliance. [40 C.F.R. § 60.284a(b)(3)]

Values of ESP secondary voltage and secondary current shall be recorded at least once each successive 15-minute period. Woodland shall calculate semiannual averages from the recorded measurements of ESP parameters. [40 C.F.R. § 60.284a(c)(3)(ii)]

Woodland shall investigate the cause of deviations from the operating limits for these parameters established during performance testing within 24 hours, and initiate corrective action as needed. Additional performance testing may be used to reestablish ESP secondary voltage and secondary current minimums. [06-096 C.M.R. ch. 115, BACT and 40 C.F.R. § 60.284a(c)(4)]

(4) Woodland Pulp shall maintain and operate monitors for the continuous measurement of the pressure drop of the gas stream and scrubbing liquid flow rate in the Smelt Dissolving Tank Scrubber. The pressure monitoring device must be certified by the manufacturer to be accurate to within a gage pressure of ±500 Pascals (±2 includes of water gage pressure). The device used for continuous measurement of the scrubbing liquid flow rate must be certified by the manufacturer to be accurate within ±5% of the design scrubbing liquid flow rate. [40 C.F.R. § 60.284a(b)(2)]

The pressure drop and liquid flow rate shall be recorded at least once each successive 15-minute period. Woodland shall calculate 12-hour block averages from the recorded measurements of wet scrubber pressure drop and liquid flow rate. [40 C.F.R. § 60.284a(c)(3)(i)]

Woodland shall investigate the cause of deviations from the operating limits for these parameters established during performance testing within 24 hours, and initiate corrective action as needed. Additional performance testing may be used to reestablish operating limits for the pressure drop of the gas stream and scrubbing liquid flow rate.
[06-096 C.M.R. ch. 115, BACT and 40 C.F.R. § 60.284a(c)(4)]

(5) During the initial performance tests required for the #3 RB and Smelt Dissolving Tank, Woodland Pulp shall establish site-specific operating limits for the monitoring parameters for the ESP secondary voltage, ESP secondary current, wet scrubber pressure drop, and wet scrubber liquid flow rate. The arithmetic average of the measured values for the three test runs shall establish the minimum operating limit for each ESP and wet scrubber parameter. Woodland Pulp may establish replacement operating limits for the monitoring parameters during subsequent performance tests. [40 C.F.R. § 60.284a(c)(4)]

(6) The continuous monitoring systems described above shall collect data at all required intervals at all times the affected units are operating except for periods of monitoring system malfunctions our out-of-control periods, repairs associated with monitoring system malfunctions or out-of-control periods, and required monitoring system quality assurance or quality control activities including, as applicable, calibration checks and required zero and span adjustments. [40 C.F.R. § 60.284a(c)(5)]

(7) Data recorded during monitoring system malfunctions or out-of-control periods, repairs associated with monitoring system malfunctions or out-of-control periods, or required monitoring system quality assurance or control

activities may not be used in calculations used to report emissions or operating limits. All data collected during all other periods must be used in assessing the operation of the control device and associated control system.
[40 C.F.R. § 60.482a(c)(6)]

d. Recordkeeping and Reporting

(1) Woodland Pulp shall maintain records of the performance evaluations of the continuous monitoring systems associated with the #3 RB and Smelt Dissolving Tank. [40 C.F.R. § 60.287a(a)]

(2) Woodland Pulp shall maintain records of the following information:

(i) Records of the opacity of gases discharged into the atmosphere from the #3 RB, and records of the ESP secondary voltage and secondary current (or total secondary power) averaged semiannually.

(ii) Records of the concentration of TRS emissions on a dry basis and the percent of oxygen by volume on a dry basis in the gases discharged into the atmosphere from the #3 RB.

(iii) Records of the pressure drop of the gas stream through the Smelt Dissolving Tank wet scrubber, and of the scrubbing liquid flow rate.

(iv) Records of excess emissions as defined in 40 C.F.R. § 60.284a(d).

(v) Records of the occurrence and duration of each malfunction of operation or of the air pollution control and monitoring equipment, and of actions taken during periods of malfunction to minimize emissions.

[40 C.F.R. §§ 60.287a(b) and (c)]

(3) Woodland Pulp shall submit an excess emissions and monitoring systems performance report semiannually containing the following:

(i) The magnitude of excess emissions computed in accordance with 40 C.F.R. § 60.13(h), any conversion factor(s) used, the date and time of commencement and completion of each time period of excess emissions, and the process operating time during the reporting period.

(ii) Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions.

(iii) The nature and cause of any malfunction resulting in excess emissions, and the corrective action taken or preventative measures adopted.

(iv) The date and time identifying each period during which a continuous monitoring system was inoperative except for zero and span checks, and the nature of the system repairs or adjustments.

(v) When no excess emissions have occurred or the continuous monitoring system(s) have not been inoperative, repaired, or adjusted, such information shall be stated in the report.

[40 C.F.R. §§ 60.288a(a) and 60.284a(d)]

(4) Woodland Pulp shall submit the results of each performance test required by 40 C.F.R. Part 60, Subpart BBa within 60 days after the completion of the test. Woodland Pulp shall use the latest version of EPA's Electronic Reporting Tool (ERT) existing at the time of the performance test to generate a submission package file documenting performance test data. The submission package file must then be submitted through EPA's Compliance and Emission Data Reporting Interface (CEDRI), which can be accessed through EPA's Central Data Exchange (CDX). [40 C.F.R. § 60.288a(b)]

Please note that test results must be submitted to The Department within 30 days from the date of the test completion. [06-096 C.M.R. ch. 115]

(5) Woodland Pulp shall submit relative accuracy test audit (RATA) data to the EPA's Central Data Exchange (CDX) within 60 days after the date of completing each CEMS performance evaluation test as defined in 40 C.F.R. § 60.13. [40 C.F.R. § 60.288a(c)]

Please note that test results must be submitted to The Department within 30 days from the date of the test completion. [06-096 C.M.R. ch. 115]

(6) If a malfunction occurs during a reporting period, Woodland Pulp shall submit a report that contains the following:

(i) The number, duration, and a brief description for each type of malfunction which occurred during the reporting period and which caused or may have caused any applicable emission limitation to be exceeded.

(ii) A description of actions taken during a malfunction to minimize emissions in accordance with 40 C.F.R. § 60.11(d), including actions taken to correct a malfunction.

[40 C.F.R. § 60.288a(d)]

5. Fuel Changes

Woodland Pulp has requested the removal of #6 fuel oil as allowable fuel for the #3 RB, Lime Kiln, and #9 Power Boiler. The fuel oil infrastructure has been removed from the facility, and these emission units are no longer capable of receiving and firing fuel oil. The #3 RB has not fired fuel oil since it was converted to natural gas in May 2012. The Lime Kiln has not fired fuel oil since May 2011. The #9 Power Boiler has not fired fuel since July 2011.

No changes in emission limits or other requirements for these units as a result of the removal of #6 fuel oil for this license have been identified.

C. Incorporation Into the Part 70 Air Emission License

Pursuant to *Part 70 Air Emission License Regulations*, 06-096 C.M.R. ch. 140 § 1(C)(8), for a modification at the facility that has undergone NSR requirements or been processed through 06-096 C.M.R. ch. 115, the source must apply for an amendment to their Part 70 license within one year of commencing the proposed operations, as provided in 40 C.F.R. Part 70.5. An application to incorporate the requirements of this NSR license into the Part 70 air emission license has been submitted to the Department.

D. Annual Emissions

The table below provides an estimate of facility-wide annual emissions for the purposes of calculating the facility's annual air license fee. Only licensed equipment is included, i.e., emissions from insignificant activities are excluded. Similarly, unquantifiable fugitive particulate matter emissions are not included. Maximum potential emissions were calculated based on the following assumptions:

- Operating the Tissue Machines, #9PB, #3RB, SDT, Lime Kiln, and Natural Gas Heater for 8,760 hours/year (each);
- Operating the Lime Kiln Auxiliary Drive Engine and #1 and #2 Fire Pumps for 100 hour/year, each; and
- Operating the Portable Package Boiler for six weeks (42 days) per year.

Total Licensed Annual Emissions for the Facility
Tons/year
(used to calculate the annual license fee)

	PM	**PM_{10}**	**SO_2**	**NO_x**	**CO**	**VOC**	**TRS**
Tissue Machines	25.3	47.8	0.8	98.7	120.0	160.9	--
#9 Power Boiler	355.0	355.0	676.0	780.0	5,008.8	130.0	--
#3 Recovery Boiler	214.6	214.6	1,117.0	727.1	1,879.0	176.1	28.6
Smelt Dissolving Tank	62.2	62.2	30.7	--	--	--	16.2

	PM	PM_{10}	SO_2	NO_x	CO	VOC	TRS
Lime Kiln	87.0	87.0	35.0	175.0	1,750.0	--	--
Package Boiler	56.0	56.0	9.9	5.6	1.4	0.1	--
NCG Incinerator	8.4	8.4	12.7	39.6	2.8	0.2	--
Emergency Engines	0.1	0.1	--	1.1	0.2	0.1	--
Natural Gas Heater	0.7	0.7	--	1.3	1.1	0.1	--
Total TPY	**809.3**	**831.8**	**1,882.1**	**1,828.4**	**8,763.3**	**467.5**	**44.8**

IV. AMBIENT AIR QUALITY ANALYSIS

A. Overview

A refined modeling analysis was performed to show that emissions from Woodland Pulp, in conjunction with other sources, will not cause or contribute to violations of National Ambient Air Quality Standards (NAAQS) for SO_2, PM_{10}, $PM_{2.5}$, NO_2, or CO or to Class I or Class II increments for $PM_{2.5}$ or NO_2.

As required by 06-096 C.M.R. ch. 115, the Department notified Federal Land Managers (FLMs) representing the US Fish & Wildlife Service (USFWS), the National Park Service (NPS) and the National Forest Service (NFS) of the proposed Woodland Pulp major modification. The notification contained a detailed description of the proposed project, the proposed project-only TPY emissions increases of SO_2, PM_{10}, $PM_{2.5}$, and NO_x, the distances to each of the nearby Class I areas and the proposed methodology for addressing NAAQS, increment and Air Quality Related Values (AQRV) for the closest Class I area, Moosehorn National Wildlife Refuge – Baring Unit (MNWR-Baring).

Based upon the information provided in the notification, FLMs representing USFWS requested that a visibility assessment for plume blight be conducted for MNWR-Baring using Woodland Pulp's project-only emissions. FLMs representing the NPS requested that a long-range visibility/AQRV analysis be conducted using Woodland Pulp's maximum potential-to-emit facility-wide emissions which included emission from units unaffected by the proposed modification. After careful review, the Department determined that this request was not consistent with procedures required or provided for in *New Source Review Workshop Manual (Draft, 1990)* or the *Workbook for Plume Visual Impact Screening and Analysis (Revised)* and *Federal Land Managers Air Quality Related Values Work Group: Phase I Report Revised 2010* (FLAG 2010). Therefore, only the AQRV analysis for MNWR-Baring was required to be conducted by the Department.

B. Model Inputs

The AERMOD refined dispersion model was used to address NAAQS and increment impacts in all areas. The modeling analysis accounted for the potential of building wake and cavity effects on emissions from all modeled stacks that are below their calculated formula GEP stack heights.

All modeling was performed in accordance with all applicable requirements of the Department and the USEPA. The most-recent regulatory version of the AERMOD model and its associated processors were used to conduct the analyses.

A valid five-year hourly on-site meteorological database was used in the AERMOD modeling analysis. The following parameters and their associated heights were collected at Woodland Pulp's meteorological monitoring site during the period July 1, 1991 to June 30, 1996:

TABLE III-1: Meteorological Parameters and Collection Heights

Parameter	Sensor Heights
Wind Speed	10 & 76 meters
Wind Direction	10 & 76 meters
Standard Deviation of Wind Direction (Sigma Θ)	10 & 76 meters
Temperature	10 & 76 meters

When possible, hourly ISHD TD-3505 surface data collected at the Bangor International Airport NWS site were substituted for missing on-site surface data. All other missing data were interpolated or coded as missing, per USEPA guidance. In addition, hourly Bangor International Airport NWS data from the same time period were used to supplement the primary surface dataset for any required variables that were not explicitly collected on-site.

The surface meteorological data was combined with concurrent hourly cloud cover and upper-air data obtained from the Caribou National Weather Service (NWS). Missing cloud cover and/or upper-air data values were interpolated or coded as missing, per USEPA guidance.

All necessary representative micrometeorological surface variables for inclusion into AERMET (surface roughness, Bowen ratio, and albedo) were calculated using the AERSURFACE utility program and from procedures recommended by USEPA.

Point-source parameters, used in the NAAQS and increment modeling for Woodland Pulp, are listed in Table III-2.

TABLE III-2: Woodland Pulp Point Source Stack Parameters

Woodland Pulp Stacks	Stack Base Elevation (m)	Stack Height (m)	GEP Stack Height (m)	Stack Diameter (m)	UTM Easting NAD83 (m)	UTM Northing NAD83 (m)
PROPOSED/CURRENT						
#9 Power Boiler	37.06	68.58	128.45	3.66	625,698	5,001,618
#3 Recovery Boiler	35.88	83.82	130.05	2.90	625,747	5,001,644
#3 Smelt Tank	35.72	70.71	130.21	1.78	625,745	5,001,652
Lime Kiln	38.51	79.55	127.00	1.27	625,649	5,001,526
TM #1 – Yankee Hood	40.75	35.75	88.49	1.31	625,481	5,001,613
TM #1 – Dust Vent	40.75	29.66	88.49	1.60	625,480	5,001,640
TM #2 – Yankee Hood	40.75	35.75	70.97	1.31	625,432	5,001,594
TM #2 – Dust Vent	40.75	29.66	70.97	1.60	625,420	5,001,618
TM #3 – TAD	45.42	35.89	66.30	1.68	625,390	5,001,538
TM #3 – Dust Vent	45.42	29.79	66.30	1.68	625,370	5,001,549
TM #4 – Yankee Hood	45.42	35.89	66.30	1.31	625,330	5,001,497
TM #4 – Dust Vent	45.42	29.79	66.30	1.60	625,318	5,001,513
2010 BASELINE ($PM_{2.5}$ INCREMENT)						
#9 Power Boiler	37.06	68.58	128.45	3.66	625,698	5,001,618
#3 Recovery Boiler	35.88	83.82	130.05	2.90	625,747	5,001,644
#3 Smelt Tank	35.72	70.71	130.21	1.78	625,745	5,001,652
Lime Kiln	38.51	79.55	127.00	1.27	625,649	5,001,526
1987 BASELINE (NO_2 INCREMENT)						
#9 Power Boiler	37.06	46.33	92.26	3.66	625,698	5,001,618
Lime Kiln	38.51	49.07	127.00	1.49	625,649	5,001,526

Emission parameters, used in the NAAQS and increment modeling for Woodland Pulp, are listed in Table III-3.

TABLE III-3: Stack Emission Parameters

Stacks	Averaging Periods	SO_2 (g/s)	PM_{10} (g/s)	PM2.5 (g/s)	NO_x (g/s)	CO (g/s)	Stack Temp (K)	Stack Velocity (m/s)
MAXIMUM LICENSE ALLOWED								
#9 Power Boiler (NG)	All	23.44	10.63	9.58	23.44	150.24	328.7	10.67
#3 Recovery Boiler (NG)	All	49.39	6.18	6.18	25.20	277.20	484.8	33.08
#3 Smelt Tank (NG)	All	0.88	1.79	1.70	-	-	338.7	9.58
Lime Kiln (NG)	All	1.05	2.62	1.89	5.25	52.54	332.6	7.07
TM #1 – Yankee Hood (NG)	All	0.013	0.10	0.10	0.57	0.52	654.3	17.79
TM #1 – Dust Vent (NG)	All	-	0.004	0.003	-	-	303.2	13.12
TM #2 – Yankee Hood (NG)	All	0.013	0.10	0.10	0.57	0.52	654.3	17.79
TM #2 – Dust Vent (NG)	All	-	0.004	0.003	-	-	303.2	13.12
TM #3 – TAD (NG)	All	0.014	0.15	0.15	0.72	1.90	400.9	21.17
TM #3 – Dust Vent (NG)	All	-	0.005	0.004	-	-	303.2	17.58
TM #4 – Yankee Hood (NG)	All	0.013	0.10	0.10	0.20	0.52	654.3	17.79
TM #4 – Dust Vent (NG)	All	-	0.004	0.003	-	-	303.2	13.12

2018/2019 CURRENT ACTUALS								
#9 Power Boiler	24-Hour	-	-	10.03	-	-	328.7	10.67
	Annual	-	-	6.59	14.89	-	328.7	7.47
Lime Kiln	24-Hour	-	-	0.97	-	-	332.6	7.07
	Annual	-	-	0.71	0.79	-	332.6	6.57
2010 BASELINE ($PM_{2.5}$ INCREMENT)								
#9 Power Boiler	Short Term	-	-	10.63	-	-	341.5	9.57
	Annual	-	-	8.02	-	-	341.5	6.89
#3 Recovery Boiler	Short Term	-	-	3.02	-	-	466.5	21.22
	Annual	-	-	1.60	-	-	466.5	20.08
#3 Smelt Tank	Short Term	-	-	1.03	-	-	341.5	4.40
	Annual	-	-	0.72	-	-	341.5	4.50
Lime Kiln	Short Term	-	-	2.37	-	-	344.3	7.92
	Annual	-	-	1.62	-	-	344.3	6.26
1987 BASELINE (NO_2 INCREMENT)								
#9 Power Boiler	Annual	-	-	-	21.54	-	341.5	8.23
Lime Kiln	Annual	-	-	-	4.68	-	344.3	5.38

C. Single Source Modeling Impacts – Significant Impact Analysis

AERMOD modeling was performed for a range of operating scenarios that represented a range of maximum, typical and minimum boiler/equipment operations.

The AERMOD significant impact results for Woodland Pulp alone are shown in Table III-4. Maximum predicted impacts that exceed their respective significance level are indicated in boldface type. For comparison to the Class II significance levels, the impacts for 1-hour SO_2, 1-hour NO_2, 24-hour $PM_{2.5}$, and annual $PM_{2.5}$ were conservatively based on the maximum High-1st-High predicted values, averaged over five years of meteorological data. All other pollutants/averaging periods were conservatively based on their maximum High-1st-High predicted values. For the purpose of determining maximum predicted impacts, all NO_x emissions were conservatively assumed to convert to NO_2.

TABLE III-4: Maximum AERMOD Significant Impact Analysis Results from Woodland Pulp

Pollutant	Averaging Period	Max Impact ($\mu g/m^3$)	Receptor UTM E (m)	Receptor UTM N (m)	Receptor Elevation (m)	Class II Significance Level ($\mu g/m^3$)
SO_2	1-hour	**192.41**	624,600	4,999,800	137.16	**7.9**
	3-hour	**157.03**	625,383	5,001,783	45.57	**25**
PM_{10}	24-hour	**35.84**	626,130	5,001,397	29.43	**5**
$PM_{2.5}$	24-hour	**27.37**	626,135	5,001,431	21.87	**1.2**
	Annual	**3.46**	626,110	5,001,415	29.11	**0.2**
NO_2	1-hour	**271.00**	623,300	4,999,550	137.72	**7.5**
	Annual	**7.57**	626,130	5,001,422	28.55	**1**
CO	1-hour	**3455.40**	623,200	4,999,650	136.48	**2,000**
	8-hour	**826.12**	626,800	4,999,600	126.07	**500**

D. Secondary Formation of $PM_{2.5}$

Since Woodland Pulp's proposed NO_x and SO_2 emissions for this modification are each greater than 40 TPY, a review of secondary impacts due to $PM_{2.5}$ precursor emissions (secondary $PM_{2.5}$) is required.

A $PM_{2.5}$ compliance demonstration must account for both primary $PM_{2.5}$ from a source's direct PM emissions, as well as secondarily formed $PM_{2.5}$ from a source's precursor emissions of NO_x and SO_2. The formation of secondary $PM_{2.5}$ is dependent on the concentrations of precursor and relative species, atmospheric conditions, and the interactions of precursors with other entities, such as particles, rain, fog, or cloud droplets.

Since the contribution from secondary formation of $PM_{2.5}$ cannot be explicitly accounted for in AERMOD, the impacts of secondarily formed $PM_{2.5}$ from Woodland Pulp was determined using a Tier I analysis following methodologies prescribed in USEPA's *Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program (April 2019).*

For a Tier I secondary formation assessment, a source uses technically credible empirical relationships between precursor emissions and secondary impacts, based upon USEPA modeling. Specifically, USEPA has performed single-source photochemical modeling to examine the range of modeled estimated impacts of secondary $PM_{2.5}$ formation for different theoretical source types (based on pollutant, stack height, and location) for facilities in different geographical locations in the United States.

Woodland Pulp estimated the potential impact of its precursor emissions using Equation 2 from USEPA's MERPs guidance, in which a source's impacts are estimated as the product of the relevant hypothetical source air quality impacts relative to emissions, scaled either upwards or downwards to the emission rate of the project itself. Equation 2 is presented below:

$$\textit{Project Impact} = \frac{\textit{Project}}{\textit{Emission Rate}} \; X \; \frac{\textit{Modeled impact from hypothetical modeling}}{\textit{Modeled emission rate from hypothetical modeling}}$$

This procedure was followed for both NO_x and SO_2 precursors and the individual contributions summed to achieve a final estimated potential secondary $PM_{2.5}$ concentration, as shown in Table III-5.

TABLE III-5: Secondary $PM_{2.5}$ from NO_x & SO_2 Precursors

Pollutant	Potential Increase of Precursors (TPY)	Impact/Emissions Ratio (μg/m³ / TPY)	Estimated Secondary $PM_{2.5}$ Impacts (μg/m³)
NOx	164.5	0.0011084	0.0182
SO_2	52.7	0.0007827	0.0413
Total Estimated Secondary $PM_{2.5}$ from NO_x and SO_2 precursors			**0.0595**

Using this methodology, the total estimated secondary $PM_{2.5}$ impact due to Woodland Pulp's NO_x and SO_2 precursor emissions were predicted to be extremely low (~0.06 μg/m³) and are not expected to contribute significantly to the $PM_{2.5}$ NAAQS and Class I or Class II increment impacts.

E. Combined Source Modeling Impacts

As indicated in boldface type in Table III-4, pollutants/averaging periods with predicted impacts greater than their respective significant impact levels must consider other local sources for inclusion in a combined-source analysis.

The Department examined other nearby sources to determine if any impacts would be significant in or near the Woodland Pulp significant impact area. Due to the location of Woodland Pulp, extent of the predicted significant impact area on a pollutant-by-pollutant basis and other nearby source's emissions, the Department has determined that no other sources need to be included into a combined-source AERMOD modeling analysis.

In addition to the consideration of other sources, the modeling analysis must also account for the existing air quality background concentrations by using monitored data representative of the area.

Background concentrations, listed in Table III-6, are derived from representative rural background data for use in the Eastern Maine region.

TABLE III-6: Background Concentrations

Pollutant	Averaging Period	Background Concentration (μg/m³)	Site Name, Location, Data Years
SO_2	1-hour	4	Mic Mac Site, Presque Isle, 2017 - 2019
	3-hour	3	
PM_{10}	24-hour	58	Kenduskeag Pump Station, Bangor, 2016 - 2018
$PM_{2.5}$	24-hour	14	Kenduskeag Pump Station, Bangor, 2017 – 2019
	Annual	6	
NO_2	1-hour	42	Mic Mac Site, Presque Isle, 2017 - 2019
	Annual	4	
CO	1-hour	1660	Mic Mac Site, Presque Isle, 2017 - 2019
	8-hour	772	

For the purpose of determining maximum predicted impacts for comparison against NAAQS, the following assumptions were used:

- The predicted impacts were explicitly normalized to the form of their respective NAAQS;
- NO_x emissions were assumed to convert to NO_2 using USEPA's Tier II Ambient Ratio Method (ARM2) which uses an upper default ambient ratio limit of 0.9 and a lower default ambient ratio limit of 0.5; and
- all direct particulate emissions were conservatively assumed to convert to PM_{10}.

As shown in Table III-7, the maximum modeled impacts were added with conservative background concentrations to demonstrate compliance with NAAQS. Because all pollutant/averaging period impacts using this method meet their respective standards, no further NAAQS modeling analyses are required to be performed.

TABLE III-7: Maximum Combined Source Impacts (µg/m³)

Pollutant	Averaging Period	Max Impact (µg/m³)	Receptor UTM E (m)	Receptor UTM N (m)	Receptor Elevation (m)	Back-Ground (µg/m³)	Total Impact (µg/m³)	NAAQS (µg/m³)
SO_2	1-hour	133.27	626,180	5,001,347	30.16	4	137.27	196
	3-hour	135.99	625,384	5,001,793	45.49	3	138.99	1,300
PM_{10}	24-hour	30.47	626,180	5,001,422	27.78	58	88.53*	150
$PM_{2.5}$	24-hour	17.82	626,052	5,001,484	30.28	14	31.88*	35
	Annual	3.46	626,110	5,001,415	29.11	6	9.52*	12
NO_2	1-hour	104.46	626,003	5,001,496	33.17	42	146.46	188
	Annual	6.81	626,130	5,001,422	28.55	4	10.81	100
CO	1-hour	1905.58	623,300	4,999,550	137.72	1660	3,565.58	40,000
	8-hour	638.15	625,066	5,001,872	45.35	772	1,410.15	10,000

* Final predicted impacts for PM_{10} and $PM_{2.5}$ were adjusted by 0.06 µg/m³ to account for secondary formation of particulates, as calculated in Section D.

F. Secondary Formation of Ozone

The *New Source Review Workshop Manual (Draft, 1990)* requires that any major new source or major source undergoing a major modification evaluate for the potential formation of ozone, which is a secondary pollutant formed through non-linear photochemical reactions, primarily driven by precursor emissions of NO_x and VOC in the presence of sunlight.

NO_x and VOC precursor contributions to the 8-hour daily maximum ozone are considered together to determine if a source's air-quality impact would exceed a prescribed critical threshold value. Since the chemical formation of ozone associated with precursor emissions cannot be explicitly be accounted for in AERMOD, USEPA has developed a two-tiered MERPs approach for addressing single-source impacts.

MERPs are expressed as an annual emissions rate (in TPY) of precursor emissions and relate maximum downwind impacts to a critical threshold value. A value less than 100% indicates that the USEPA's critical air-quality threshold ozone value of 1 part per billion (ppb) will not be exceeded.

Using methodologies from USEPA's *Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and* $PM_{2.5}$ *under the PSD Permitting Program (April 2019)* and data from the lowest (most conservative) MERP values representative of the Northeast climate zone from Table 4-1, the proposed emissions increase can be conservatively expressed as a percent of the lowest MERP for each precursor. Those individual contributions are then summed to achieve a final estimated potential secondary ozone concentration, as shown in the calculation below:

(164.5 TPY NO_x increase / 209 TPY NO_x 8-hour daily maximum O_3 MERP) +

(3.2 TPY VOC increase / 2068 TPY default VOC 8-hour daily maximum O_3 MERP) =

0.79 + 0.00 = 0.79

Since the final calculated value of 79% is less than 100%, USEPA's critical air-quality threshold value of 1 ppb will not be exceeded. Therefore, the proposed NO_x and VOC emissions are not expected to contribute to any new significant formation of ozone.

G. Class II Increment

AERMOD was used to predict maximum Class II increment impacts.

Since Woodland Pulp's current actual SO_2 and PM_{10} TPY values (for non-modified equipment) and future actual TPY values (for new or modified equipment) combined are much less than they were during the 1977 baseline year, these pollutants are not considered to be increment consuming. Therefore, only $PM_{2.5}$ and NO_2 increment were explicitly modeled.

Results of the Class II increment analysis are shown in Tables III-8. Because all predicted increment impacts meet their respective Class II increment standards, no additional Class II $PM_{2.5}$ and NO_2 increment modeling is required to be performed.

For the purpose of determining maximum predicted increment impacts, all NO_x was conservatively assumed to convert to NO_2.

TABLE III-8: Class II Increment Consumption

Pollutant	Averaging Period	Max Impact (μg/m^3)	Receptor UTM E (km)	Receptor UTM N (km)	Receptor Elevation (m)	Class II Increment (μg/m^3)
$PM_{2.5}$	24-hour	4.57*	625,368	5,001,444	42.48	9
	Annual	0.88*	625,409	5,001,472	43.14	4
NO_2	Annual	0.69	625,401	5,001,467	42.99	25

* Final predicted Class II increment impacts for $PM_{2.5}$ were adjusted by 0.06 μg/m^3 to account for secondary formation of particulates, as calculated in Section D.

The *New Source Review Workshop Manual (Draft, 1990)* requires that any major new source or major source undergoing a major modification provide analyses of additional impacts that may occur as a direct result of the general, commercial, residential, industrial, and mobile-source growth associated with the construction and operation of that source.

GENERAL GROWTH: The proposed modification at Woodland Pulp is not expected to induce any secondary growth at the site. Other than temporary construction-related activities, no commercial, residential, industrial, or other growth impacts are expected.

Some very minor increases in localized emissions due to modification-related activities may occur, with these possible emissions likely stemming from additional truck and contractor vehicle traffic. Any increase in potential emissions of NO_x and $PM_{2.5}$ due to this vehicle traffic will be temporary and short-lived.

AREA SOURCE GROWTH: Population growth in the general area of Woodland Pulp can be used as a surrogate factor for the growth in emissions from residential combustion sources. Since the 1977 (PM_{10}), 1988 (NO_x) and 2010 ($PM_{2.5}$) baseline years, there has been a decrease in population in Washington County as show in Table III-9.

TABLE III-9: Washington County Population Growth

Pollutant	Baseline Year	Baseline Year Population	2019 Population	Percent Change from Baseline Year
NO_2	1988	35,308 (1990)	31,379	-11.1%
PM_{10}	1977	34,963 (1980)		-10.3%
$PM_{2.5}$	2010	32,856 (2010)		-4.5%

In addition, the manpower required for the operation of the proposed project will be primarily available from the local workforce. Therefore, no new residential, commercial, and/or industrial growth will follow from the modification associated with Woodland Pulp.

MOBILE SOURCE GROWTH: Since mobile sources are considered minor sources of NO_2, their contribution to increment consumption needs to be evaluated. The *New Source Review Workshop Manual (Draft, 1990)* points out that screening procedures can be used to determine whether additional detailed analyses of minor source emissions are required. Compiling a source inventory may not be required if it can be shown that little or no growth has taken place in the impact area of the proposed source since the pollutant baseline dates were initially established.

The Maine Department of Transportation has compiled Vehicle Miles Travelled (VMT) data for all counties in Maine from 1985 through 2020. To be conservative, 2019 data was used to represent present-day VMTs instead of 2020 because the amount of traffic was significantly impacted by the COVID-19 pandemic and is not likely indicative of the current trend. As shown in Table III-10, the calculated growth in VMTs over the 1988-2019 time period, combined with the increasingly stringent federal NO_x emission requirements for mobile sources and the concurrent decrease in NO_2 background concentrations, indicate that mobile sources are not expected to impact the available increment.

TABLE III-10: Washington County Growth in Vehicle Miles Travelled

Pollutant	Baseline Year	Baseline Year VMTs	2019 VMTs	Percent Change from Baseline Year
PM_{10}	1977	292,192,533 (1985)	371,489,558	+27.1%
NO_2	1988	352,664,880		+5.3%
$PM_{2.5}$	2010	392,864,783		-5.4%

Therefore, no additional analyses of mobile source NO_x emissions are required to be performed.

H. Impacts on Plants, Soils & Animals

In accordance with the *New Source Review Workshop Manual (Draft, 1990)*, Woodland Pulp evaluated the impacts of its emissions using procedures described in *A Screening Procedure for the Impacts of Air Pollution on Plants, Soils and Animals (USEPA, 1981)*.

AERMOD was used to predict maximum impacts in both Class I and Class II areas. The overall maximum impacts were then compared to USEPA's screening concentrations values (see Table III-11), which represent the minimum concentration at which adverse growth effects or tissue injury in sensitive vegetation can be anticipated.

TABLE III-11: Maximum Impacts on Plants, Soils & Animals (μg/m³)

Pollutant	Averaging Period	Max Impact (μg/m³)	Receptor UTM E (m)	Receptor UTM N (m)	Receptor Elevation (m)	Back-Ground (μg/m³)	Total Impact (μg/m³)	Screening Concentration (μg/m³)
SO_2	1-hour	371.12	624,600	4,999,800	137.16	4	375.12	917
	3-hour	157.03	625,383	5,001,783	45.57	3	160.03	786
	Annual	6.92	626,180	5,001,397	28.65	1	7.92	18
NO_2	4-hour	156.23	626,800	4,999,600	126.07	42	198.26	3,760
	8-hour	109.40	626,180	5,001,347	30.16	38	147.40	3,760
	Month	14.14	626,155	5,001,397	29.15	25	39.14	564
	Annual	7.57	626,130	5,001,422	28.55	4	11.57	94
CO	Week	826.12	626,800	4,999,600	126.07	772	1,598.12	1,800,000

Because all predicted impacts for all pollutants/averaging periods were below their respective screening concentrations, no further assessment of the impacts to plants, soils, and animals is required to be performed.

I. Class I Increment

AERMOD was used to predict maximum increment impacts in the Baring and Edmunds unit of MNWR, the closest Class I area.

Since Woodland Pulp's current actual SO_2 and PM_{10} TPY values (for non-modified equipment) and future actual TPY values (for new or modified equipment) combined are much less than they were during the 1977 baseline year, these pollutants are not considered to be increment consuming. Therefore, only $PM_{2.5}$ and NO_2 increment were explicitly modeled.

Results of the Class I increment analysis are shown in Table III-12. Because all predicted increment impacts meet Class I $PM_{2.5}$ and NO_2 increment standards, no additional Class I increment modeling is required to be performed.

For the purpose of determining maximum predicted impacts, all NO_x was conservatively assumed to convert to NO_2.

TABLE III-12: Class I Increment Consumption

Pollutant	Averaging Period	Max Impact (μg/m³)	Receptor UTM E (km)	Receptor UTM N (km)	Receptor Elevation (m)	Class I Increment (μg/m³)
$PM_{2.5}$	24-hour	0.1547*	634,110	4,994,083	81.98	2
	Annual	0.0764*	634,487	4,994,029	66.99	1
NO_2	Annual	0.0031	640,642	4,965,513	50.86	2.5

* Final predicted Class I increment impacts for $PM_{2.5}$ were adjusted by 0.06 μg/m³ to account for secondary formation of particulates, as calculated in Section D.

J. Class I AQRVs

Based upon the magnitude of SO_2, PM_{10}, and NO_2 proposed emissions increases and the distance from Woodland Pulp to the nearest Class I area, FLMs representing USFWS requested that a VISCREEN visibility assessment for plume blight be conducted for MNWR-Baring using Woodland Pulp's project-only emissions.

The VISCREEN model calculates the change in color difference index (Delta E) and contrast between a coherent plume and the viewing (sky & terrain) background. If the visual plume screening analysis can demonstrate that the increase in project emissions will not cause a plume with any hourly estimates greater than or equal to 2.0, or the absolute value of plume contrast greater than or equal to 0.05, then no further review of visibility impacts due to plume blight is required.

Using methodologies and procedures prescribed in USEPA's *Workbook for Plume Visual Impact Screening and Analysis (Revised)*, *Federal Land Managers Air Quality Related Values Work Group: Phase I Report Revised 2010* (FLAG 2010) and guidance obtained directly from USFWS staff, a VISCREEN Level-2 modeling analysis was performed for MNWR - Baring.

Inputs for the VISCREEN Level-2 modeling can be found in Table III – 13.

Table III – 13: VISCREEN Level-2 Inputs for MNWR - Baring

Pollutant	**Maximum Hourly Emissions (g/s)**	
Particulates (PM_{10})	3.11	
NO_x (as NO_2)	5.86	
Primary NO_2	0.00	
Soot	0.00	
Primary SO_4	0.00	
Background Characteristics		
Background Ozone	46 ppb	
Background Visual Range	166.0 km	
Plume-Source-Observer Angle	11.25˚	
Level-2 Worst Case Meteorological Conditions		
Stability Class	F	
Wind Speed	3.0 m/s	
Level-2 Particle Characteristics		
Constituent	**Density (g/cm^3)**	**Mass Median Diameter (μg)**
Background Fine	1.5	0.3
Background Coarse	2.5	6.0
Plume Particulate	2.5	2.0
Plume Soot	2.0	0.1
Plume Sulfate	1.5	0.5

Distance Input Data			
Class I Area	**Source-Observer Distance**	**Minimum Source to Class I Distance**	**Maximum Source to Class I Distance**
MNWR - Baring	9.3 km	7.6 km	13.0 km

The results of the VISCREEN Level-2 visibility assessment modeling are listed in Table III-14.

Based upon a review of the topography within and outside of MNWR-Baring and in accordance with a specific example presented in *Workbook for Plume Visual Impact Screening and Analysis (Revised),* no observer orientation exists that would allow an elevated plume originating at Woodland Pulp to be viewed against an elevated terrain background within MNWR-Baring. Therefore, only visual impacts based on "against the sky" were utilized for comparison to the prescribed visual screening criteria.

Because all predicted "against the sky" visibility (Delta E and Contrast) impacts are below the defined critical values, no additional VISCREEN modeling is required to be performed.

Table III – 14: VISCREEN Level-2 Results for MNWR - Baring

Background	Scatter Angle (degrees)	Azimuthal Angle (degrees)	Distance (km)	Alpha (degrees)	Inside MNWR - Baring	
					Delta E	**Contrast (+/-)**
Sky	10	144	13.0	25	1.675	0.030
Sky	140	144	13.0	25	0.905	-0.018
Critical Values (Sky & Terrain)					**2.000**	**0.050**

K. Summary

In summary, it has been demonstrated that Woodland Pulp in its proposed configuration will not cause or contribute to a violation of any SO_2, PM_{10}, $PM_{2.5}$, NO_2, or CO NAAQS or to Class I or II increments for $PM_{2.5}$ or NO_2.

In addition, it has also been determined that Woodland Pulp will not cause an impairment to visibility AQRVs in MNWR – Baring Class I area.

ORDER

Based on the above Findings and subject to conditions listed below, the Department concludes that the emissions from this source:

- will receive Best Practical Treatment,
- will not violate applicable emission standards,
- will not violate applicable ambient air quality standards in conjunction with emissions from other sources.

The Department hereby grants New Source Review License A-215-77-18-A pursuant to the preconstruction licensing requirements of 06-096 C.M.R. ch. 115 and subject to the specific conditions below.

Severability. The invalidity or unenforceability of any provision of this License or part thereof shall not affect the remainder of the provision or any other provisions. This License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

SPECIFIC CONDITIONS

(1) Woodland Pulp is granted certification of 189.1 tons of NO_x offset credits per 06-096 C.M.R. ch. 113. These credits were generated as a result of the shutdown of Boiler #1 at the ReEnergy Fort Fairfield facility and Boiler #1 at the ReEnergy Ashland facility.

(2) **Fuel Changes**

Upon issuance of this NSR license, #6 fuel oil is hereby removed as a licensed fuel for the #3 RB, #9 Power Boiler, and Lime Kiln.
[06-096 C.M.R. ch. 115, BACT]

(3) **#3 Recovery Boiler**

A. Woodland Pulp is authorized to modify the #3 RB as described in this document.

B. Fuel

1. The #3 RB is licensed to fire black liquor, natural gas, synthetic natural gas, propane, low volume, high concentration (LVHC) non-condensable gases (NCG), high volume, low concentration (HVLC) NCG, and stripper off-gases (SOG). [06-096 C.M.R ch. 115, BACT]

2. Woodland Pulp shall not exceed an annual capacity factor of 10% for natural gas in the #3 RB on a 12-month rolling total basis. Compliance with this capacity factor shall be demonstrated by fuel use records showing the quantity and heating value of natural gas fired, and calculations of the total heat input updated on a monthly and 12-month rolling total basis.
[40 C.F.R. § 60.49b(d)(1) and 06-096 C.M.R. ch. 115, BACT]

C. Emissions shall not exceed the following:

Unit	Limit Units	PM	PM_{10}	$PM_{2.5}$	SO_2	NO_x	CO	VOC
#3 RB	lb/hr (1-hr basis unless otherwise noted)	49.0	49.0	49.0	392.0	166.0[a]	429.0[b]	40.2
						200.0		
	gr/dscf @ 8% O_2	0.021	0.021	0.021	--	--	--	--
	ppmvd @ 8% O_2	--	--	--	150[c]	85[a]	300[c]	--

[a] On a 24-hr block average basis.
[b] On a 24-hr block average basis, with no single hour to exceed 2,200 lb/hr.
[c] On a 30-day rolling average basis.

[06-096 C.M.R. ch. 115, LAER for NO_x, BACT for the other listed pollutants]

D. The existing NO_x CEMS shall be used to demonstrate compliance with the 166.0 lb/hr 24-hr block average emission limit and the 85 ppmvd 24-hr block average emission limit. [06-096 C.M.R. ch. 115, LAER]

E. Woodland shall demonstrate compliance with the 200.0 lb/hr 1-hr NO_x emission limit by stack testing upon request by the Department using appropriate test methods as approved by the Department. [06-096 C.M.R. ch. 115, LAER]

F. Control Equipment

Woodland Pulp shall control PM, PM_{10}, and $PM_{2.5}$ emissions from the #3 RB by use of a two-chamber dry ESP. Woodland Pulp shall maintain records of all maintenance performed on the ESP, as well as records documenting the nature of all failures and corrective actions taken. [06-096 C.M.R. ch. 115, BACT]

G. Visible emissions from the #3 RB shall not exceed 20% opacity on a 6-minute block average basis. Compliance shall be demonstrated by use of a continuous opacity monitoring system (COMS). [40 C.F.R. §§ 60.282a(a)(1)(ii) and 60.284a(a)(1)]

H. Woodland Pulp shall comply with all requirements of 40 C.F.R. Part 60, Subpart Db applicable to the #3 RB including, but not limited to, the following:

1. General Recordkeeping Requirements

All records required under 40 C.F.R. Part 60, Subpart Db shall be maintained for a period of two years following the date of such record. [40 C.F.R. § 60.49b(o)]

Please note that Standard Condition (6) of Woodland Pulp's Part 70 air emission license (A-215-70-I-R/A, issued 11/18/2011) requires that records of monitoring data and supporting information be retained for at least six years from the date of the monitoring sample, measurement, report, or application.

2. Annual Capacity Factor

Woodland Pulp shall record and maintain records of the amounts of each fuel combusted during each day and calculate the annual capacity factor, as defined in 40 C.F.R. § 60.41b and Section III.B.2.c. of this document, for natural gas for the reporting period. The annual capacity factor is determined on a 12-month rolling average basis with a new annual capacity factor calculated at the end of each calendar month. [40 C.F.R. § 60.49b(d)(1)]

(4) **Smelt Dissolving Tank**

A. Woodland Pulp is authorized to modify the Smelt Dissolving Tank as described in this document in order to accommodate the increased firing rate of the #3 RB.

B. Emissions shall not exceed the following:

Unit	Limit Units	PM (lb/hr)	PM_{10} (lb/hr)	$PM_{2.5}$ (lb/hr)	SO_2 (lb/hr)	TRS (lb/hr)
Smelt Dissolving Tank	lb/hr	14.2	14.2	13.5	7.0	3.7
	lb/ton BLS	0.127	--	--	--	0.033

[06-096 C.M.R. ch. 115, BACT]

C. Control Equipment

Woodland Pulp shall operate a wet scrubber whenever the Smelt Dissolving Tank in in operation. Woodland Pulp shall perform regular inspections of the scrubber during recovery boiler outages and maintain records documenting such inspections and any maintenance conducted on the scrubber during the outage or at any other time. [06-096 C.M.R. ch. 115, BACT]

Visible emissions from the Smelt Dissolving Tank shall not exceed 20% opacity on a six-minute block average basis. [06-096 C.M.R. ch. 101, § 3 B (4)]

(5) **New Source Performance Standards (NSPS): 40 C.F.R. Part 60, Subpart BBa**

Woodland Pulp shall comply with all requirements of 40 C.F.R. Part 60, Subpart BBa applicable to the #3 RB and Smelt Dissolving Tank including, but not limited to, the following:

A. Visible emissions from the #3 RB shall not exceed 20% on a 6-minute block average. Compliance with the visible emission limit shall be demonstrated with a continuous opacity monitoring system (COMS). The span of the COMS must be set at 70% opacity. The COMS shall be installed, certified, and operated in accordance with Performance Specification (PS) 1 in appendix B to 40 C.F.R. Part 60.
[40 C.F.R. § 60.282a(a)(1)(ii) and 60.284a(a)(1)]

B. The #3 RB and Smelt Dissolving Tank are subject to the following PM standards:

Unit	Standard	Citation
#3 RB	0.044 gr/dscf @ 8% O_2	40 C.F.R. § 60.282a(a)(1)(i)
Smelt Dissolving Tank	0.2 lb/ton BLS	40 C.F.R. § 60.282a(a)(3)

C. The #3 RB and Smelt Dissolving Tank are subject to the following TRS standards:

Unit	Standard	Citation
#3 RB	5 ppmvd @ 8% O_2	40 C.F.R. § 60.283a(a)(2)
Smelt Dissolving Tank	0.033 lb/ton BLS as H_2S	40 C.F.R. § 60.283a(a)(4)

D. Testing Requirements

1. #3 RB

a. Within 60 days after achieving the maximum production rate at which the #3 RB will be operated, but no later than 180 days after initial startup following the modification, Woodland Pulp shall conduct an initial performance test to measure PM concentration using Method 5 of 40 C.F.R. Part 60, Appendix A-3. During the performance test, Woodland Pulp shall also measure condensable particulate matter using Method 202 of appendix M of 40 C.F.R. Part 51. [40 C.F.R. §§ 60.8 and 60.285a(b)]

b. Within 60 days after achieving the maximum production rate at which the #3 RB will be operated, but no later than 180 days after initial startup following the modification, Woodland Pulp shall conduct an initial performance test to measure TRS concentration using Method 16 of 40 C.F.R. Part 60, Appendix A-6. The TRS concentration must be corrected to the appropriate oxygen concentration using the procedure in 40 C.F.R. § 60.284a(c)(1)(iii). The sampling time must be at least 3 hours, but no longer than 6 hours.

The oxygen concentration must be determined over the same time period as the TRS samples using the procedure of Method 3B of 40 C.F.R. Part 60, Appendix A-2.

[40 C.F.R. §§ 60.8 and 60.285a(d)]

c. Woodland Pulp shall conduct repeat performance tests for filterable particulate matter and TRS on the #3 RB at intervals no longer than 5 years following the previous performance test. During the performance test for filterable PM, Woodland Pulp shall also measure condensable particulate matter using Method 202 of appendix M of 40 C.F.R. Part 51.
[40 C.F.R. §§ 60.285a(b)(4) and 60.285a(d)(4)]

2. Smelt Dissolving Tank

a. Within 60 days after achieving the maximum production rate at which the Smelt Dissolving Tank will be operated, but no later than 180 days after initial startup following the modification, Woodland Pulp shall conduct an initial performance test to measure PM concentration using Method 5 of 40 C.F.R. Part 60, Appendix A-3. Woodland Pulp shall calculate the emission rate of filterable particulate matter using the procedures found in 40 C.F.R. § 60.285a(c). Woodland Pulp shall also measure condensable particulate matter using Method 202 of appendix M of 40 C.F.R. Part 51. [40 C.F.R. §§ 60.8 and 60.285a(c)]

b. Within 60 days after achieving the maximum production rate at which the Smelt Dissolving Tank will be operated, but no later than 180 days after initial startup following the modification, Woodland Pulp shall conduct an initial performance test to compute the emission rate of TRS in lb/ton of BLS. Woodland Pulp shall use Method 16 of 40 C.F.R. part 60, Appendix A-6 to determine the average combined concentration of TRS in ppm, and Method 2 of 40 C.F.R. Part 60, Appendix A-1 to determine the volumetric flow rate of the effluent gas. The emission rate shall be calculated using the following formula:

$E = C_{TRS} \times F \times Q_{SD}/P$

Where:

E = emission rate of TRS, g/kg (lb/ton) of BLS.

C_{TRS} = average combined concentration of TRS in ppm.

F = conversion factor, 0.001417 g H_2S/m^3-ppm
(8.846×10^{-8} lb H_2S/ft^3-ppm).

Q_{SD} = volumetric flow rate of stack gas, dscm/hr (dscf/hr).

P = black liquor solids feed rate, kg/hr (ton/hr).

[40 C.F.R. §§ 60.8 and 60.285a(e)]

c. Woodland Pulp shall conduct repeat performance tests for filterable particulate matter and TRS on the Smelt Dissolving Tank at intervals no longer than 5 years following the previous performance test. During the performance test for filterable PM, Woodland Pulp shall also measure condensable particulate matter using Method 202 of appendix M of 40 C.F.R. Part 51.
[40 C.F.R. § 60.285a(c)(4)]

D. Monitoring Requirements

1. Woodland Pulp shall maintain and operate a continuous opacity monitoring system (COMS) and record the opacity of the gases discharged into the atmosphere from the #3 RB. The span of this system shall be set at 70% opacity. The COMS must be installed, certified, and operated in accordance with Performance Specification 1 in appendix B to 40 C.F.R. Part 60. [40 C.F.R. § 60.284a(a)(1)]

2. Woodland Pulp shall maintain and operate continuous emission monitoring systems (CEMS) to monitor and record the concentration of TRS emissions on a dry basis and the percent oxygen by volume on a dry basis in the gases discharged into the atmosphere from the #3 RB. The CEMS must be installed, certified, and operated in accordance with Performance Specification 3 in appendix B to 40 C.F.R. Part 60. The CEMS must be located downstream of the ESP. The range of the CEMS must encompass all expected concentration values, including the zero and span values used for calibration. The span of the TRS CEMS must be set at a concentration of 30 ppm. The span of the oxygen CEMS must be set at 21% oxygen. [40 C.F.R. § 60.284a(a)(2)]

   Woodland Pulp shall calculate and record on a daily basis 12-hour average TRS concentrations for the two consecutive periods of each operating day. Each 12-hour average must be determined as the arithmetic mean of the appropriate 12 contiguous 1-hour average TRS concentrations provided by the continuous monitoring system. [40 C.F.R. § 60.284a(c)(1)(i)]

Woodland Pulp shall calculate and record 12-hour average oxygen concentrations corresponding to the 12-hour average TRS concentrations. The 12-hour averages shall be determined as an arithmetic mean of the appropriate 12 contiguous 1-hour average oxygen concentrations provided by the continuous monitoring system. [40 C.F.R. § 60.284a(c)(1)(ii)]

All 12-hour average TRS concentrations shall be corrected to 8% oxygen by volume according to the following equation:

$C_{corr} = C_{meas} \times [13/(21-Y)]$

Where:

C_{corr} = the concentration corrected for oxygen.

C_{meas} = the 12-hour average of the measured concentrations uncorrected for oxygen.

Y = the 12-hour average of the measured volumetric oxygen concentration.

[40 C.F.R. § 60.284a(c)(1)(iii)]

3. Woodland Pulp shall monitor and record the secondary voltage and secondary current of each collection field of the #3 RB ESP. Alternatively, Woodland may calculate the secondary power as the product of the secondary voltage and secondary current of each ESP collection field as a means of demonstrating compliance. [40 C.F.R. § 60.284a(b)(3)]

   Values of ESP secondary voltage and secondary current shall be recorded at least once each successive 15-minute period. Woodland shall calculate semiannual averages from the recorded measurements of ESP parameters. [40 C.F.R. § 60.284a(c)(3)(ii)]

   Woodland shall investigate the cause of deviations from the operating limits for these parameters established during performance testing within 24 hours, and initiate corrective action as needed. Additional performance testing may be used to reestablish ESP secondary voltage and secondary current minimums. [06-096 C.M.R. ch. 115, BACT and 40 C.F.R. § 60.284a(c)(4)]

4. Woodland Pulp shall maintain and operate monitors for the continuous measurement of the pressure drop of the gas stream and scrubbing liquid flow rate in the Smelt Dissolving Tank Scrubber. The pressure monitoring device must be certified by the manufacturer to be accurate to within a gage pressure of ±500 Pascals (±2 includes of water gage pressure). The device used for continuous measurement of the scrubbing liquid flow rate must be certified by the manufacturer to be accurate within ±5% of the design scrubbing liquid flow rate. [40 C.F.R. § 60.284a(b)(2)]

   The pressure drop and liquid flow rate shall be recorded at least once each successive 15-minute period. Woodland shall calculate 12-hour block averages from the recorded measurements of wet scrubber pressure drop and liquid flow rate. [40 C.F.R. § 60.284a(c)(3)(i)]

   Woodland shall investigate the cause of deviations from the operating limits for these parameters established during performance testing within 24 hours, and initiate corrective action as needed. Additional performance testing may be used to reestablish operating limits for the pressure drop of the gas stream and scrubbing liquid flow rate. [06-096 C.M.R. ch. 115, BACT and 40 C.F.R. § 60.284a(c)(4)]

5. During the initial performance tests required for the #3 RB and Smelt Dissolving Tank, Woodland Pulp shall establish site-specific operating limits for the monitoring parameters for the ESP secondary voltage, ESP secondary current, wet scrubber pressure drop, and wet scrubber liquid flow rate. The arithmetic average of the measured values for the three test runs shall establish the minimum operating limit for each ESP and wet scrubber parameter. Woodland Pulp may establish replacement operating limits for the monitoring parameters during subsequent performance tests. [40 C.F.R. § 60.284a(c)(4)]

6. The continuous monitoring systems shall collect data at all required intervals at all times the affected units are operating except for periods of monitoring system malfunctions or out-of-control periods, repairs associated with monitoring system malfunctions or out-of-control periods, and required monitoring system quality assurance or quality control activities including, as applicable, calibration checks and required zero and span adjustments. [40 C.F.R. § 60.284a(c)(5)]

7. Data recorded during monitoring system malfunctions or out-of-control periods, repairs associated with monitoring system malfunctions or out-of-control periods, or required monitoring system quality assurance or control activities may not be used in calculations used to report emissions or operating limits. All data collected during all other periods must be used in assessing the operation of the control device and associated control system. [40 C.F.R. § 60.482a(c)(6)]

E. Recordkeeping and Reporting

1. Woodland Pulp shall maintain records of the performance evaluations of the continuous monitoring systems associated with the #3 RB and Smelt Dissolving Tank. [40 C.F.R. § 60.287a(a)]

2. Woodland Pulp shall maintain records of the following information:

   a. Records of the opacity of gases discharged into the atmosphere from the #3 RB, and records of the ESP secondary voltage and secondary current (or total secondary power) averaged semiannually.

   b. Records of the concentration of TRS emissions on a dry basis and the percent of oxygen by volume on a dry basis in the gases discharged into the atmosphere from the #3 RB.

   c. Records of the pressure drop of the gas stream through the Smelt Dissolving Tank wet scrubber, and of the scrubbing liquid flow rate.

   d. Records of excess emissions as defined in 40 C.F.R. § 60.284a(d).

   e. Records of the occurrence and duration of each malfunction of operation or of the air pollution control and monitoring equipment, and of actions taken during periods of malfunction to minimize emissions.

   [40 C.F.R. §§ 60.287a(b) and (c)]

3. Woodland Pulp shall submit an excess emissions and monitoring systems performance report semiannually containing the following:

   a. The magnitude of excess emissions computed in accordance with 40 C.F.R. § 60.13(h), any conversion factor(s) used, the date and time of commencement and completion of each time period of excess emissions, and the process operating time during the reporting period.

   b. Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions.

   c. The nature and cause of any malfunction resulting in excess emissions, and the corrective action taken or preventative measures adopted.

   d. The date and time identifying each period during which a continuous monitoring system was inoperative except for zero and span checks, and the nature of the system repairs or adjustments.

e. When no excess emissions have occurred or the continuous monitoring system(s) have not been inoperative, repaired, or adjusted, such information shall be stated in the report.

[40 C.F.R. §§ 60.288a(a) and 60.284a(d)]

4. Woodland Pulp shall submit the results of each performance test required by 40 C.F.R. Part 60, Subpart BBa within 60 days after the completion of the test. Woodland Pulp shall use the latest version of EPA's Electronic Reporting Tool (ERT) existing at the time of the performance test to generate a submission package file documenting performance test data. The submission package file must then be submitted through EPA's Compliance and Emission Data Reporting Interface (CEDRI), which can be accessed through EPA's Central Data Exchange (CDX). [40 C.F.R. § 60.288a(b)]

   Please note that test results must be submitted to The Department within 30 days from the date of the test completion. [06-096 C.M.R. ch. 115]

5. Woodland Pulp shall submit relative accuracy test audit (RATA) data to the EPA's Central Data Exchange (CDX) within 60 days after the date of completing each CEMS performance evaluation test as defined in 40 C.F.R. § 60.13. [40 C.F.R. § 288a(c)]

   Please note that test results must be submitted to The Department within 30 days from the date of the test completion. [06-096 C.M.R. ch. 115]

6. If a malfunction occurs during a reporting period, Woodland Pulp shall submit a report that contains the following:

   a. The number, duration, and a brief description for each type of malfunction which occurred during the reporting period and which caused or may have caused any applicable emission limitation to be exceeded.

b. A description of actions taken during a malfunction to minimize emissions in accordance with 40 C.F.R. § 60.11(d), including actions taken to correct a malfunction.

[40 C.F.R. § 60.288a(d)]

DONE AND DATED IN AUGUSTA, MAINE THIS 5th DAY OF JANUARY, 2022.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY:______________________________ for

MELANIE LOYZIM, COMMISSIONER

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: May 25, 2021
Date of application acceptance: June 7, 2021

Date filed with the Board of Environmental Protection:

This Order prepared by Benjamin Goundie, Bureau of Air Quality.

FILED

JAN 05, 2022

State of Maine
Board of Environmental Protection