

NARRATIVE

TO: Jeng-Hon Su
FROM: S. Ganapathy
DATE: October 20, 2021

Facility Name: **Great Southern Wood Preserving, Inc.**
AIRS No.: 247-00074
Location: Conyers, GA (Rockdale County)
Application #: 28036
Date of Application: July 7, 2021 and August 9, 2001 update

Background Information

Great Southern Wood Preserving, Inc. (GSWP) (hereinafter “facility”) operates a wood treating plant at 2290 Plunkett Road NW, Conyers, Georgia. The facility currently pressure treats southern yellow pine with a waterborne, copper-based solution to protect against bacteria, fungi, insects, and marine organisms. The facility’s current operation is exempt from permitting under Georgia Rule 391-3-1-.03(6)(i)(1).

Purpose of Application

The facility submitted a SIP permit application (assigned Application No. 28036) for the construction and operation of an additional treating facility adjacent to and on the same property as the existing facility. The proposed facility will include treating kiln dried lumber received on site with flame retardant and then drying the added moisture from the treated lumber within a direct natural gas-fired batch lumber drying kiln (ID No. BK1). A public advisory was issued for this permit application.

Process Description:

The facility currently pressure treats southern yellow pine lumber with a waterborne, copper-based solution to protect against bacteria, fungi, insects, and marine organisms.

With the proposed project, the facility will bring untreated kiln dried lumber onsite into a new building. The incoming lumber will be at a moisture content of 19% or less.

Various tanks and totes will be used to store raw materials required for the aqueous fire-retardant solution treatment operation. Lumber will be loaded into the pressure vessel and sealed, the fire-retardant will be added and pressure applied to infuse the wood with the fire retardant solution. Excess treatment solution will be collected from the wet lumber for reuse and then the treated lumber will be placed in a batch drying kiln (ID No. BK1) operated at 160 °F. The kiln will be heated with a 20 MMBtu/hr direct fired natural gas burner. The treated lumber will dry at the low temperature for approximately 60 hours until the moisture introduced with treatment is removed and the fire-retardant is set in the lumber.

The facility proposed to operate Kiln BK1 at a temperature no more than 180°F that it would help to decrease VOC emissions from the drying operation and to assure that the facility will not be a Title V major source for VOC emissions.

The kiln will have 11 vents on each side of the kiln roof located 5 ft. from the crest/center line of the roof. Each vent area is 21"x21". To maintain a set temperature and humidity within the kiln, all 22 vents will open intermittently; 11 vents on one side of the kiln will exhaust steam laden air to the atmosphere and 11 vents on the opposite side of the kiln will intake fresh air to replace hot air being exhausted. At the end of the drying process, the kiln will be shut down and upon cooling, the doors will be opened to remove the dried lumber and add a fresh charge of fire retardant treated lumber. Emissions from the lumber drying and natural gas combustion in the kiln burner are released mostly through vents on the top of the kiln but can also be released when the kiln doors are opened. 90% of the emissions are assumed to be released from the kiln vents on the kiln roof. After drying, the lumber will be shipped off site for sale to customers. The facility will dry no more than 65 million board feet per year of fire-retardant treated lumber in any consecutive twelve months for Title V avoidance for VOC emissions.

Updated Equipment List

The only emission source associated with the proposed operation is the direct-fired batch drying kiln (ID No. BK1)

Emission Units			Associated Control Devices	
Source Code	Description	Installation Date	Source Code	Description
BK1	Direct-fired batch drying kiln with a 20 MMBTU/hr dryer gas-fired burner	2021	N/A	None

*proposed within current application

Emissions Summary

Safety Data Sheets for the fire-retardant treatment solution components show that no volatile organic compounds and very minimal air toxics are introduced in this treatment process. Only one raw material required in the fire-retardant solution, 273-KPC contains hexachlorobenzene (HCB) at ≤ 16 ppm. The vapor pressure of this material is below 10 mmHg and usage will be less than 1,000 gal/year. Potential emission of this HAP was estimated at 0.165 lb HCB/year. Published emission factors of VOC and toxics for drying previously dried lumber after reintroducing moisture were not found. Potential emissions were based on emission factors recommended for use or commonly accepted by the GA EPD for drying green lumber.

The hourly emissions are based on the kiln design capacity of 304 MBf per batch assuming a 36-hour batch time and the kiln burner design capacity of 20 MMBtu/hr. All pollutants but VOC have annual emissions estimated from hourly PTE at 8,760 hr/yr. Annual emissions of VOC from the drying Kiln BK1 depend on the proposed annual drying capacity of 65 MMBf.

VOC emission is based on the state's recommended emission factor of 4.0 lb VOC (WPP1)/MBf of lumber dried and an adjustment for drying of pre dried lumber in a low temperature resulting in a VOC emission factor of 2.74 lb VOC (WPP1)/MBf. This adjustment is supported by EPA Region 10 study of the impact of kiln temperature on VOC emissions. The kiln drying will be completed at a relatively low temperature (expected around 160 °F). EPA Region 10 has emission factor information demonstrating the dependence on drying temperature for VOC (WPP1), for drying of various types of wood below and above 200 °F. The reduction in VOC emissions range from 37% to around 62%. The average reduction ratio measured for VOC (WPP1) for Ponderosa Pine and Western White Pine, 68.5%, was applied to EPD's VOC factor to arrive at the VOC emission factor of 2.74 lb VOC (WPP1)/MBf for low temperature drying below 200 °F.

Note that all the NCASI emission factors for hazardous air pollutants and toxic air pollutants are not adjusted for the lower kiln temperature. The HAP/TAP emissions are therefore conservative.

Facility-Wide Emissions
(in tons per year)

Pollutant	Potential Emissions	Actual Emissions
	After Mod.	After Mod.
PM/PM ₁₀ /PM _{2.5}	1.5/1.5/1.5	1.1/1.1/1.1
NO _x	4.29	2.58
SO ₂	0.05	0.03
CO	7.21	4.33
VOC	< 89.1	<89.1
Max. Individual HAP (Methanol)	5.23	5.23
Total HAP	9.78	9.78

Regulatory Applicability

Opacity of emissions from the proposed drying Kiln BK1 and other sources including exempt sources are subject to 40% opacity limit per Georgia Rule (b).

Potential PM emissions from the batch drying kiln lumber drying operation is limited per Georgia Rule (e) is given by the equation $E = 4.1 * P^{0.67}$ for process rates equal to or less than 30 tons/hour. At the kiln process rate of 8.5 MBf/hr the Georgia Rule (e) allowable PM emission limit is 27.4 lbs/hr.

Georgia Rule (g)2. requires the facility to use fuel with sulfur content less than 2.5 wt.%. The drying kiln (BK1) burner will fire natural gas only. Natural gas has negligible sulfur content and will comply with Georgia Rule (g)2.

Georgia Rule (n) limits visible emission opacity from all fugitive sources at the facility to 20%.

Georgia Rule (tt) requires facilities with VOC emissions exceeding 25 tpy in Rockdale County to apply RACT (Reasonable Available Control Technology). The facility provided a RACT analysis in the permit application documenting that proper maintenance and operation is the appropriate RACT to minimize VOC emissions from the lumber drying Kiln BK1. Below is a summary of the RACT analysis that the Division approves.

The facility considered the following technology in its RACT analysis:

- Option 1: Regenerative Thermal Oxidation
- Option 2: Regenerative Catalytic Oxidation
- Option 3: Carbon Adsorption
- Option 4: Condensation
- Option 5: Biofiltration
- Option 6: Wet Scrubbing
- Option 7: Proper Maintenance and Operation

The high moisture content and low exit temperature of the kiln exhaust leaves RTO and carbon adsorption technically infeasible for GSWP's application.

Low kiln exit temperature, fouling or poisoning of the catalyst by particulate matter or other pollutants in the air stream and the expense of catalyst regeneration and replacement leaves the Regenerative Catalytic Oxidation technically and economically infeasible for the facility.

Terpenes are the primary constituent of lumber drying kiln exhaust that has a condensation temperature of -40°F. Cooling the exhaust to this low temperature will cause the moisture in the exhaust stream to freeze and block the line. Therefore, condensation is not technically feasible.

The kiln exhaust temperature of 160°F is too high for the microorganisms to thrive and be effective in removing and breaking down VOCs in the exhaust stream. Terpenes in the kiln exhaust will foul up the biofilter beds. Therefore, biofiltration is technically infeasible.

The viscous properties of terpenes within the VOC exhaust stream would foul the absorption media (scrubber bed) of a wet scrubber. Also, terpenes are not highly soluble eliminating wet scrubbing as a technically feasible option.

Therefore, the last control option of proper maintenance and operation of the drying kiln is the only feasible RACT option for the reduction of VOC emissions from the facility. The facility will manage lumber drying to minimize emissions by not over drying through drying in accordance with the target moisture content and not drying at an excessively high temperature.

Condition 2.6 is a result of the RACT plan for the facility in the form of a Kiln Emission Management Plan (KEMP) designed to minimize VOC emissions from the drying kiln.

Permit Conditions

Condition 2.1 limits the batch drying kiln (ID No. BK1) to drying no more than 65 million board feet (MMbf) of fire retardant treated lumber in any consecutive twelve months for Title V avoidance for VOC emissions. This is a synthetic minor permit limit.

Condition 2.2 prohibits the Permittee from operating the lumber drying Kiln BK1 at a temperature greater than 180 °F in order to prevent the facility from being a Title V major source of VOC emissions. Keeping the drying temperature low would keep the VOC emission factor at 2.74 lb/Mbf instead of 4.0 lb/Mbf . This is also a synthetic minor permit limit.

Condition 2.3 prevents firing any fuel other than natural gas in the drying Kiln BK1 burner. Drying kiln (BK1) fires natural gas only that has negligible sulfur content and will easily comply with the 2.5 wt.% fuel sulfur content limit of Georgia Rule (g)2.

Condition 2.4 limits opacity of visible emissions from sources at the facility including the during Kiln BK1 to less than 40% per Georgia Rule (b).

Condition 2.5 is the allowable emission limit from the drying Kiln BK1 and other operations at the facility per Georgia Rule (e)1.(i).

Within 180 days of the startup of Kiln BK1, Condition 2.6 requires the Permittee to develop and implement a site-specific Kiln Emission Management Plan (KEMP) in order to minimize emissions from the kiln. This plan may be modified by future equipment changes or modifications to the facility operation.

Condition 3.1 requires the Permittee to minimize fugitive emissions from the facility and limits opacity of fugitive emissions to less than 20%.

Condition 5.1 requires the Permittee to monitor the temperature of the drying Kiln BK1 and record them each hour, such that the three-hour rolling average kiln temperature does not exceed 180 °F.

Condition 7.1 requires the facility to notify EPD within 15 days of startup of the fire retardant treating operation.

Condition 7.2 requires the Permittee to record the amount of lumber dried in the drying Kiln BK1 each month and promptly report any monthly total that exceed 1/12 of the annual limit in Condition 2.1.

Condition 7.3 requires the Permittee to use the monthly production from Condition 7.2 and calculate the 12 month rolling total of lumber dried in the drying kiln each month, report any 12 month rolling total in excess of 65 MMBf.

Condition 7.4 requires reporting of any three-hour rolling average drying Kiln BK1 temperature greater than 180 °F.

Condition 8.2 requires the Permittee to pay the synthetic minor permit fee to EPD each year.

Toxic Impact Assessment

A toxic impact assessment (TIA) was completed for hazardous air pollutants (HAP) emitted from the lumber drying kiln (BK1), the only source of HAPs/Air Toxics at the facility. Air dispersion modeling was provided to demonstrate that at the worst-case assumption of potential emissions, the facility complies with the Acceptable Ambient Concentration (AAC) for the various time periods for each air toxics emitted above the Minimum emission rate (MER) in the Georgia Air Toxic Guideline.

The toxic air pollutants will be those associated with lumber drying and the combustion of natural gas. The toxic air pollutants considered from lumber drying were those listed in the definition of total hazardous air pollutants under the PCWP MACT. The toxic air pollutants considered from the combustion of natural gas were those listed in AP-42 Section 1.4 Natural Gas Combustion not addressed by EPA's lumber drying emission factors.

In the TIA exercise, the facility first compared the potential-to-emit (PTE) for each key HAP and toxic air pollutant (TAP) with the associated MER as follows:

Pollutant	PTE (lb/yr)	MER (lb/yr)	Modeling Needed?
Arsenic	0.0344	0.0567	No
Chromium VI	0.00962	0.0195	No
Acetaldehyde	2,925	1,110	Yes
Acrolein	260	4.87	Yes
Formaldehyde	2,509	267	Yes
Hexachlorobenzene	0.165	4.87	No
Methanol	10,465	30,100	No
Phenol	650	2,200	No
Propionaldehyde	260	1,950	No

For the HAP/TAP that requires modeling, the emissions from lumber drying are based on continuous operation at an hourly capacity of 8.5 MBF/hr. The emissions from natural gas combustions are based on the burner capacity of 20 MMBtu/hr at continuous operation. According to the above table, acetaldehyde, acrolein, and formaldehyde are emitted in amounts greater than the associated MER and would require modeling.

AERMOD version 21112 was used to determine ambient impacts surrounding the facility for acetaldehyde, acrolein and formaldehyde. Rural dispersion coefficients were used in the model as the area was determined to be less than 50% developed within a 3 km radius.

Each scenario was modeled with a nominal 1-lb/hr emission rate to result in dispersion coefficients in the units of (ug/m³)/(lb/hr). The impacts for each pollutant were determined by multiplying the dispersion coefficients by the maximum hourly pollutant emission rate. The modeled results showed that except for formaldehyde for the annual averaging period, the modeled concentrations (MGLCs) were less than the respective AACs for acetaldehyde and acrolein for all averaging periods.

The MGLC assessment for Acetaldehyde, Acrolein and Formaldehyde for the 15 minute and annual averaging period are listed below based on review by our modeling unit:

TAP	Averaging Period	AAC ($\mu\text{g}/\text{m}^3$)	Max Modeled Conc. ($\mu\text{g}/\text{m}^3$)
Acetaldehyde	15-min	4,500	38.10
	Annual	4.55	1.57
Acrolein	15-min	23	3.38
	Annual	0.35	0.14
Formaldehyde	15-min	245	32.63
	Annual	1.1	1.34

EPD's TIA Guideline calls for a reduction in emissions if the MGLC is above the AAC, if these options fail a site-specific risk analysis is required.

The modeling results in the site specific risk assessment by our modeling unit are listed below:

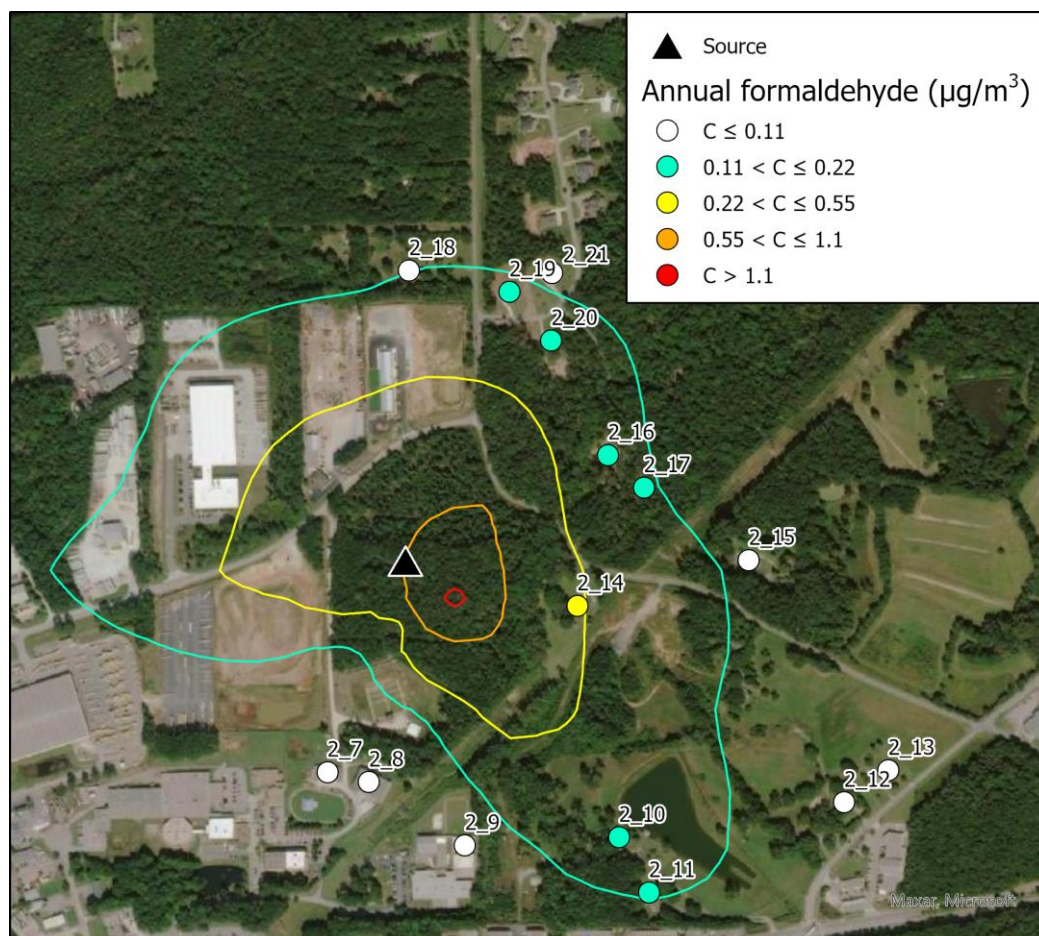


Figure 1. Modeled average annual ground-level concentrations (in $\mu\text{g}/\text{m}^3$) of formaldehyde across 5 years (2015-2019) overlaid on a satellite map with the closest residential areas. The red line indicates the annual AAC for formaldehyde ($1.1 \mu\text{g}/\text{m}^3$).

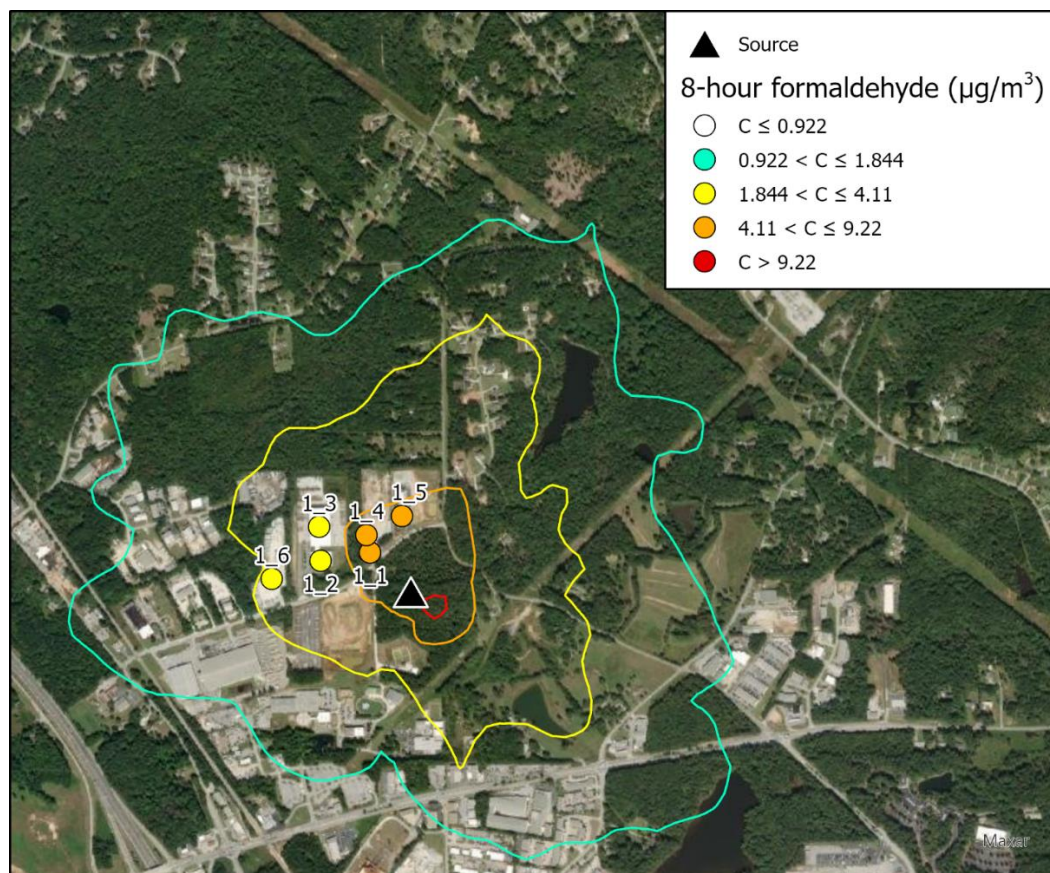


Figure 2. Modeled maximum 8-hour ground-level concentrations (in $\mu\text{g}/\text{m}^3$) of formaldehyde across 5 years (2015-2019) overlaid on a satellite map with the closest business areas. The red line indicates the 8-hour AAC for formaldehyde ($9.22 \mu\text{g}/\text{m}^3$). Note: The 8-hr modeled impacts represent the highest 8-hr impacts from the 5-year modeling period. Annual impacts represent the highest annual average of the 5-year modeling period.

The modeled impacts in the site-specific risk assessment were found to be below the respective ACCs for formaldehyde at the 6 business receptors (8 hr average) and the 15 residence receptors (annual average). The site specific risk assessment demonstrated that emissions of formaldehyde will not cause any adverse impact on the health and wellbeing of those working and living near the facility.

Summary & Recommendations

I recommend that Air Quality Permit No. 2491-247-0074-S-01-0 be issued to Great Southern Wood Preserving, Inc. for the construction and operation of a facility for treating kiln dried lumber with a fire retardant and drying the treated lumber in a low temperature Kiln BK1, and for continued operation of existing pressure treating facility. The proposed batch drying kiln BK1 will be limited to drying 65 million board feet of fire retardant treated lumber per year. The kiln will also be required to operate below 180°F for the facility to avoid being a Title V major source for VOC emissions.

The public advisory issued for this application expired without any comment on August 20, 2021. In addition, a Public Notice was issued for this application on October 27, 2021 and expired November 26, 2021. EPD's Stationary Source Compliance program will be responsible for facility inspections and overall compliance oversight of this facility.