

4/20/2022

**TO:** Maria Zufall, Georgia Pacific  
**FROM:** Zach Emerson  
**SUBJECT:** WWTS Emissions Estimates

NCASI staff have performed emissions modeling work for the Georgia Pacific Toledo facility. The goal of this work was to estimate emissions of acetaldehyde, formaldehyde, methanol and methyl ethyl ketone from the wastewater treatment unit operations.

EPA's WATER9 software was used to estimate the air emissions of methanol from the Strong Waste Pipe, the Weak waste Pipe and the Lower & Upper lagoons. WATER9 implements the estimation procedures presented in the guidance document *Air Emission Models for Waste and Wastewater* (EPA-453/R-94-080A, 1994). These procedures are the basis for demonstrating MACT compliance for several sectors, including pulp & paper, POTWs, and organic chemical manufacturing. WATER9 is also used in emissions inventory calculations and in EPA's residual risk and technology review process.

WATER9 is a mass-balance based software tool used to estimate air emissions of volatile compounds from a number of waste and wastewater sources. It combines empirical mass-transfer correlations, estimated biological activity, and compound specific properties to simulate the fate of pollutants in industrial systems. WATER9, Version 3.0 is available from EPA's *Clearinghouse for Inventories & Emission Factors* at <http://www.epa.gov/ttnchie1/software/water>.

### **Pond Concentrations**

Two phases of liquid sampling were performed. Samples were collected by mill staff and analyzed by NCASI at the Newberry Offices and Labs (NOL) location. The results of analysis for the December 2020 + January 2021 sampling event are presented in Table 1; those for the April 2021 sampling event are presented in Table 2.

	<b>Formaldehyde (mg/L)</b>	<b>Acetaldehyde (mg/L)</b>	<b>Methanol (mg/L)</b>	<b>Methyl Ethyl Ketone (mg/L)</b>
<b>Clarifier Overflow</b>	< 0.2	0.205	6.2	< 0.2
<b>Thermal B</b>	< 0.2	0.2975	4.7	< 0.2
<b>Thermal C</b>	< 0.2	< 0.2	< 5.0	< 0.2
<b>Load Level</b>	< 0.2	< 0.2	< 0.5	< 0.2
<b>Treatment A</b>	< 0.2	< 0.2	< 5.0	< 0.2
<b>Treatment B</b>	< 0.2	< 0.2	< 5.0	< 0.2
<b>Treatment Outlet</b>	< 0.2	< 0.2	< 5.0	0.22
<b>Settling Pond Outlet</b>	< 0.2	< 0.2	< 5.0	0.565

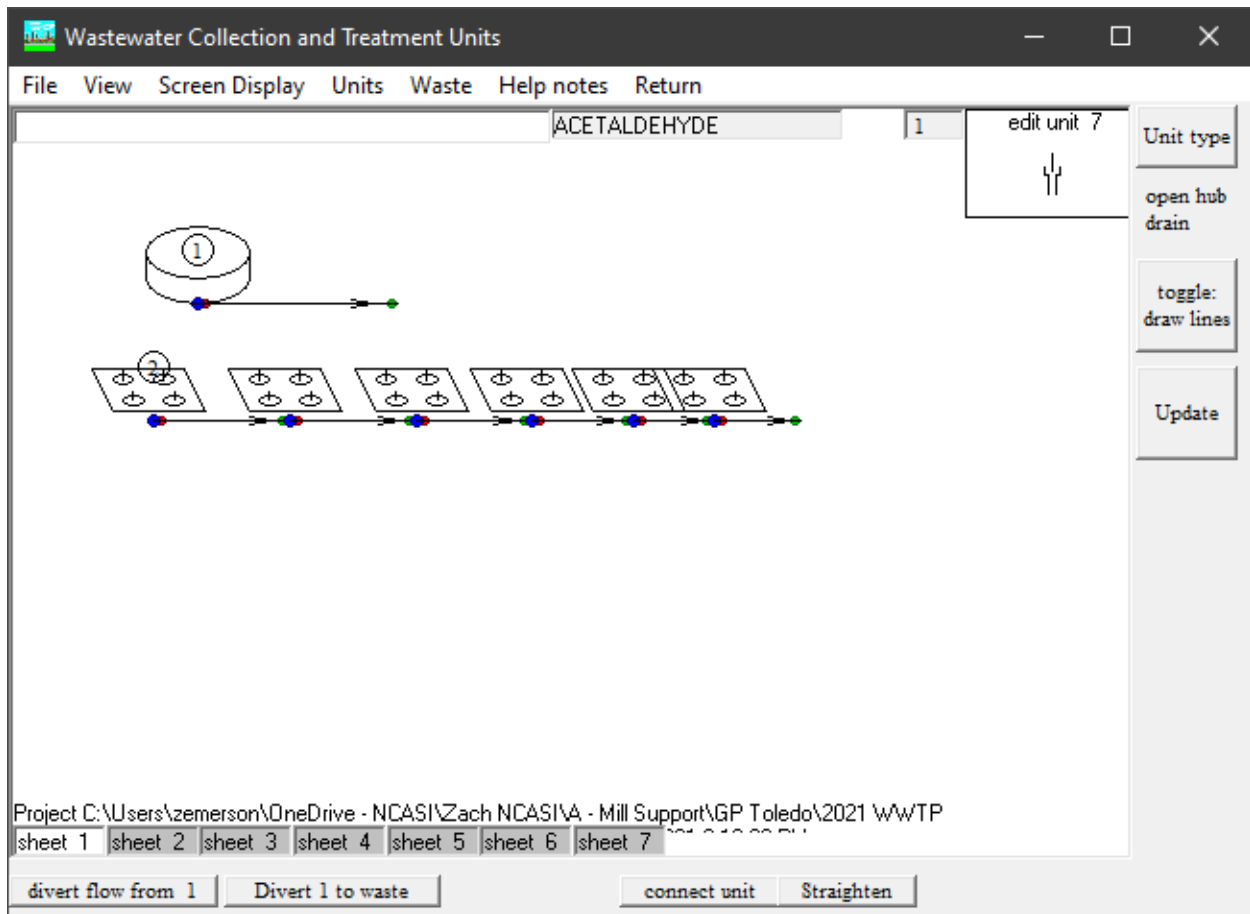
**Table 1: Average Concentration Results for December 2020 + January 2021 Sampling Event**

	<b>Formaldehyde (mg/L)</b>	<b>Acetaldehyde (mg/L)</b>	<b>Methanol (mg/L)</b>	<b>Methyl Ethyl Ketone (mg/L)</b>
<b>Clarifier Overflow</b>	< 0.3	< 0.3	13.7	< 0.3
<b>Thermal B</b>	0.3	0.6	10.4	<0.3
<b>Thermal C</b>	< 0.3	< 0.3	2	< 0.3
<b>Load Level</b>	< 0.3	< 0.3	1.1	< 0.3
<b>Treatment A</b>	< 0.3	< 0.3	1.0	< 0.3
<b>Treatment B</b>	< 0.3	< 0.3	1.0	< 0.3
<b>Treatment Outlet</b>	< 0.3	< 0.3	0.9	< 0.3
<b>Settling Pond Outlet</b>	< 0.3	< 0.3	0.9	< 0.3

**Table 2: Average Concentration Results for April 2021 Sampling Event**

## **Model Parameters**

Site-specific models were created to estimate the emissions of select compounds from the various process units in the wastewater treatment system. The specifications for each process unit were provided by mill staff. The system was simulated as a series of process units. Figure 1 is a screen capture of the WATER9 simulation flow sheet for the Toledo Wastewater Treatment System.



**Figure 1: WATER9 simulation flow sheet for the WWTs**

## Results

A large amount of the liquid concentration measurements were below detection limits. For these cases, an inlet concentration equal to the detection limit was used. Emissions estimates based upon non-detect liquid data are presented as "less than". Emissions were estimated for each sampling event and are presented in Tables 3 and 4.

	Estimated Emission Rates (g/s)			
	Acetaldehyde	Formaldehyde	Methanol	Methyl Ethyl Ketone
<b>Clarifier</b>	6.7E-03	<5.1E-05	2.7E-02	5.2E-03
<b>Thermal Ponds</b>	<2.6E-02	<1.9E-04	1.6E-02	1.4E-02
<b>Load Leveling Lagoon</b>	<1.8E-03	<1.4E-05	<1.2E-04	<1.0E-03
<b>Treatment Pond</b>	<2.8E-04	<2.7E-06	1.0E-02	<1.6E-04
<b>Settling Pond</b>	Not significant	Not significant	Not significant	Not significant

**Table 3: Estimated emissions for select compounds, based upon liquid sampling from December 2020 and January 2021**

	Estimated Emission Rates (g/s)			
	Acetaldehyde	Formaldehyde	Methanol	Methyl Ethyl Ketone
<b>Clarifier</b>	<4.3 E-03	<3.2 E-05	5.1 E-02	< 3.5 E-03
<b>Thermal Ponds</b>	<1.2 E-02	<1.3 E-05	2.1 E-2	<9.8E-03
<b>Load Leveling Lagoon</b>	<8.5 E-04	<9.9 E-06	<1.5 E-04	<6.9 E-04
<b>Treatment Pond</b>	<1.3 E-04	Not Significant	Not Significant	<1.1 E-04
<b>Settling Pond</b>	Not significant	Not significant	Not significant	Not significant

**Table 4: Estimated emissions for select compounds, based upon liquid sampling from April 2021**

If you have any comments or questions concerning these estimates, please free to contact me.

Sincerely,



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