# ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

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**JB PRITZKER**, GOVERNOR          **JAMES JENNINGS**, ACTING DIRECTOR

**MEMORANDUM**

**Date:**        November 25~~1~~, 2024

**To:**          Alicia Huntley, FESOP/LOP Unit, Permits/BOA

**From:**        Rain Sevenshadows, Modeling Unit, Permits/BOA

**Subject:**     International Paper Company Belleville, ID: 163010AEZ, Permit Application #23090012

International Paper (IP) in Belleville, IL runs a packaging plant and has retained ALL4, LLC to help with a construction permit application (#23090012). The permit seeks approval to build a new Three-Color Die Cutter and to modify the existing Corrugator to increase production capacity. The existing facility is located at 3001 Otto St, Belleville, IL in St. Clair County. Centering coordinates for this facility are UTM Zone 15 coordinates 759,933 m Easting and 4,268,785 m Northing. IP operates its main manufacturing equipment under a Federally Enforceable State Operating Permit (FESOP) (#90090035), issued by the Illinois Environmental Protection Agency (IEPA) on August 10, 2022.

IP's core operations involve corrugating, printing, folding, and gluing materials to meet client specifications for box production. On September 12, 2023, IP submitted a permit application seeking approval to install a new Three-Color Die Cutter (DC) and modify the existing Corrugator to enhance its production capacity. As part of the permit application, IP has revised the potential to emit (PTE) for $PM_{10}$ and $PM_{2.5}$ from the existing cyclone separator, incorporating updated Particulate Matter (PM) emission factors based on the latest published data on cyclone emissions. The facility would have increases in emissions of $PM_{10}$ and $PM_{2.5}$, as well as hazardous air pollutants (HAPs).

Since the facility is located in an Environmental Justice (EJ) area, IEPA requested that IP perform an air quality modeling analysis in support of its construction permit application to confirm the project would not threaten or compromise existing National Ambient Air Quality Standards (NAAQS) or other relevant air quality standards. In response to this request, IP had the consulting firm, ALL4, perform an air quality dispersion modeling analysis to evaluate the environmental impact from the requested increase in emissions.

## Modeling Unit Audit

ALL4 initially submitted an air quality analysis on May 24, 2024. After initial review, the IEPA Modeling Unit (Modeling Unit) requested the inclusion of nearby sources and background monitor data in the modeling analysis for all cumulative modeling analyses, including all averaging periods of $PM_{10}$ and $PM_{2.5}$. The latest report submitted on September 2024 incorporated the requested changes and updated the source parameters for their cyclone. The following main dot entries identify key aspects of the modeling methodology used in this analysis:

- ALL4 used AERMOD (v. 23132), the AMS/USEPA Regulatory Model. AERMOD is a federally approved regulatory model appropriate for use in an air quality analysis of this nature.

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- Modeling inputs utilized USEPA recommended default regulatory options, which simulate phenomena such as atmospheric stability, plume rise, and downwash. The modeling analysis incorporated five years of locally representative meteorology. In 2023, the Modeling Unit obtained National Weather Service (NWS) meteorological data files for years 2018 through 2022 from the National Centers for Environmental Information (NCEI) which consisted of surface data collected at Cahokia Airport, IL and upper air data collected at the National Weather Surface office in Lincoln, IL. Surface and upper air stations were selected because of their proximity and representativeness to the project site in St. Clair County. The Modeling Unit provided the applicant with meteorology data processed with AERMET (v. 23132). The Modeling Unit audit utilized meteorological data files for the same surface and upper air stations for years 2019 through 2023.

- ALL4 processed National Elevation Data (NED) terrain elevations from USGS using the most recent version of AERMAP (v. 18081) to develop the receptor terrain elevations and hill height scales required by AERMOD. The site elevation at the proposed facility is approximately 171 m above mean sea level.

- Newer versions of AERMOD, AERMAP, and AERMET (v. 24142)[1] have been released, this update will not impact the results of this modeling analysis. Therefore, the use of AERMOD (v. 23132), AERMET (v. 23132), and AERMAP (v. 18081) was accepted for this analysis.

- ALL4 used a Cartesian grid in their distribution of 1,898 receptors. The following receptor grid densities were used:
  - 25 m spacing along facility boundary and out to 200 m.
  - 100 m spacing from 200 m to 1,000 m.
  - 500 m spacing from 1,000 m to 5,000 m and
  - 1,000 m spacing from 5,000 m to 10,000 m.

- ALL4 selected the rural modeling option in their analysis. The Modeling Unit conducted an Auer's Analysis as part of its review to characterize the area surrounding the facility and determine whether the AERMOD rural option should be utilized. Like ALL4, the Modeling Unit developed its Auer's Analysis using 2021 National Land Cover Data (NLCD) within a 3-km radius of the facility. Results of the analysis showed that the surrounding area is 34.8% urban and 65.2% rural. Thus, the Modeling Unit audit also utilized the rural modeling option in BEEST.

- ALL4 used USEPA's Building Profile Input Program (BPIPPRM) to account for downwash effects of on-site structures. All on-site nearby buildings were included in the modeling analysis.

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[1] Tillerson, Clint (2024, November 20) *Release of the regulatory AERMOD Modeling System (AERMOD, AERMET, and AERMAP), AERSURFACE, and AERPLOT (Version 24142), and MMIF (Version 4.1.1).* USEPA

## Source Impact Analysis

ALL4 performed a source impact analysis to determine if more detailed modeling would be required for any $PM_{2.5}$ and $PM_{10}$ averaging period. The results of this analysis are compared against significant impact levels (SILs) for each pollutant and averaging period. The results of this analysis can be found in **Table 1** below.

**Table 1**
**Source Impact Analysis Results by ALL4 in µg/m³**

| Pollutant | Averaging Period | Maximum Modeled Impact | Significant Impact Level |
|---|---|---|---|
| $PM_{2.5}$ | 24-Hour | 3.59[1] | 1.2 |
| | Annual | 0.49[2] | 0.13 |
| $PM_{10}$ | 24-Hour | 16.64[3] | 5 |

The results from both ALL4's analysis and the Modeling Unit's audit[2] found that impacts for 24-hour $PM_{2.5}$, annual $PM_{2.5,}$ and 24-hour $PM_{10}$ would be above their respective SILs and further analysis was necessary.

## NAAQS Analysis

A cumulative NAAQS analysis was conducted for 24-hour $PM_{2.5}$, annual $PM_{2.5}$, and 24-hour $PM_{10}$ that incorporated monitored background design values and nearby emission inventory sources into the modeling analysis. ALL4 included all receptors that modeled concentrations greater than their respective SILs in the source impact analysis. The NAAQS analysis included an inventory of nearby sources provided by the Illinois EPA.

The selection of background monitors was based on the facility's location and the similarities in surrounding terrain. The facility itself is situated in a predominantly residential area, with some commercial zones, mixed vegetation, and farmland to the southwest. The following monitors were selected for use in this analysis:

- For $PM_{10}$, data was collected from the Arnold West monitor (AQS 29-099-0019) in Missouri, outside the St. Louis metropolitan area. The monitor is located about 21 km northwest of the facility in a well-developed area with residential, commercial, and industrial facilities. It is near interstate highways and major state routes. While the facility is mainly surrounded by neighborhood streets, significant state routes are to the south and west. Overall, the monitor offers a conservative representation of the facility's conditions. Therefore, it was selected to represent the background levels of $PM_{10}$.

- For $PM_{2.5}$, the Arnold West monitor did not meet completeness criteria. Data was instead collected from the IEPA monitor in Houston, Illinois (AQS ID 17-157-0001). The monitor is approximately 44 km southeast of the facility in an area with primarily undeveloped farmland and

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[2] The Modeling Unit's maximum modeled impact results were 3.48 µg/m³ for 24-hour $PM_{2.5}$, 0.538 µg/m³ for annual $PM_{2.5}$, and 19.3 µg/m³ for 24-hour $PM_{10}$.

mixed vegetation, with a few residences. While the monitor is in a less developed area, the proximity to unpaved roads, a shooting range, and a campground contributes to elevated particle pollution, making the monitoring site representative of the $PM_{2.5}$ conditions at the facility. ALL4 obtained the $PM_{2.5}$ monitor data from the Exceptional Events Design Value tool,[3] excluding days flagged as exceptional events. **Table 2** below provides the design values for each pollutant and their respective averaging period.

**Table 2**
**Background Monitoring Values in µg/m³**

| Pollutant | Averaging Period | Monitor Name and ID | 2021 | 2022 | 2023 | Design Value |
|---|---|---|---|---|---|---|
| $PM_{2.5}$ | 24-Hour [(1)] | Houston \| 17-157-0001 | 18.8 | 13.7 | 13.0 | 15.2 |
| | Annual [(2)] | Houston \| 17-157-0001 | 8.06 | 6.48 | 6.91 | 7.2 |
| $PM_{10}$ | 24-Hour [(3)] | Arnold West \| 29-099-0019 | 77.0 | 84.0 | 59.0 | 73.3 |

(1) The average of the 99th percentile concentrations per year over 3 years of monitoring data.
(2) The annual arithmetic mean concentration averaged over 3 years of monitoring data.
(3) Highest 2nd high concentration over 3 years of monitoring data.

ALL4's maximum modeled impacts were combined with the background concentrations and subsequently compared to the NAAQS. **Table 3** below represents ALL4's NAAQS results for each pollutant and their averaging periods respectively.

**Table 3**
**NAAQS Analysis Results for $PM_{2.5}$ and $PM_{10}$ by ALL4 in µg/m³**

| Pollutant | Averaging Period | Maximum Modeled Impact | Background Concentration | Total Concentration | NAAQS |
|---|---|---|---|---|---|
| $PM_{2.5}$ | 24-Hour | 4.1[(1)] | 15.2[(a)] | 19.3 | 35 |
| | Annual | 1[(2)] | 7.2[(b)] | 8.2 | 9 |
| $PM_{10}$ | 24-Hour | 12.5[(3)] | 73.3[(c)] | 85.9 | 150 |

| | |
|---|---|
| (1) Average of the 8th highs over 5 years. | (a) Three-year average of the 98th percentile daily max 1-hour values. |
| (2) Average of the 1st highs per year over 5 years. | (b) Highest annual concentration over three years of monitoring data. |
| (3) Sixth highest concentration over 5 years. | (c) Average 99th percentile concentrations per year over three years. |

The Modeling Unit's results[4] confirmed that the combined model-predicted impacts with background concentrations for all averaging periods of $PM_{2.5}$ and $PM_{10}$ were below their respective NAAQS.

## Hazardous Air Pollutants (HAPs) Analysis

ALL4 submitted a HAPs analysis to assess the increases in HAPs emissions from the project and provided the Modeling Unit with emission calculations for HAPs emissions from the facility.

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[3] U.S. Environmental Protection Agency (2024). Exceptional Events Design Value Tool Retrieved from: https://www.epa.gov/air-quality-analysis/exceptional-events-design-value-tool
[4] Modeling Unit's maximum modeled impact results were: 24-hour $PM_{2.5}$: 4.34 µg/m³, annual $PM_{2.5}$: 0.98 µg/m³ and annual $PM_{10}$: 14.3 µg/m³.

**Commented [SC3]:** This number is not correct based on the data for 2021, 2022 and 2023

**Commented [TS4R3]:** Wrong value in 2021 box.

**Commented [SRL5]:** Cari, I fixed the monitor info.

**Commented [SC6]:** This includes per year. . . Other footnotes here and in Table 2 do not include per year. Is this accurate

**Commented [TS7R6]:** Values from NSR spreadsheet

**Commented [RC8R6]:** This is somewhat correct - the annual standard is the average of the 1st highs per year over 5 years, but I think it honestly ends up meaning the same thing whether it says "per year" or not. The spreadsheet we have does have a difference there.

**Commented [SC9]:** This includes "per year" as well

**Commented [SRL10R9]:** That is the language of calculations - they might seem similar but contextually different. Happy to elaborate if you need.

**Commented [TS11R9]:** How can you elaborate? Is there wording you can add.

The Modeling Unit performed a screening analysis using the Air Emissions Risk Analysis (AERA) Guidance[5] from the Minnesota Pollution Control Agency (MPCA). It was determined from the use of the MPCA Risk Assessment Screening Spreadsheet (RASS) that IP Belleville should conduct a dispersion modeling analysis for the following six pollutants: acetaldehyde, acrolein, acrylic acid, formaldehyde, diethylene glycol monoethyl ether (DGME) and propionaldehyde.

The Modeling Unit provided ALL4 with federal- and state-level reference concentrations for these pollutants. The standards were provided from USEPA's Integrated Risk Information System (IRIS)[6], California's Office of Environmental Health Hazard Assessment (OEHHA),[7] Minnesota's Department of Health (MDH),[8] and USEPA's Provisional Peer-Reviewed Toxicity Values (PPRTV)[9].The results of ALL4's maximum modeled concentrations for the requested HAPs and their respective averaging periods are displayed and compared to their reference standards in **Table 4**.

**Table 4**
**HAPs Modeling Results – Short and Long Term in μg/m³**

| Pollutant | CAS No. | Averaging Period | Standard | Maximum Modeled Concentration | Reference |
|---|---|---|---|---|---|
| Acetaldehyde | 75-07-0 | 1-hour | 470 | 16.4 | OEHHA REL[(1)] |
| | | 8-hour | 300 | 10.5 | |
| | | Annual | 9 | 1.57 | IRIS RfC [(2)] |
| Acrolein | 107-02-8 | 24-hour | 5 | 2.37 | MN HRV [(3)] |
| | | Annual | 9 | 0.484 | |
| Formaldehyde | 50-00-0 | 24-hour | 50 | 5.42 | MN HRV [(3)] |
| | | Annual | 9 | 1.11 | |
| Propionaldehyde | 123-38-6 | Annual | 8 | 1.11 | IRIS RfC [(2)] |
| Acrylic Acid | 79-10-7 | 1-hour | 6000 | 3.21 | OEHHA REL [(1)] |
| | | Annual | 1 | 0.113 | IRIS RfC [(2)] |
| DGME | 111-90-0 | 24-hour | 3 | 0.841 | PPRTV p-RfC [(4)] |
| | | Annual | 0.3 | 0.252 | |

(1) OEHHA Reference Exposure Levels (REL) are established for pollutants based on exposure durations.
(2) IRIS reference concentrations for inhalation exposure (RfCs) provide an estimate of concentrations that human populations could inhale over a lifetime without an appreciable risk of negative health outcomes.
(3) MN Health Risk Values (HRV) are concentrations of a chemical that are likely to pose little or no risk to human health during that exposure duration.
(4) PPRTV inhalation reference concentrations (p-RfCs) provide a provisional estimate of concentrations that human populations could inhale over a lifetime without an appreciable risk of negative health outcomes.

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[5] Minnesota Pollution Control Agency (2024). Air Emissions Risk Analysis (AERA) Guidance. Retrieved from: https://www.pca.state.mn.us/business-with-us/air-emissions-risk-analysis-aera
[6] U.S. Environmental Protection Agency (2023). IRIS Assessments. Retrieved from: https://iris.epa.gov/AtoZ/?list_type=alpha.
[7] California Office of Environmental Health Risk Assessment (2023). OEHHA Acute, 8-hour and Chronic Reference Exposure Level (REL) Summary. Retrieved from: https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary
[8] Minnesota Department of Health, MN (2023). Air Guidance Values. Retrieved from: https://www.health.state.mn.us/communities/environment/risk/guidance/air/table.html
[9] U.S. Environmental Protection Agency (2024). Provisional Peer-Reviewed Toxicity Values. Retrieved from: https://www.epa.gov/pprtv/provisional-peer-reviewed-toxicity-values-pprtvs-assessments

The Modeling Unit's audit verified that all HAPs modeled concentrations are below all respective reference standards, confirming ALL4's analysis.

## Summary

Based upon the applicant's submittal and the IEPA Modeling Unit's review of ALL4's modeling results, the air quality analysis confirms that the proposed operations would not exceed the NAAQS for $PM_{2.5}$ and $PM_{10}$. The audit also confirms that HAPs emissions are within limits, ensuring that toxics-based standards are met.

cc:    Bill Marr, Section Manager, Permits/BOA
        Azael Ramirez, FESOP/LOP Section Manager, Permits/BOA
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        Cari Rutherford, Modeling Unit, Permits/BOA
        Tamara Stewart, Modeling Unit, Permits/BOA

**Commented [RC14]:** Advice has been to not use the term "health" in respect to HAPs - so this language will need to be modified to something else. You can view the Crysalis memo for some guidance on how we previous referenced HAPS - I believe we used "toxics-based"

**Commented [SRL15R14]:** I think that we can end that sentence there. What do you think?

**Commented [RC16]:** Same comment here - needs to say something besides health