

**Odor Investigation Plan for Graphic Packaging
International, LLC's Recycled Paperboard Mill
in Kalamazoo, MI**

July 6, 2020

Prepared for:

Graphic Packaging International, LLC

Prepared by:

RK & ASSOCIATES, INC



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Odor Investigation Plan

Graphic Packaging Int'l – Kalamazoo, Michigan

INTRODUCTION

RK & Associates, Inc. (RKA) has been retained to evaluate the operations at the Graphic Packaging International, LLC (GPI) recycled paperboard mill, located at 1500 North Pitcher Street in Kalamazoo, Michigan, to investigate community odor levels. This investigation plan will also identify potential odor sources within GPI facility and any nearby other odor sources. In addition, this investigation will assist in the assessment of community odor levels compared to Michigan Rule 901 odor criteria.

Additionally, as part of the investigation, RKA will review historical odor complaint records in the area and evaluate those complaints against sources identified at the GPI mill and any other relevant neighboring operations.

1. ODOR STANDARDS

A. Michigan Administrative Code, Environment, Great Lakes, and Energy, Air Quality Division, Air Pollution Control

R 336.1901 Air contaminant or water vapor; prohibition.

Rule 901. Notwithstanding the provisions of any other rule, a person shall not cause or permit the emission of an air contaminant or water vapor in quantities that cause, alone or in reaction with other air contaminants, either of the following:

- (a) Injurious effects to human health or safety, animal life, plant life of significant economic value, or property.
- (b) Unreasonable interference with the comfortable enjoyment of life and property.

The Michigan Department of Environment, Great Lakes, and Energy (MEGLE), formerly Michigan Department of Environmental Quality (MDEQ), uses the following scale to identify objectionable odors:

Odor Intensity Odor Scale

- 0 – Non-Detect
- 1 – Just barely detectable
- 2 – Distinct and definite odor
- 3 – Distinct and definite objectionable odor
- 4 – Odor strong enough to cause a person to attempt to avoid it completely
- 5 – Odor so strong as to be overpowering and intolerable for any length of time

It is RKA's understanding that MEGLE considers anything at level 3 or above as a potential unreasonable interference with the comfortable enjoyment of life and property, depending on

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the intensity and duration of the odor.

B. Objectionable odor using objective measurements at other states and localities.

RKA understands that the State of Michigan does not currently have an odor nuisance standard that requires a Scentometer or other analytical device to measure the level of odors.

Nevertheless, looking to the regulatory programs of other states and localities that do rely upon the Scentometer or similar devices to measure odors helps put the GPI operations and other odor sources nearby in context:

State or Locality	Source of Standard	Determination Criteria
Colorado	5 CCR 1001-4: Odor Emission	7:1 Dilution to Threshold (D/T); (2 samples over 1-hour period)
Connecticut	Sec. 22a-174-23: Control of Odors	(a) Nuisance standard. (b) 7:1 D/T (3 samples over 1-hour period); and (c) Ambient air limits for certain substances in Table 23-1 (e.g. Hydrogen sulfide: 0.0045 ppm (15-minute average))
Illinois	Section 9(a) of the Act and 35 IAC 245.121: Objectionable Odor Nuisance Determination	Nuisance standard. 8:1 D/T (Scentometer)
Kentucky	401 KAR 53:010: Ambient Air Quality Standards	7:1 D/T (Nasal Ranger/Scentometer)
Missouri	10 CSR 10-6.165: Restriction of Emission of Odors	7:1 D/T (Nasal Ranger) (2 samples over 1-hour)
North Dakota	Section 33-15-16: Restriction of Odorous Air Contaminants	Objectionable odors prohibited. 7:1 D/T (Scentometer)
San Francisco Bay Area Air Quality District		5 D/T applied after at least 10 complaints within 90 days. ¹
State of Massachusetts	Draft policy and guidance for composting facilities	5 D/T
City of San Diego WWTP		5 D/T average over 5 minutes
City of Seattle, WWTP		5 D/T average over 5 minutes

¹ Thomas Mahin, *Measurement and Regulation of Odors in the USA*, 64

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Thomas Mahin, in his paper Measurement and Regulation of Odors in the USA, references a study conducted for the California Air Resources Board that itself reviewed six published studies related to the recognizability, unpleasantness and annoyance associated with a variety of odors. The study found that for unpleasant odors, the threshold of annoyance is about five times the threshold of detection. He also reports that the California's South Coast Air Quality Management District found that at 5 D/T, people become aware of an odor and that at 5 to 10 D/T, odors may be strong enough to trigger complaints.

2. INITIAL ODOR EVALUATION

RKA visited the GPI facility in Kalamazoo to evaluate its current odor status and conducted the following activities:

- Toured the facility to get familiar with the process and current operation, and to identify potential odor sources
- Interviewed management personnel about daily operations, identified and inspected suspected odor sources, regulatory issues, and odor complaints
- Reviewed available history of odor complaints, frequency of odor complaints, location of complaints, and odor characteristics of the complaints, including publicly available information on complaints compiled by Michigan EGLE.
- Reviewed predominant wind conditions and assessed correlation against historical odor complaints
- Toured the facility perimeter and neighborhood areas to identify potential odor monitoring locations. Odor monitoring locations are selected along facility property line or appropriate perimeter locations. Odor monitoring locations are also located in the nearby residential areas.
- Additional monitoring locations are also located near other potential odor sources such as the City of Kalamazoo Water Reclamation facility, and Wright Coating Technologies.

3. ODOR MONITORING

RKA will either conduct, or arrange and oversee, odor monitoring activities which are planned to occur three (3) times per week for a period of sixty days (2 months). A Scentometer device, will be used to measure odor thresholds of various potential sources. The day and time of the odor monitoring will be selected randomly throughout the week, during facility operating hours. In addition to Scentometer readings, H₂S ambient air concentrations will be measured using a portable H₂S analyzer.

Scentometer and H₂S Readings at Selected Perimeter (fence line) Locations

Perimeter Scentometer readings will be taken at the selected perimeter locations along facility

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fence lines. Five (5) perimeter locations, P-1 through P-5, were selected. A map of perimeter monitoring locations is shown in Figure 1A and 1B (Figure 1B is a zoom version which shows further details of locations).

Scentometer and H₂S Readings at Selected Community Locations

Community Scentometer readings will be taken at the selected community locations. Nineteen (19) community locations, C-1 through C-19 were identified. A map of community monitoring locations is shown on Figure 1A and Figure 1B.

Documenting Field Sampling Data

Odor readings taken with the Scentometer or other appropriate devices will be documented on the Perimeter and Community Log sheet included in Figure 2. If odor is present, the field operator will identify: 1, odor intensity as measured by Scentometer; and 2, odor character or the nature (such as chemical, rotten egg, or ethanol, etc.) of smell. Based on these measurements of odor intensity, odor character and wind direction, RKA trained field personnel will identify the source of the odor at a given location.

On-Site Meteorological Data

GPI will provide onsite meteorological data that includes time, wind speed, wind direction, temperature, humidity, barometric pressure, and rainfall related information. These data are used in the evaluation of potential off-site impacts from the facility and for investigating odor complaints.

Olfactometry Analysis of Potential Odor Sources from GPI Facility

RKA will collect up to 12 odor samples from potential odor sources from the GPI Facility in 10-liters Tedlar sample bags. The selected potential odor sources may include a clarifier, exhaust stacks and other selected odor sources located within the GPI Facility. A portable H₂S analyzer will be used to measure H₂S at the GPI sources selected to be sampled for odors. H₂S readings will be taken simultaneously with sample collection.

It is estimated that after about a month of field odor measurements, RKA will determine odor source locations within the GPI facility for collecting odor samples. In a month's time, RKS staff will have necessary community odor measurement levels to make an educated determination of potential odor sources within the facility.

The sample bags will then be taken to an onsite RKA Olfactometry lab for odor analysis to determine the odor threshold value and odor characterization using ASTM 679-11 and ASTM DATA Series DS 61.

a) Odor Threshold Value

Odor threshold value will be determined by performing triangular forced-choice odor analysis in accordance with ASTM 679-04, Standard Practice for Determination of Odor and Taste Thresholds by a Forced-Choice Ascending Concentration Series Method of Limits. Result will be reported in Odor Units.

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b) Odor Characterization

Odor samples will also be analyzed for odor characterization using eight recognized odor descriptor categories for odor “smells like” and eight sensation descriptors for odor “feels like”. Results will be plotted on a spider graph.

4. DATA ANALYSIS AND REPORTS

RKA will compile the data from the odor monitoring events that will include community and perimeter locations, Scentometer readings, odor character determination, daily meteorological data, and odor complaint data. This report will be updated after each monitoring event. Report template is shown on Figure 3.

RKA will evaluate the impact from the various odor sources at the GPI and neighboring operations against the odors measured at each monitoring location to determine the potential contribution against the Rule 901 criteria.

A final report will be issued in accordance with Michigan EGLE requirements within 60 days of last date of sampling.

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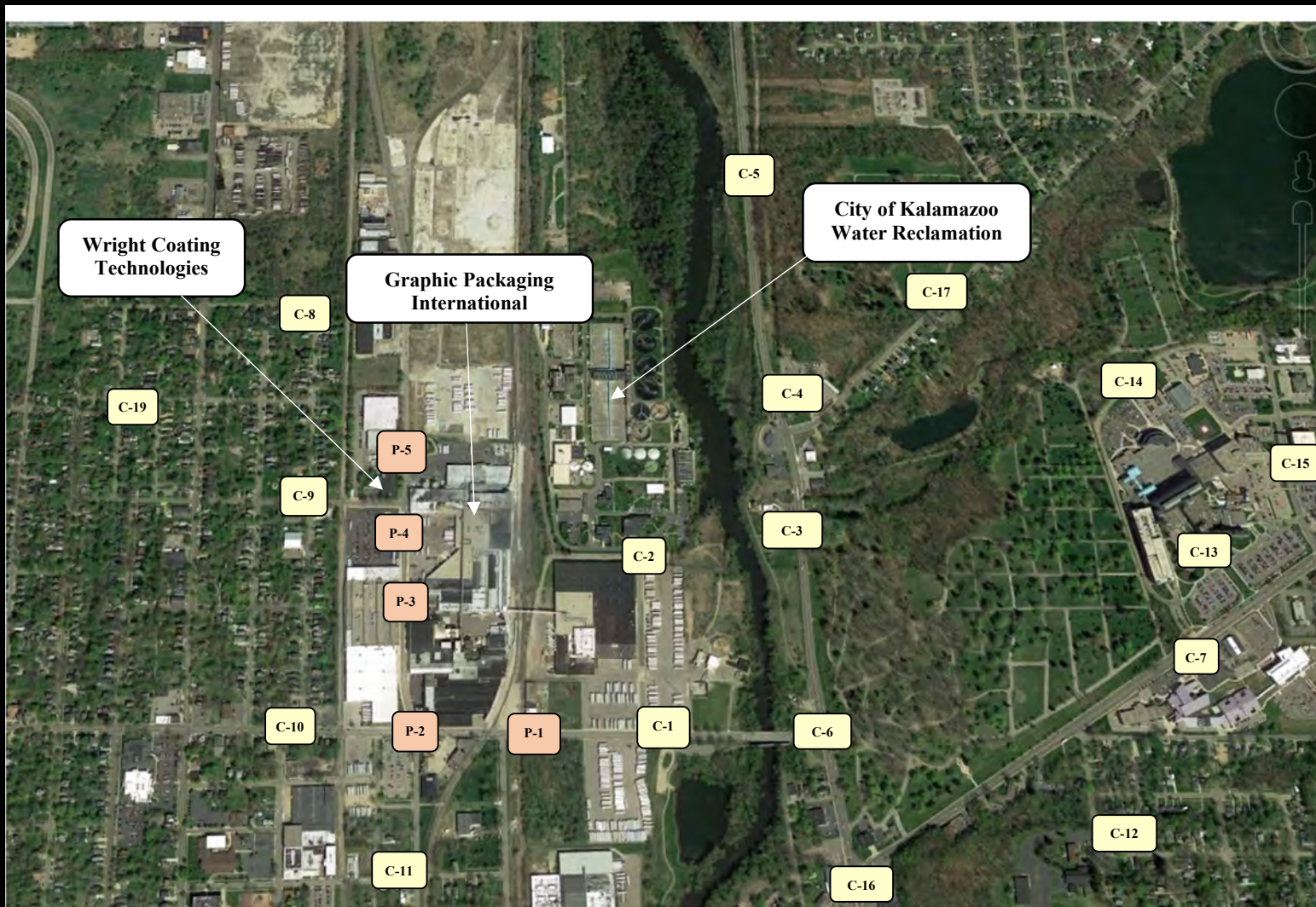
FIGURES



RK No.	Location
Perimeter	
P-1	Paterson St & Walbridge St
P-2	Paterson St & Porter St
P-3	Graphic Packaging – Gate 2
P-4	Graphic Packaging – Gate 5
P-5	Graphic Packaging – Gate 6
Community	
C-1	Paterson St & Harrison St
C-2	Harrison St at WWT Plant gate
C-3	Kalamazoo River Watershed Council Parking Lot
C-4	Kalamazoo Township Parking Lot
C-5	Riverview Dr & Old Riverview Sav Rd
C-6	East side of Verburg Park Parking Lot
C-7	Kalamazoo County Juvenile Home Parking Lot
C-8	Dunkley St & Edwards St
C-9	Prouty St & Edwards St
C-10	Paterson S & Edwards St
C-11	Parsons St & Porter St
C-12	St. Mary Catholic Church Parking Lot
C-13	Borgress Medical Center Entrance Parking Lot
C-14	Neurosurgery of Kalamazoo Parking Lot
C-15	Borgress Medical Center at Lawrence Educational Center Parking Lot
C-16	E Paterson St & Riverview Dr. at Walgreens Parking Lot
C-17	Front Entrance of Mt Olivet Cemetery
C-18	1248 Blakeslee Street
C-19	Union St & E. Hopkins St.

Google Earth

<p>28631 ROUTE 59, SUITE B WARRENVILLE, IL 60555 630-393-9000 630-790-2966</p>	COMMENTS: Perimeter and Community Odor Monitoring Location		Graphic Packaging International Kalamazoo, MI		FIGURE 1A
	DRAWN BY: SS	APPROVED BY: SR	PROJECT NUMBER: R19444	DATE DRAWN: 01-16-2020	REVISED DATE: 07-06-2020



RK No.	Location
Perimeter	
P-1	Paterson St & Walbridge St
P-2	Paterson St & Porter St
P-3	Graphic Packaging – Gate 2
P-4	Graphic Packaging – Gate 5
P-5	Graphic Packaging – Gate 6
Community	
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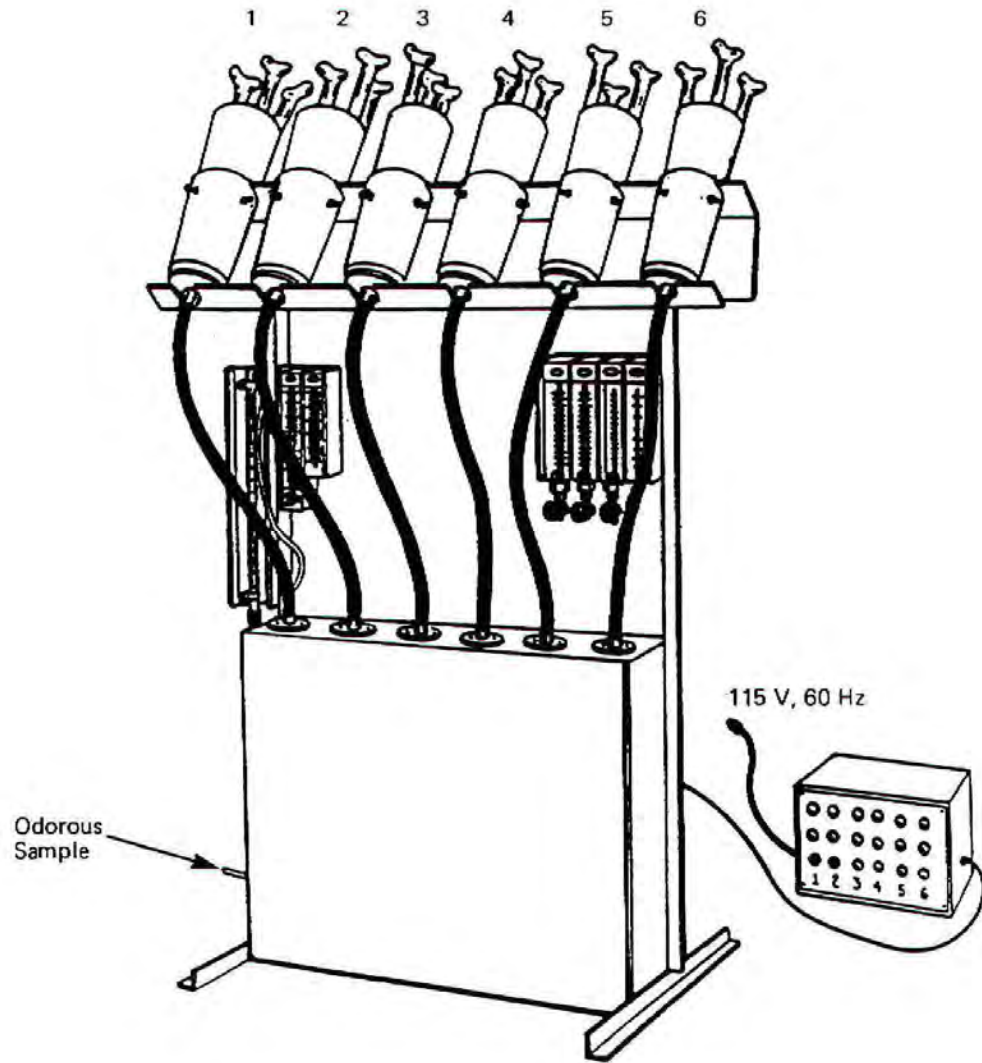
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COMMENTS:
Perimeter and Community Odor Monitoring Location

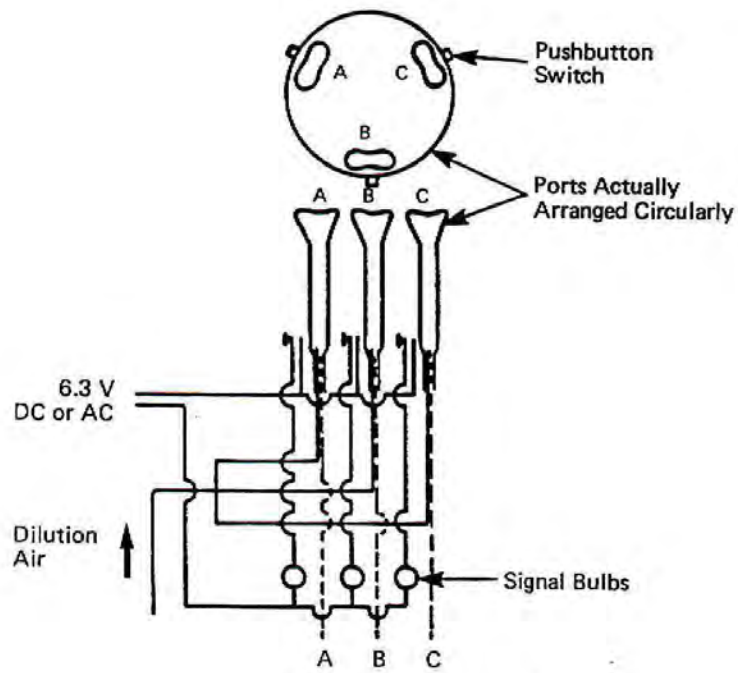
**Graphic Packaging International
Kalamazoo, MI**


FIGURE
1B

DRAWN BY: SS	APPROVED BY: SR	PROJECT NUMBER: R19444	DATE DRAWN: 01-16-2020	REVISED DATE: 07-06-2020
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 28631 ROUTE 59, SUITE B WARRENVILLE, IL 60555 630-393-9000/630-790-2966	COMMENTS: Odor Management and Monitoring Plan – Graphic Packaging International		OLFACTOMETER		FIGURE 4
	DRAWN BY:	APPROVED BY:	PROJECT NUMBER	DATE DRAWN:	REVISED DATE



 <p>28631 ROUTE 59, SUITE B WARRENVILLE, IL 60555 630-393-9000/630-790-2966</p>	<p>COMMENTS:</p> <p>Odor Management and Monitoring Plan – Graphic Packaging International</p>		<p>OLFACTOMETER DILUTION LEVEL</p>		<p>FIGURE</p> <p>5</p>
	<p>DRAWN BY: _____</p>	<p>APPROVED BY: _____</p>	<p>PROJECT NUMBER _____</p>	<p>DATE DRAWN: _____</p>	<p>REVISED DATE _____</p>