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## Technical Memorandum – Work Plan Addendum No. 2

**To:** Matt Thompson  
Wisconsin Department of Natural Resources

**From:** Dave Fox, Ken Quinn, and Bruce Iverson  
TRC

**Subject:** Technical Memorandum – Work Plan Addendum No. 2 to Site Investigation Work Plan, Wauleco Wood Waste Burning, BRRTS #02-37-000006

**Date:** May 16, 2019

**CC:** Evan Schreiner – Wauleco  
Dave Crass – Michael Best

**Project No.:** 189597.0008

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### Executive Summary

- Consistent with the approach and WDNR-approved input parameters detailed in Tech Memo No. 1, a computer modeling analysis was performed, based on four cases, to predict expected patterns of potential aerial distributions of emissions from historical operations at Wauleco.
- The model, using historical wind patterns, has identified that maximum distributions would have occurred along a primary axis beginning northwest of the Wauleco facility and ending southeast of Wauleco. The overall maximum predicted aerial depositions for all model cases run occurred at the boundary of the former Wauleco facility (Figures 1 to 4).
- The predicted distributions decrease noticeably with distance from the Wauleco property boundary and also decrease with distance perpendicular to the primary axis.
- In light of the model results and the identification of background sources, soil sampling plans are proposed, including:
  - Background samples (25 sample locations, Table C and Figure 5).
  - Data gap samples (10 sample locations, Table D and Figure 6).

These sampling plans are based both upon the predicted distributions from the model and in consideration of areas that may have been affected by other historical burning operations in proximity to Wauleco.

## 1.0 Introduction

On behalf of Wauleco, Inc. (Wauleco), TRC presents this Technical Memorandum – Work Plan Addendum No. 2 (Tech Memo 2). This Tech Memo 2 is based on the following:

- TRC’s Site Investigation Work Plan, Wauleco Wood Waste Burning dated March 15, 2019 (SI Work Plan), presented the proposed sampling and analysis strategy, sampling methods, and other details in response to a request from the Wisconsin Department of Natural Resources (WDNR) dated January 15, 2019 “to address the aerial deposition of contaminants associated with the combustion of wood waste generated at the facility.”
- TRC’s Technical Memorandum – Work Plan Addendum No. 1 dated April 5, 2019 (Tech Memo 1), proposed input parameters to the air dispersion model.
- Wisconsin Department of Natural Resources’ (WDNR) letter dated April 16, 2019 approved the SI Work Plan and Tech Memo 1.

As discussed in Sections 5.2 to 5.6 of the SI Work Plan, this Tech Memo 2 presents the following information:

- The results of the air dispersion model based on the input parameters as described in the WDNR-approved Tech Memo 1.
- A summary of background conditions, including other potential burning sources in the area.
- The proposed background soil sample locations.
- The proposed data gap soil sample locations.

The sole purpose of this air dispersion modeling effort is to predict expected patterns of potential aerial distribution which, when combined with all other information to be developed as a part of the SI Work Plan implementation, inform proposed sample locations for a data gap sampling plan. The model input parameters were developed based on professional engineering assumptions and were approved by WDNR. Since the sole purpose of the model is to predict dominant aerial distribution patterns, we have not made an effort to precisely define certain input parameters where the lack of precision or modest deviation is unlikely to have a material effect on the model results. The model input parameters and results cannot and should not be used for any other purpose than those described in Tech Memo 1 and this Tech Memo.

## 2.0 Air Dispersion Model Results

### 2.1 Introduction

Tech Memo 1 proposed model input parameters to be used in an air dispersion model to predict the expected patterns of potential aerial distribution due to historical operation of boilers at the Wauleco facility in Wausau. See Tech Memo 1 for a discussion of all proposed model input parameters. Tech Memo 1 was approved by WDNR on April 16, 2019.

Tech Memo 1 also proposed to model four operating cases, two assuming 12 month per year operations, and two assuming seven cold month (October- April) per year operations (see Table A below). These cases were chosen to identify possible alternative operating scenarios at the facility through the years it was in operation.

## 2.2. Modeling Analysis

The key aspects of the air dispersion modeling analysis are summarized as follows:

- Tech Memo 1 identified key stack parameters (refer to Tables 1 and 2 in Tech Memo 1) and the operating scenarios to be modeled. Stack parameters and cases modeled are summarized in the following Table A.

**Table A**  
**Wauleco Assumed Stack Parameters and Operation Cases**

SOURCE ID	CASE	HEIGHT (M)	HEIGHT (FT)	TEMP (K)	VELOCITY (M/S)	DIAM (M)
WOOD1216	One wood boiler (#21), 12 month operation, 16 hr/day	26.2	86	319	2.3	1.22
WOOD716	One wood boiler (#21), 7 month operation, 16 hr/day	26.2	86	319	2.3	1.22
BOTH1216	Two boilers (#21/22), 12 month operation, 16 hr/day	26.2	86	393	4.33	1.22
BOTH716	Two boilers (#21/22), 7 month operation, 16 hr/day	26.2	86	393	4.33	1.22

Notes/Source ID Boiler Summary:

1. Boiler 21 is the 4.8 mmbtu/hr wood fired boiler
2. Boiler 22 is the 15.3 mmbtu/hr natural gas fired boiler
3. Both is Boilers 21 and 22

- Five years (2011 to 2015) of preprocessed meteorological data were used in this analysis. The surface data was collected from the Wausau Airport and the upper air meteorological data originated in Green Bay. This dataset was processed by the WDNR using AERMET version 16216, AERMINUTE version 15272 and AERSURFACE version 13016.
- Tech Memo 1 identified that while the modeling analysis for this project utilized a 5-year set of hourly meteorological data, a much longer-term data set for the Wausau airport showed a similar wind direction frequency distribution (wind rose) when compared to the wind rose developed for the 2011 to 2015 dataset. Therefore, the results from the 2011 to 2015 dataset should be representative of longer (than 5-year) periods of operations. The wind rose for the 2011 to 2015 dataset is attached as Figure 1 in Appendix A.
- The AERMIC (AMS/EPA Regulatory Model Improvement Committee) Model (AERMOD) was also used in the analysis (Version 18081). The model used rural dispersion coefficients with the regulatory default options. These options allow for calm wind and missing data

correction, buoyancy induced dispersion and building downwash including recirculation cavity effects. This model is considered to be state of the science for evaluating industrial facilities.

- Based on a review of historical aerial photos and the size of the Wauleco site, a representation of the building configuration was made and entered into the model. This is important because it is known that the exhaust plume exiting the boiler stack is very much influenced by the flow of wind over building structures. To take this factor into account, the USEPA's Building Profile Input Program- PRIME algorithm was used to generate wind-direction-dependent-building-dimensions for 36 different wind directions.
- The model was used to predict aerial distributions at 2,900 different positions to a distance of 3 to 6 kilometers (i.e., 1 kilometer = approximately 0.62 miles) from the facility, with spacing of 25, 125 and 250 meters (i.e., 1 meter = approximately 3.28 feet). This distribution was recommended by a WDNR air quality modeler to ensure that possible localized higher aerial distribution "islands" due to elevated terrain would not be missed in the analysis. The model results showed that there were no pockets of elevated aerial distributions separated from the general pattern of high values beginning at the facility boundary and diminishing noticeably with distance from the facility boundary.

### 2.3 Modeling Results

The model was executed for each case described in Table A and was directed to plot the 5-year average predicted distribution based on an emission rate of 1 g/s. Then the model was used to contour the predicted distributions (see Figures 1 to 4). Although the modeling domain was extended to a distance of 3 to 6 kilometers, the predicted distributions decrease dramatically within 1 kilometer of the facility. For each case, the furthest (lowest relative value) contour presented corresponds to a value that is 10% or less than the corresponding overall maximum predicted value. Note that the value of the contours have meaning only from the perspective of identifying where the maximum predicted aerial distributions (5-year averages) would be located. That is why contours are labeled from "High" to "Low", reflecting relative relationships, not concentrations. The overall maximum predicted aerial depositions for all model cases run occurred at the boundary of the former Wauleco facility.

A review of Figures 1 to 4 indicates that the maximum predicted aerial distributions are confined to areas close to the former Wauleco facility. Based on these patterns, a primary axis line is shown on each Figure. The primary axis would represent the position of the maximum predicted aerial distribution within the pattern. The axes of maximum distributions are generally aligned northwest (NW) and southeast (SE) of the building structure (see axes depicted on Figures 1 to 4). This directional pattern was expected due to the wind direction frequency distribution of winds in the area that shows relative high frequencies of southeast and northwest winds (Appendix A).

Aerial distributions would be maximized along these axes but would diminish with increasing distance from the building along those axes and in directions perpendicular to the axes.

### 3.0 Background Conditions Assessment

As described in the SI Work Plan, the constituents of concern for aerial deposition of burning wood during window frame manufacturing operations are dioxins and furans. However, there are many other sources of dioxins and furans in urban environments, several of which are present in Wausau. As described by EPA (2003a<sup>1</sup>, Table 4-2) there are numerous sources of dioxins/furans (e.g., EPA, 2003 Table 4.2 is 4 pages long). Those that may be relevant to the Wausau area and in the vicinity of Wauleco include:

- Waste Incineration, like municipal solid waste, and medical waste.
- Power/Energy Generation, including combustion of vehicle fuel (i.e., transportation), coal, oil, and wood.
- Other high temperature sources, like cement kilns or cigarette combustion.
- Minimally controlled or uncontrolled combustion including:
  - Backyard burning of residential waste in barrels
  - Yard waste burning
- Chemical Manufacturing/Processing Sources, like:
  - Bleached chemical wood pulp and paper mills
  - Publicly Owned Treatment Works (POTW) for municipal wastewater.

As described by EPA (2003a) “Approximately 70% of all quantifiable environmental releases were contributed by air emissions from just three source categories in 1995: municipal waste incinerators (representing 38% of total environmental releases); backyard burning of refuse in barrels (19%); and medical waste incinerators (14%).” This report also presents a summary of North American levels in environmental media and food (EPA, 2003a Table 4-4).

EPA 2003b<sup>2</sup> identified railroad corridors, with and without power poles, as possible sources of dioxins/furans due to the presence of treated railroad ties and treated wood power poles (see pages 8-31 through 8-32).

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<sup>1</sup> EPA, 2003a. Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds. Part III: Integrated Summary and Risk Characterization for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds. NAS Review Draft. [www.epa.gov/ncea/dioxin](http://www.epa.gov/ncea/dioxin).

<sup>2</sup> EPA, 2003b. Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds. Part I Estimating Exposure to Dioxin-Like Compounds. Volume 1: Sources of Dioxin-Like Compounds in the United States.

Based on this information, potential sources of dioxins/furans surrounding the Wauleco facility that could be sources of aerial deposition of dioxins/furans are summarized in Table B:

**Table B  
Potential Sources**

	FACILITY	LOCATION	WHY INCLUDED
1	City of Wausau Incinerator	At the site of the City's WWTP. Incinerator operated from about 1939 until 1976 <sup>3</sup> .	Facility type identified in EPA, 2003a.
2	Marathon Rubber	NW Corner of Sherman St. and S. 5 <sup>th</sup> Ave. Facility operated "during much of the 20 <sup>th</sup> century" until 2001, and contained a stack, boiler and coal building. Refer to the BRRS Marathon Rubber Closure document. <sup>4</sup>	Marathon Rubber was a manufacturer of rubber garments (waders, raincoats, etc.). Operation of a coal fired boiler and its practice of burning solid waste as supplemental fuel to the boiler <sup>4</sup> .
3	Railroads	Several locations, e.g., the rail line along the River east of Wauleco.	Potential source of dioxins/furans identified in EPA, 2003b.
4	Yard waste and residential waste burn barrels	Potentially throughout the residential areas	Practice type identified in EPA, 2003a.
5	Vehicle Traffic	All roads, especially principal thoroughfares, like Thomas St. and 1 <sup>st</sup> Ave.	Potential source of dioxins/furans identified in EPA, 2003a
6	Urban Conditions	Non-specific	As described in EPA, 2003a urban soils contain dioxins.

We understand that WDNR will be seeking information from various manufacturing or other industrial/municipal operations in the area to assess all potential background sources of dioxins/furans. Because this information is important to the proposed background sampling and data gap sampling locations discussed below in Sections 5 and 6, respectively, Wauleco would like the benefit of receiving and reviewing this information the WDNR is requesting prior to performing the sampling, in the event that adjustments to sample locations are warranted. If adjustments are deemed warranted, a Tech Memo will be submitted to the WDNR describing the proposed revisions.

#### **4.0 Coordination with City of Wausau Proposed Sampling in Riverside Park**

The City of Wausau has considered collecting samples in Riverside Park. TRC contacted the City to coordinate sampling activities and was informed that the City's planned sampling is currently

<sup>3</sup> Becher-Hoppe, 1990. In-Field Conditions Report. Site of Fill at the Wausau Wastewater Treatment Plant and City Garage and Public Works Property.

<sup>4</sup> Marathon Rubber BRRS Site, Closure Document, Att. A, pg1, and Section IV.4). on pdf page 762 of 923.

awaiting Wauleco’s plan (i.e., this Technical Memorandum) and results, before making a decision if additional sampling in Riverside Park will be performed by the City.

### 5.0 Background Sampling

As described in Section 3, there are at least six background conditions that should be evaluated to assess the concentrations of dioxins/furans that can be expected to occur from background conditions. These areas are described in the following Table C and shown on Figure 5; as noted in Section 3.0, above, adjustments or additions to these areas may be warranted based on information produced in response to the WDNR’s requests of other potential sources. Specific locations will be selected at the time of sample collection based on field conditions and observations.

**Table C  
Background Sample Locations**

AREA NO.	FACILITY	SAMPLE LOCATIONS	PROPOSED NUMBER OF SAMPLES
1	City Incinerator	Samples are proposed to be collected NW and SE of the former incinerator stack in street R-O-Ws. This is shown on Figure 5 as area 1.	5
2	Yard waste and residential waste burn barrels	A neighborhood similar to the neighborhood close to Wauleco was selected as much outside of the five other potential background locations as possible. Two areas were selected west of Wauleco and shown on Figure 5 as two areas labeled as 2.	5
3	Marathon Rubber	Two samples each, to the SE and NW, along the principal wind patterns are shown on Figure 5 as areas labeled as 3.	4
4	Railroads	Samples are proposed to be collected along former rail lines that are currently owned by the City (for ease of access). The only rail line owned by the City appears to be the line along the River near Wauleco. Therefore, the sampling area, shown on Figure 5 as area 4, is along this former rail line but outside most of the areas shown on Figures 1 through 4.	3
5	Vehicle Traffic	Samples will be collected along Third Street in the area shown as area 5 on Figure 5, where the street has not been reconstructed for the last 20 years. Potential locations will be modified based on discussions with the City.	4
6	Urban Conditions	Samples are proposed to be collected within Wausau, in areas outside of the Wauleco modelled area to provide a range of concentrations for urban conditions in Wausau. These locations are not shown on Figure 5, but are proposed to be selected from two additional residential areas and two urban areas downtown.	4
<b>Total</b>			<b>25</b>

## 6.0 Data Gaps Identification and Sampling

As shown on Figure 1 through 4, the maximum predicted aerial distributions from an air discharge at Wauleco has a preferential orientation in the NW and SE directions, due to the wind directions as shown on the wind rose (Appendix A). This preferential orientation is shown on each of Figures 1 through 4 as a primary axis within the predicted aerial distribution. Each of these lines are also shown on Figure 6 to assist in selecting proposed data gap sampling locations. The approach to assess conditions around Wauleco are to collect soil samples as shown on Figure 6, and summarized in the following Table D:

**Table D  
Data Gap Sample Locations**

SAMPLE LOCATIONS	PROPOSED DATA GAP SAMPLES
These samples are located south of Thomas St., due to its reconstruction, and located on terraces close to the axis.	3 along primary axis to SE
These samples are located north of 3M so that the samples avoid the probable rail line sources in this area.	3 along primary axis to NW
Two samples are proposed on a line perpendicular to the primary axis through the NW portion of the axis, with one in Riverside Park and one on S. 3 <sup>rd</sup> Avenue.  Two samples are also proposed on a line perpendicular to the primary axis through the SE portion of the axis, with samples proposed on Cleveland Ave. and the alley between Edwards and Thomas Streets.	4 offset from the primary axis
<b>Total</b>	<b>10</b>

No samples are proposed to be collected on the Wauleco property because the property was both mostly covered by buildings or parking lots during its operations, and the soils have been disturbed during building demolition and then covered with a chip seal surface.

## 7.0 Off-Site Location Access

Figures 5 and 6 shows the areas proposed for soil sampling locations. Final sample locations will be selected based on visual inspection of the areas and selection of representative locations for sampling. Sample locations will be targeted within the City right-of-way (R-O-W) as much as possible. Therefore, access permission/agreements will be obtained from the City, modifying the locations as needed to accommodate City requirements for the sample locations. If sample locations outside the City R-O-W are required, attempts to acquire access permission/agreements from private parties will be performed. Sample depths are from 0-6 inches, so no utility locations will be required.

## 8.0 Surface Soil Sampling Procedures

Soil samples will be collected per the approach described in Section 6 of the SI Work Plan.



## 9.0 Schedule

Per Section 7 of the SI Work Plan (as modified by the WDNR approval dated April 16, 2019), the targeted schedule is as follows, all following both WDNR approval of this Tech Memo 2, securing off-site access permission/agreements, and obtaining information from the WDNR regarding other potential background sources in the area:

- **Soil sample collection begins:** 2 weeks
- **Laboratory Analysis:** 4 weeks
- **Laboratory Data submittal to WDNR:** 10 days following complete laboratory analysis
- **Site Investigation Report submittal to WDNR:** 60 days following receipt of complete laboratory analysis

## 10.0 Technical Review and Requested WDNR Responses

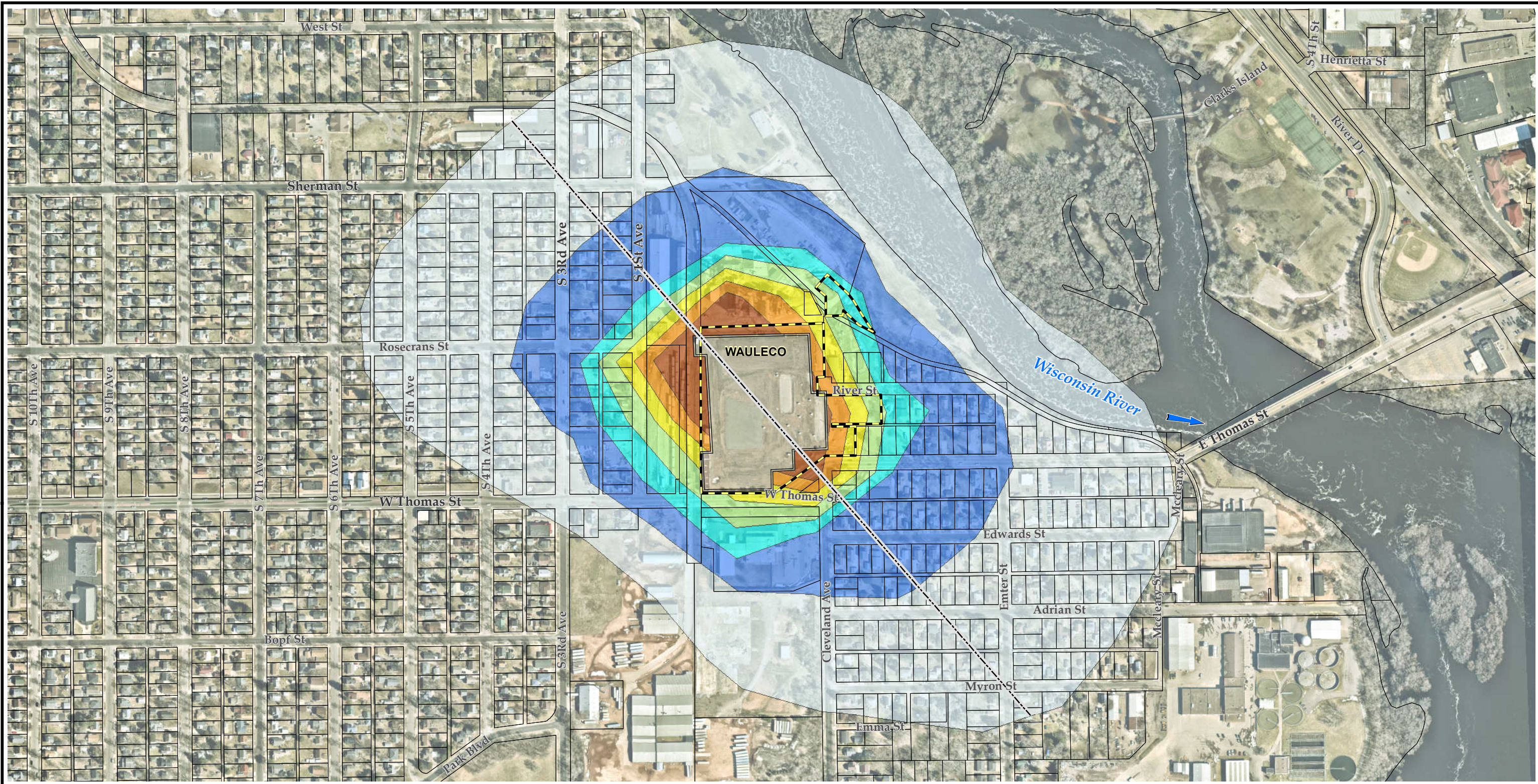
As discussed in Section 8 of the SI Work Plan, Wauleco submitted a technical review fee for review of the SI Work Plan, which also covers this Tech Memo 2. As part of the WDNR's technical review, Wauleco requests the WDNR's concurrence/responses on the following information:

- Proposed general sampling locations for background sources.
- Proposed approach and locations for the data gap samples.
- Concurrence that the information the WDNR is seeking concerning other potential background sources will be provided to Wauleco for review and potential adjustment of this proposed sampling approach, prior to the proposed soil sampling being performed.

### List of Enclosures:

- Figure 1: Air Dispersion Modeling Scenario 1 – Wood Boiler @ 12 Month Operation
- Figure 2: Air Dispersion Modeling Scenario 2 – Wood Boiler @ 7 Month Operation
- Figure 3: Air Dispersion Modeling Scenario 3 – Both Boilers @ 12 Month Operation
- Figure 4: Air Dispersion Modeling Scenario 4 – Both Boilers @ 7 Month Operation
- Figure 5: Proposed Background Soil Sample Locations
- Figure 6: Proposed Data Gap Soil Sample Locations
- Appendix A: Wind Rose Data





**LEGEND**

APPROXIMATE WAULECO PROPERTY BOUNDARY    PRIMARY AXIS

FORMER HISTORICAL BUILDING FOOTPRINT

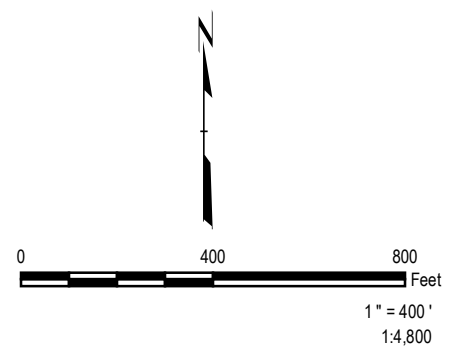
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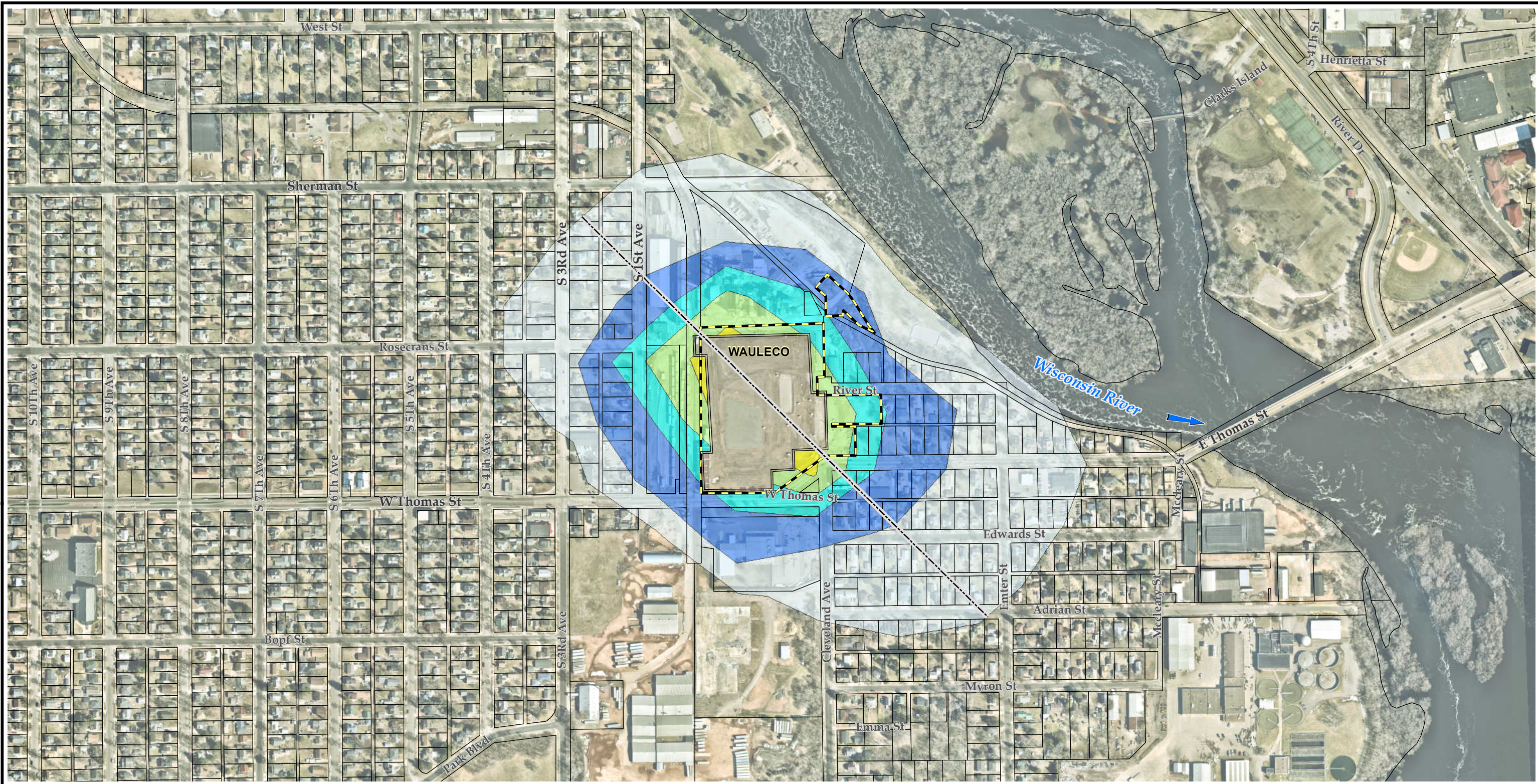
**NOTES**

1. BASE MAP IMAGERY FROM NEARMAP, INC., 4/19/2019.
2. THE VALUE OF THE CONTOURS HAVE MEANING ONLY FROM THE PERSPECTIVE OF IDENTIFYING WHERE THE RELATIVE MAXIMUM PREDICTED AERIAL DISTRIBUTIONS (5-YEAR AVERAGES) WOULD BE LOCATED. THE SOLE PURPOSE OF THIS AIR DISPERSION MODELING EFFORT IS TO PREDICT EXPECTED PATTERNS OF POTENTIAL AERIAL DISTRIBUTION TO INFORM PROPOSED SAMPLE LOCATIONS. THE MODEL INPUT PARAMETERS WERE DEVELOPED BASED ON PROFESSIONAL ENGINEERING ASSUMPTIONS AND WERE APPROVED BY WDNR. THE MODEL INPUT PARAMETERS AND RESULTS CANNOT AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE THAN THOSE DESCRIBED IN TECH MEMO 1 AND THIS TECH MEMO.



PROJECT:	<b>WAULECO, INC.</b> 125 ROSECRANS STREET WAUSAU, WISCONSIN	
TITLE:	<b>AIR DISPERSION MODELING SCENARIO #1 - WOOD BOILER @ 12 MONTH OPERATION</b>	
DRAWN BY:	J. PAPEZ	PROJ NO.: 189597.0003-T1
CHECKED BY:	D. FOX	
APPROVED BY:	B. IVERSON	
DATE:	MAY 2019	
<b>FIGURE 1</b>		
		708 Heartland Trail, Suite 3000 Madison, WI 53717 Phone: 608.826.3600 www.trcsolutions.com
FILE NO.:	189597-001air.mxd	





**LEGEND**

APPROXIMATE WAULECO PROPERTY BOUNDARY    PRIMARY AXIS

FORMER HISTORICAL BUILDING FOOTPRINT

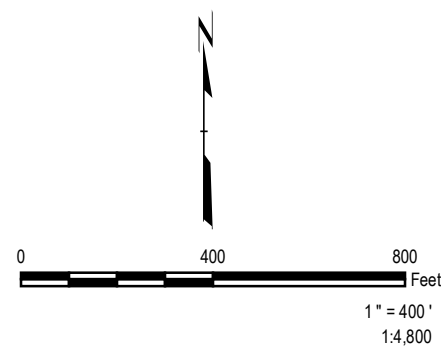
**RELATIVE CONCENTRATION**

HIGH

LOW

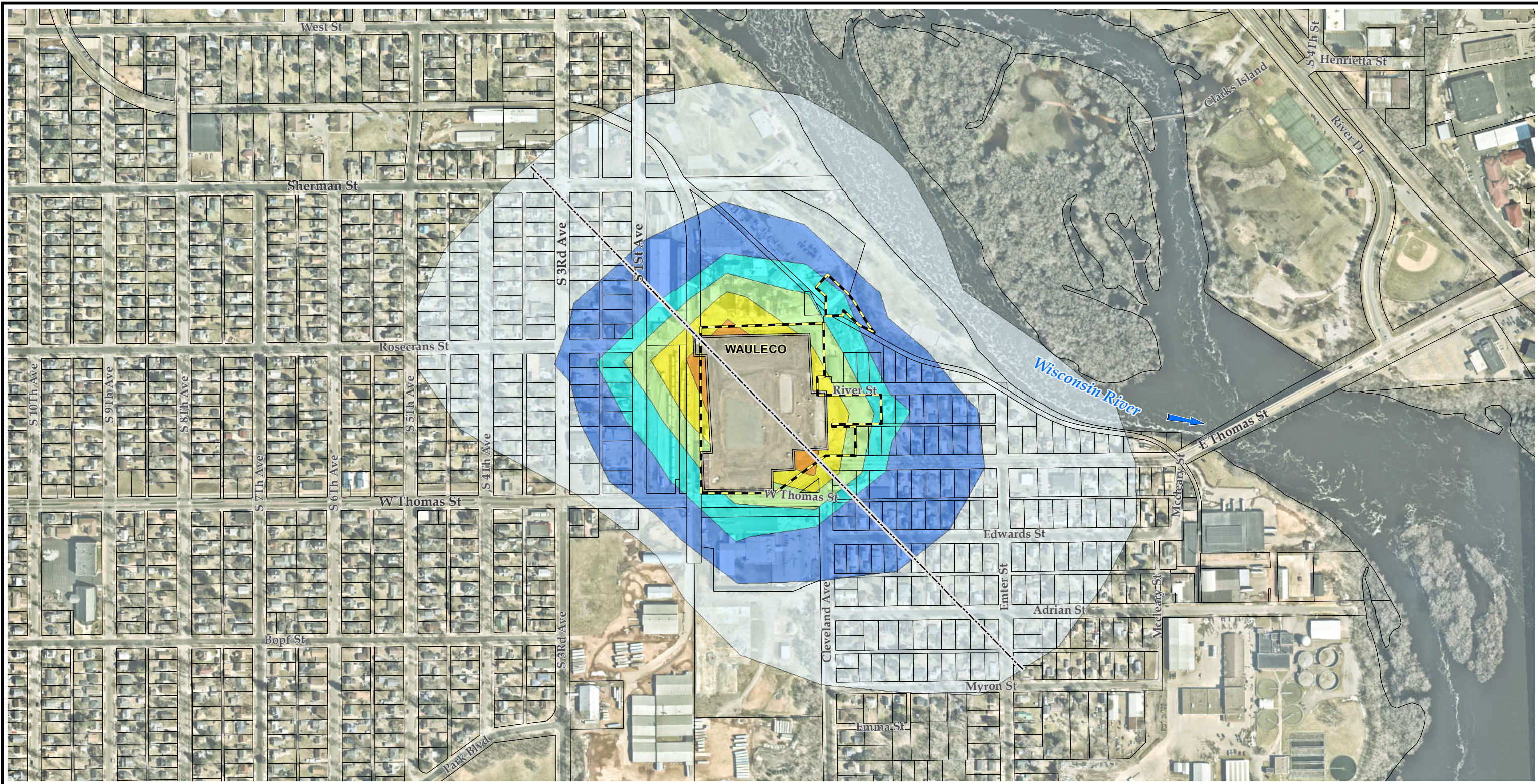
**NOTES**

1. BASE MAP IMAGERY FROM NEARMAP, INC., 4/19/2019.
2. THE VALUE OF THE CONTOURS HAVE MEANING ONLY FROM THE PERSPECTIVE OF IDENTIFYING WHERE THE RELATIVE MAXIMUM PREDICTED AERIAL DISTRIBUTIONS (5-YEAR AVERAGES) WOULD BE LOCATED. THE SOLE PURPOSE OF THIS AIR DISPERSION MODELING EFFORT IS TO PREDICT EXPECTED PATTERNS OF POTENTIAL AERIAL DISTRIBUTION TO INFORM PROPOSED SAMPLE LOCATIONS. THE MODEL INPUT PARAMETERS WERE DEVELOPED BASED ON PROFESSIONAL ENGINEERING ASSUMPTIONS AND WERE APPROVED BY WDNR. THE MODEL INPUT PARAMETERS AND RESULTS CANNOT AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE THAN THOSE DESCRIBED IN TECH MEMO 1 AND THIS TECH MEMO.



PROJECT:		<b>WAULECO, INC.</b> 125 ROSECRANS STREET WAUSAU, WISCONSIN	
TITLE:		<b>AIR DISPERSION MODELING SCENARIO #2 - WOOD BOILER @ 7 MONTH OPERATION</b>	
DRAWN BY:	J. PAPEZ	PROJ NO.:	189597.0003-T1
CHECKED BY:	D. FOX	<b>FIGURE 2</b>	
APPROVED BY:	B. IVERSON		
DATE:	MAY 2019	708 Heartland Trail, Suite 3000 Madison, WI 53717 Phone: 608.826.3600 www.trcsolutions.com	
FILE NO.:		189597-002air.mxd	





**LEGEND**

APPROXIMATE WAULECO PROPERTY BOUNDARY     PRIMARY AXIS

FORMER HISTORICAL BUILDING FOOTPRINT

**RELATIVE CONCENTRATION**

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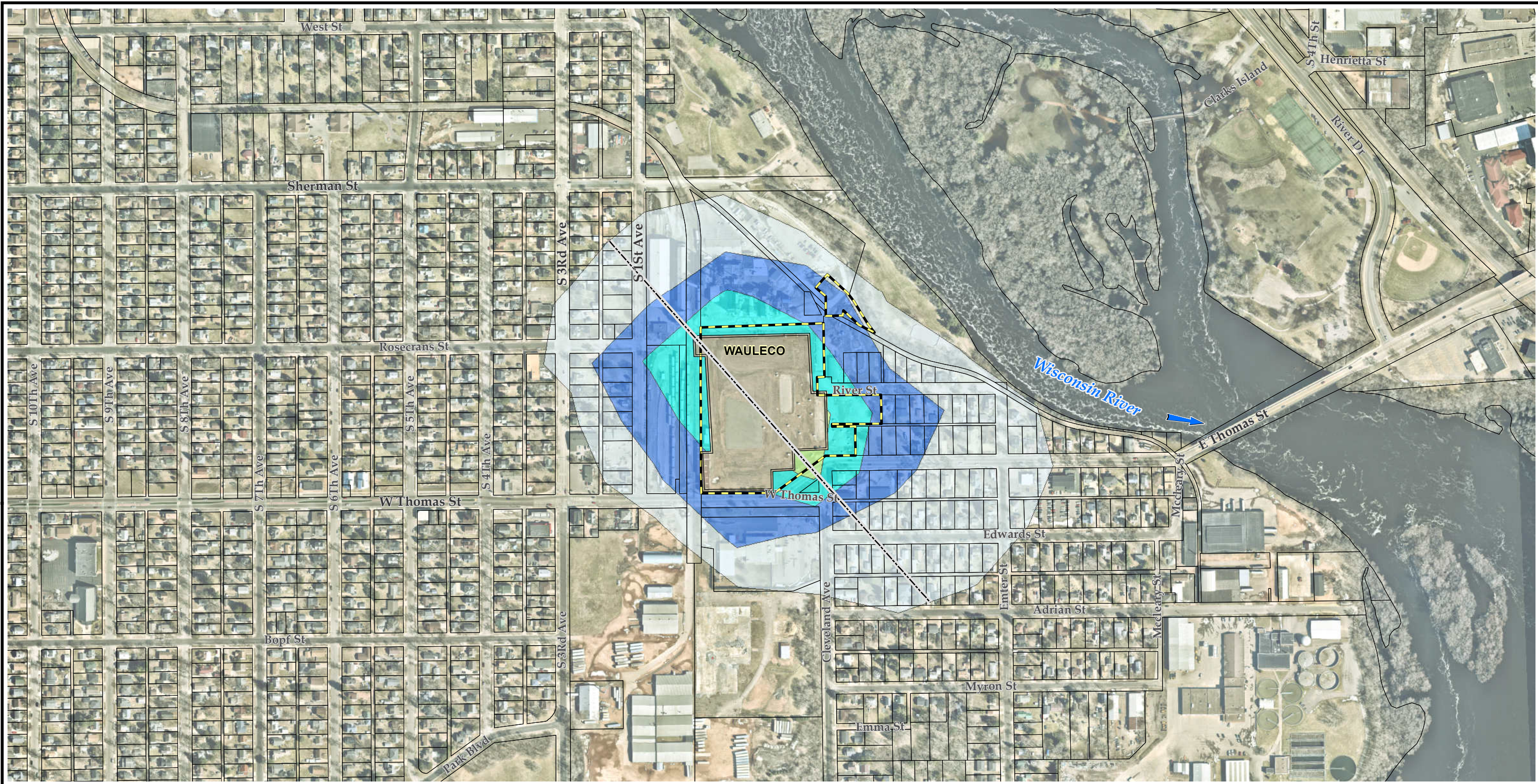
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**NOTES**

1. BASE MAP IMAGERY FROM NEARMAP, INC., 4/19/2019.
2. THE VALUE OF THE CONTOURS HAVE MEANING ONLY FROM THE PERSPECTIVE OF IDENTIFYING WHERE THE RELATIVE MAXIMUM PREDICTED AERIAL DISTRIBUTIONS (5-YEAR AVERAGES) WOULD BE LOCATED. THE SOLE PURPOSE OF THIS AIR DISPERSION MODELING EFFORT IS TO PREDICT EXPECTED PATTERNS OF POTENTIAL AERIAL DISTRIBUTION TO INFORM PROPOSED SAMPLE LOCATIONS. THE MODEL INPUT PARAMETERS WERE DEVELOPED BASED ON PROFESSIONAL ENGINEERING ASSUMPTIONS AND WERE APPROVED BY WDNR. THE MODEL INPUT PARAMETERS AND RESULTS CANNOT AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE THAN THOSE DESCRIBED IN TECH MEMO 1 AND THIS TECH MEMO.

PROJECT:		<b>WAULECO, INC.</b> 125 ROSECRANS STREET WAUSAU, WISCONSIN	
TITLE:		<b>AIR DISPERSION MODELING SCENARIO #3 - BOTH BOILERS @ 12 MONTH OPERATION</b>	
DRAWN BY:	J. PAPEZ	PROJ NO.:	189597.0003-T1
CHECKED BY:	D. FOX	<b>FIGURE 3</b>	
APPROVED BY:	B. IVERSON		
DATE:	MAY 2019	708 Heartland Trail, Suite 3000 Madison, WI 53717 Phone: 608.826.3600 www.trcsolutions.com	
FILE NO.:			189597-003air.mxd





**LEGEND**

APPROXIMATE WAULECO PROPERTY BOUNDARY    PRIMARY AXIS

FORMER HISTORICAL BUILDING FOOTPRINT

**RELATIVE CONCENTRATION**

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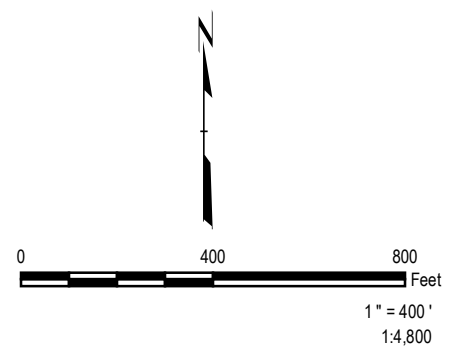
MEDIUM

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LOW

**NOTES**

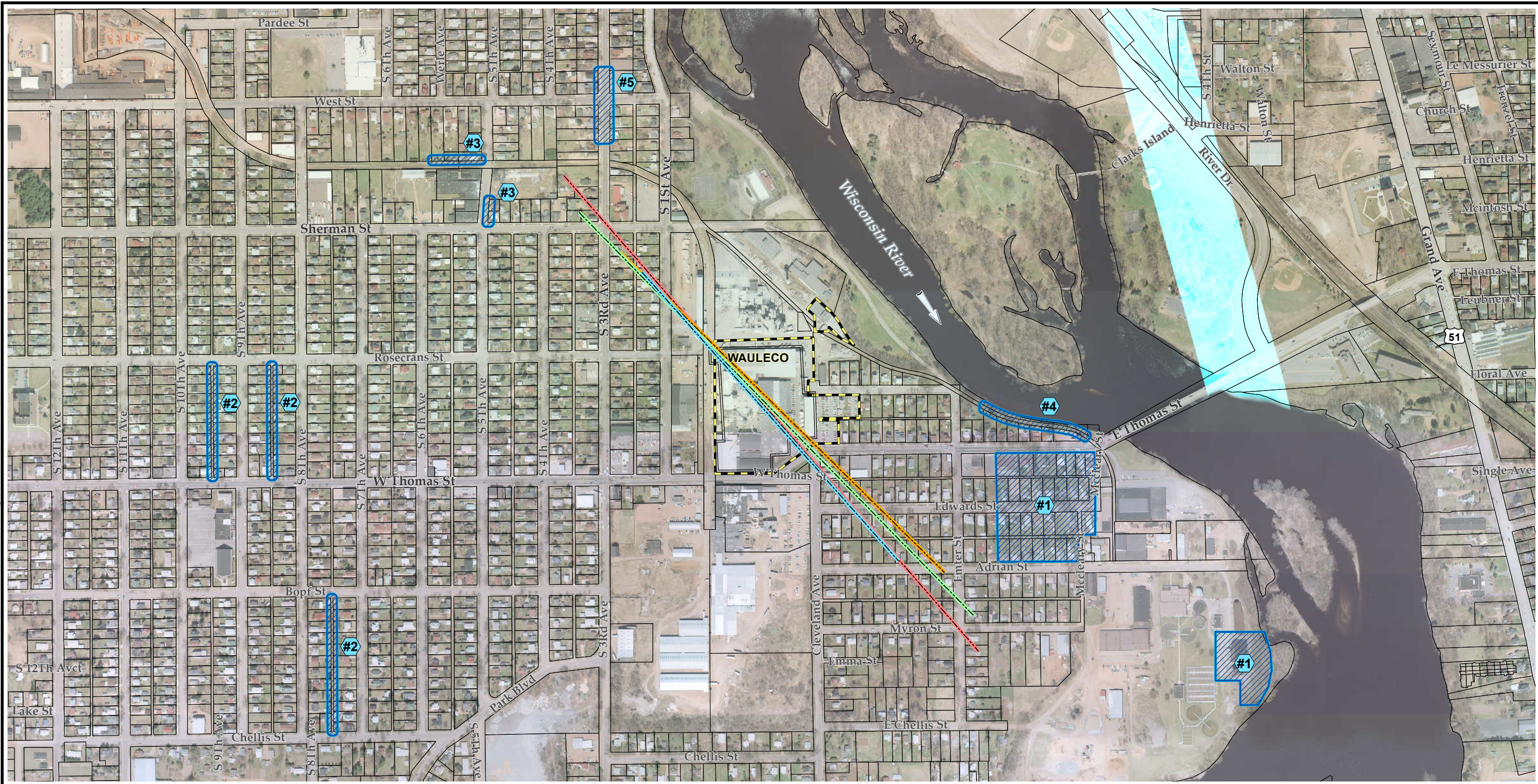
1. BASE MAP IMAGERY FROM NEARMAP, INC., 4/19/2019.
2. THE VALUE OF THE CONTOURS HAVE MEANING ONLY FROM THE PERSPECTIVE OF IDENTIFYING WHERE THE RELATIVE MAXIMUM PREDICTED AERIAL DISTRIBUTIONS (5-YEAR AVERAGES) WOULD BE LOCATED. THE SOLE PURPOSE OF THIS AIR DISPERSION MODELING EFFORT IS TO PREDICT EXPECTED PATTERNS OF POTENTIAL AERIAL DISTRIBUTION TO INFORM PROPOSED SAMPLE LOCATIONS. THE MODEL INPUT PARAMETERS WERE DEVELOPED BASED ON PROFESSIONAL ENGINEERING ASSUMPTIONS AND WERE APPROVED BY WDNR. THE MODEL INPUT PARAMETERS AND RESULTS CANNOT AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE THAN THOSE DESCRIBED IN TECH MEMO 1 AND THIS TECH MEMO.



PROJECT:		<b>WAULECO, INC.</b> 125 ROSECRANS STREET WAUSAU, WISCONSIN	
TITLE:		<b>AIR DISPERSION MODELING SCENARIO #4 - BOTH BOILERS @ 7 MONTH OPERATION</b>	
DRAWN BY:	J. PAPEZ	PROJ NO.:	189597.0003-T1
CHECKED BY:	D. FOX	<b>FIGURE 4</b>	
APPROVED BY:	B. IVERSON		
DATE:	MAY 2019	 708 Heartland Trail, Suite 3000 Madison, WI 53717 Phone: 608.826.3600 www.trcsolutions.com	
FILE NO.:			189597-004air.mxd



TRC - GIS  
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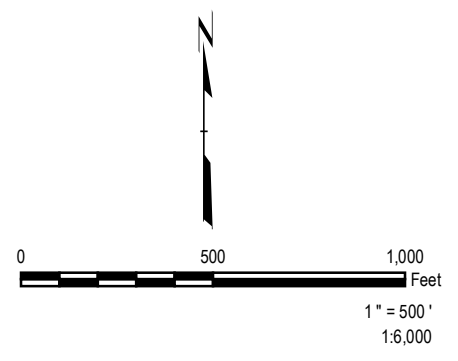


**LEGEND**

APPROXIMATE WAULECO PROPERTY BOUNDARY  
 FORMER HISTORICAL BUILDING FOOTPRINT  
**PRIMARY AXES**  
 SCENARIO #1  
 SCENARIO #2  
 SCENARIO #3  
 SCENARIO #4  
 APPROXIMATE BACKGROUND SAMPLING AREAS  
 #1- City Incinerator  
 #2- Yard Waste Burning and Burn Barrels  
 #3- Marathon Rubber  
 #4- Railroad  
 #5- Vehicle Traffic

**NOTES**

1. BASE MAP IMAGERY FROM MARATHON COUNTY, 1974.



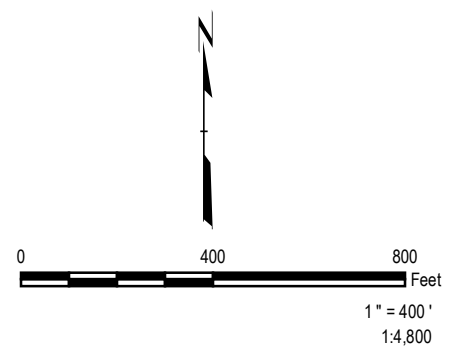
PROJECT:		<b>WAULECO, INC.</b>	
		<b>125 ROSECRANS STREET</b>	
		<b>WAUSAU, WISCONSIN</b>	
TITLE:			
<b>PROPOSED BACKGROUND SOIL SAMPLE LOCATIONS</b>			
DRAWN BY:	J. PAPEZ	PROJ NO.:	189597.0003-T1
CHECKED BY:	K. QUINN		
APPROVED BY:	B. IVERSON		
DATE:	MAY 2019		
		<b>FIGURE 5</b>	
		708 Heartland Trail, Suite 3000 Madison, WI 53717 Phone: 608.826.3600 www.trcsolutions.com	
FILE NO.:			189597-005bkg.mxd





LEGEND	
	APPROXIMATE WAULECO PROPERTY BOUNDARY
	PROPOSED DATA GAP SOIL SAMPLE LOCATION
	FORMER HISTORICAL BUILDING FOOTPRINT
	SCENARIO #1
	SCENARIO #2
	SCENARIO #3
	SCENARIO #4
	AECOM SOIL SAMPLE LOCATION (2017)
	CWE SOIL SAMPLE LOCATION (2006)
	CWE SOIL SAMPLE LOCATION (2008)
	SCC SOIL SAMPLE LOCATION (2018)

**NOTES**  
1. BASE MAP IMAGERY FROM NEARMAP, INC., 4/19/2019.



PROJECT:	<b>WAULECO, INC.</b> 125 ROSECRANS STREET WAUSAU, WISCONSIN	
TITLE:	<b>PROPOSED DATA GAP SOIL SAMPLE LOCATIONS</b>	
DRAWN BY:	J. PAPEZ	PROJ NO.: 189597.0003-T1
CHECKED BY:	K. QUINN	
APPROVED BY:	B. IVERSON	
DATE:	MAY 2019	
<b>FIGURE 6</b>		
		708 Heartland Trail, Suite 3000 Madison, WI 53717 Phone: 608.826.3600 www.trcsolutions.com
FILE NO.:	189597-006gap.mxd	

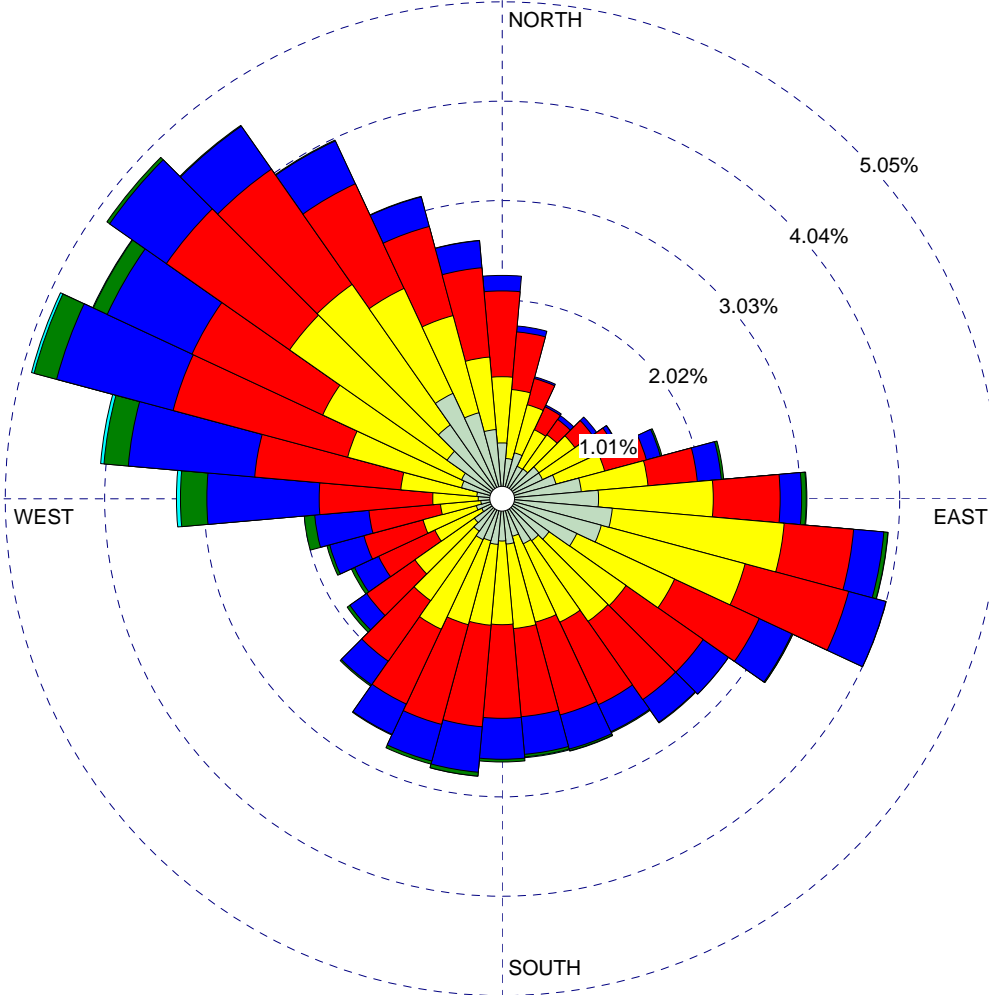


**Appendix A**  
**Wind Rose Data**



WIND ROSE PLOT:  
**Wausau Airport 2011-2015**

DISPLAY:  
**Wind Speed**  
**Direction (blowing from)**



**WIND SPEED**  
**(Knots)**

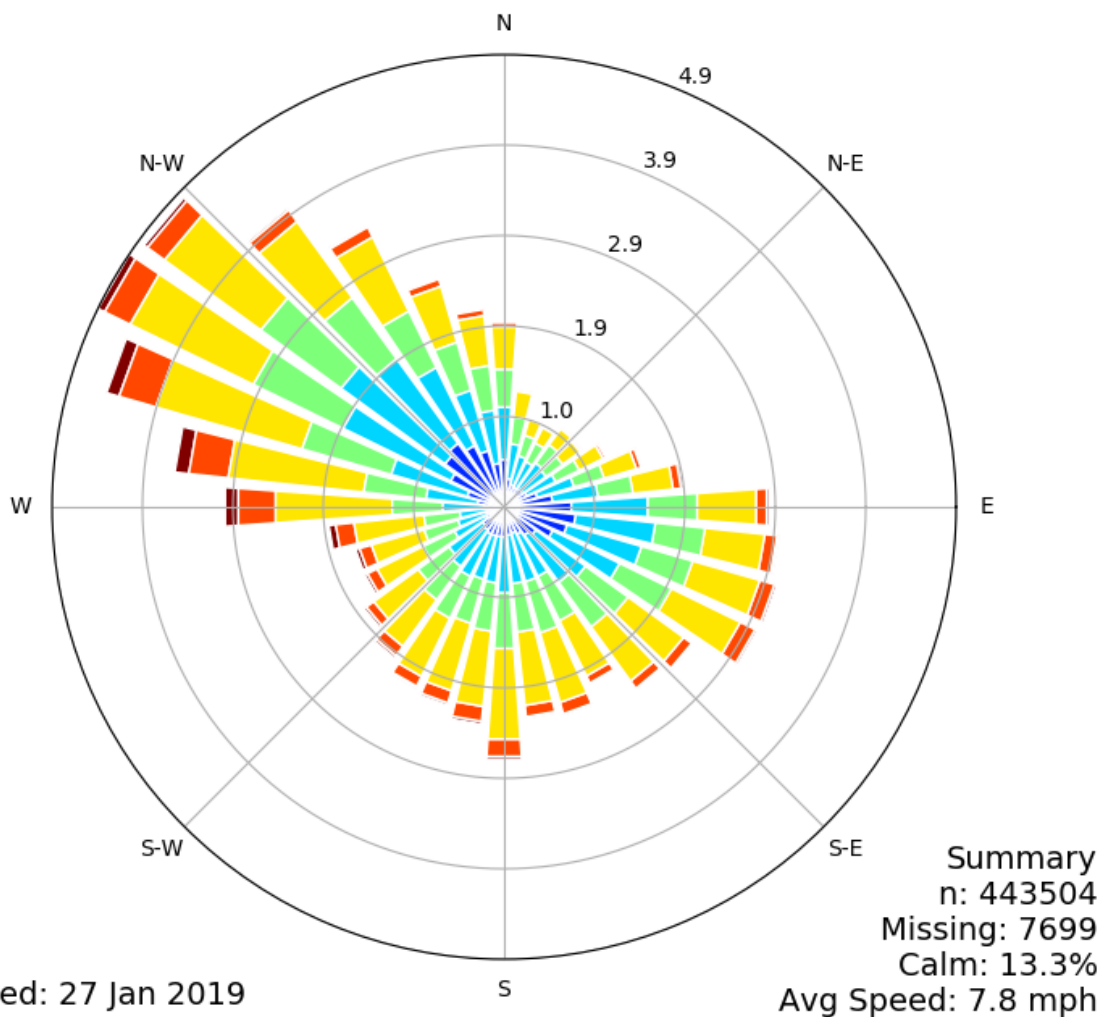
- $\geq 21.58$
- 17.11 - 21.58
- 11.08 - 17.11
- 7.00 - 11.08
- 4.08 - 7.00
- 0.97 - 4.08

Calms: 1.32%

COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	<b>Start Date: 1/1/2011 - 00:00</b> <b>End Date: 12/31/2015 - 23:59</b>	MODELER:	<b>Figure 1</b> <b>Wind Rose Data</b> <b>2011-2015</b>
	CALM WINDS:	TOTAL COUNT:	
	<b>1.32%</b>	<b>43752 hrs.</b>	PROJECT NO.:
AVG. WIND SPEED:	DATE:		
<b>7.22 Knots</b>	<b>3/8/2019</b>		



[AUW] WAUSAU  
Windrose Plot [All Year]  
Period of Record: 31 Dec 1972 - 27 Jan 2019



Generated: 27 Jan 2019

