

The logo for CTEH, featuring the letters 'CTEH' in a bold, white, sans-serif font with a registered trademark symbol (®) to the upper right. The text is set against a dark blue rectangular background.

**CTEH**<sup>®</sup>

THE SCIENCE OF READY<sup>SM</sup>

**VALERO ENERGY**

**BENICIA REFINERY PARTICULATE**

**RELEASE**

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**Benicia, CA**

**March 19, 2019**

**Project #111342**

## 1.0 Introduction

On March 13, 2019 Valero Energy requested that CTEH® conduct air monitoring in the surrounding community after a release of particulate matter from the Benicia Refinery in Benicia California. CTEH® arrived on-site on March 13, 2019 and began air monitoring operations. Activities were comprised of real-time air monitoring and analytical air sampling.

This report summarizes air monitoring data collected from March 18, 2019 06:30 PDT to March 19, 2019 06:30 PDT.

## 2.0 Air Monitoring and Sampling Methods

CTEH® developed and implemented an air sampling and analysis work plan (SAP) to document and quantify the release of fugitive emissions from the flue gas scrubber. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as, carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), 2.5-micron particulate matter (PM<sub>2.5</sub>), and 10-micron particulate matter (PM<sub>10</sub>) using handheld instruments such as RAE Systems MultiRAEs, TSI SidePak™ AM510/AM520 Aerosol Monitors, TSI DustTrak™ Aerosol Monitors, and Gastec GV-100 pumps with chemical-specific colorimetric detection tubes.

Hand-held air monitoring consisted of roaming air monitoring in the surrounding community. All hand-held air monitoring was conducted in the breathing zone.

Analytical air samples were deployed in the breathing zone at six locations through the community. Each station consisted of SKC active sampling pump equipped with mixed cellulose ester (MCE) filter media suitable for collection of metals.

All samples will be sent to an accredited laboratory for analysis in accordance with NIOSH Method 7303. **Figure 7** in **Attachment A** depicts these analytical air sampling locations.

## 3.0 Air Monitoring Results

**Figures 1 – 6** in **Attachment A** depicts the site location and hand-held monitoring locations for this reporting period.

**Table 1** summarizes the results for community hand-held air monitoring readings.

**Table 1: Community Hand-Held Real-Time Air Monitoring Results**

Analyte	Instrument	# Readings	# Detections	Range
Carbon Monoxide	MultiRAE	105	0	< 1 ppm
NO <sub>2</sub>	MultiRAE	105	0	< 0.1 ppm
PM <sub>10</sub>	AM510/AM520/DustTrak	104	102	0.009 - 0.060 mg/m <sup>3</sup>
PM <sub>2.5</sub>	AM510/AM520/DustTrak	106	106	0.007 - 0.101 mg/m <sup>3</sup>

<sup>1</sup>Maximum detections preceded by the “<” symbol are considered non-detections below the limit of detection (LoD) value to the right.

Additionally, at the request of public health officials, particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>) data have been grouped by downwind direction and averaged over a 24-hour period for comparison to AQI category equivalents. Wind-rose maps are provided for the corresponding time periods (**Appendix B**). It is notable that the USEPA has eliminated spatial averaging provisions as part of the annual National Ambient Air Quality Standards (NAAQS) to avoid potential disproportionate impacts on at-risk populations. Additionally, due to the uneven temporal distribution of particulate matter monitoring data at these locations, averages may be biased and are not directly comparable to the NAAQS. Comparisons to AQI category equivalents are provided for illustration purposes only.

#### 4.0 Weather Conditions

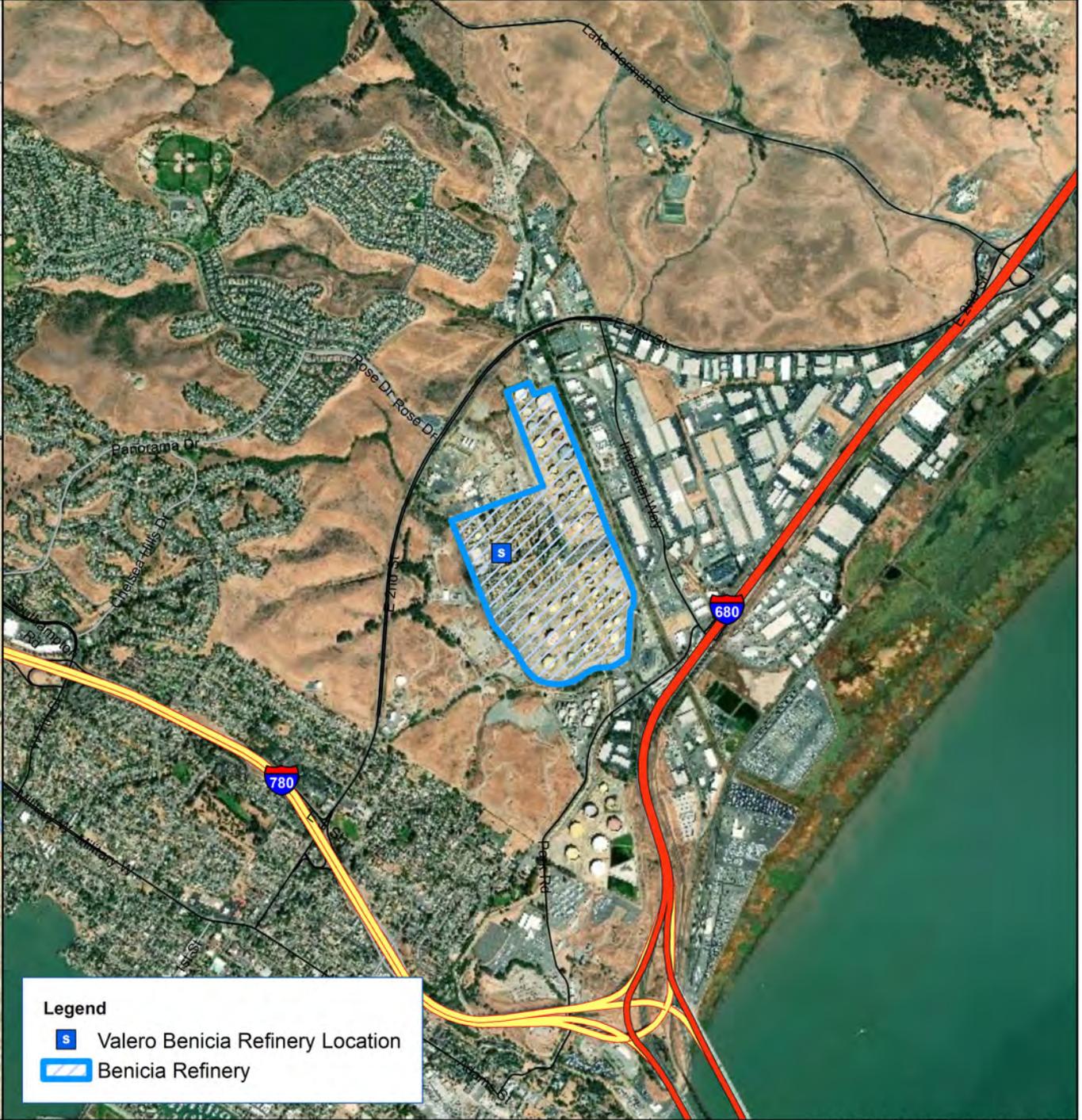
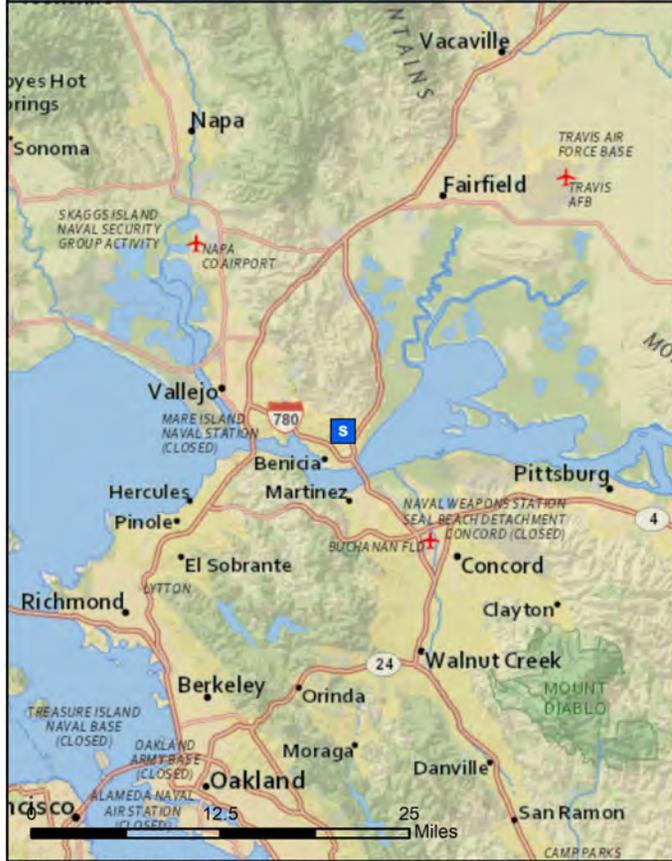
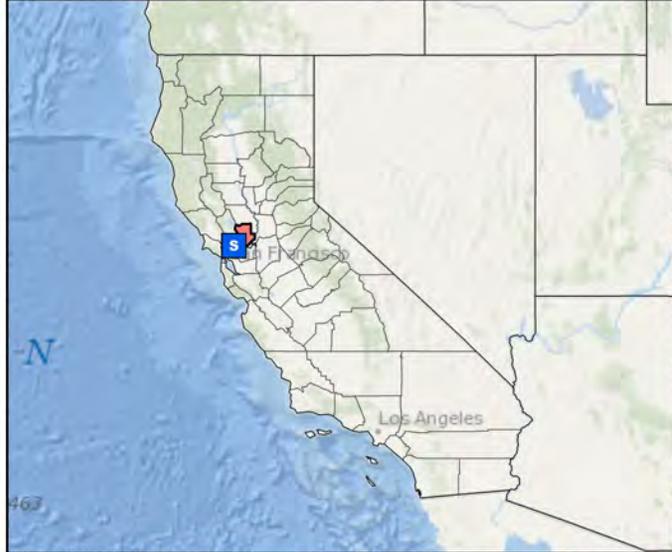
Figure 8 in attachment C contains meteorological data and a wind rose depicting wind speed and direction for this reporting period. Data was acquired from California Irrigation Management System (CIMIS) meteorological station #170 located in Concord to the southeast of the Benicia Refinery.



# Attachment A

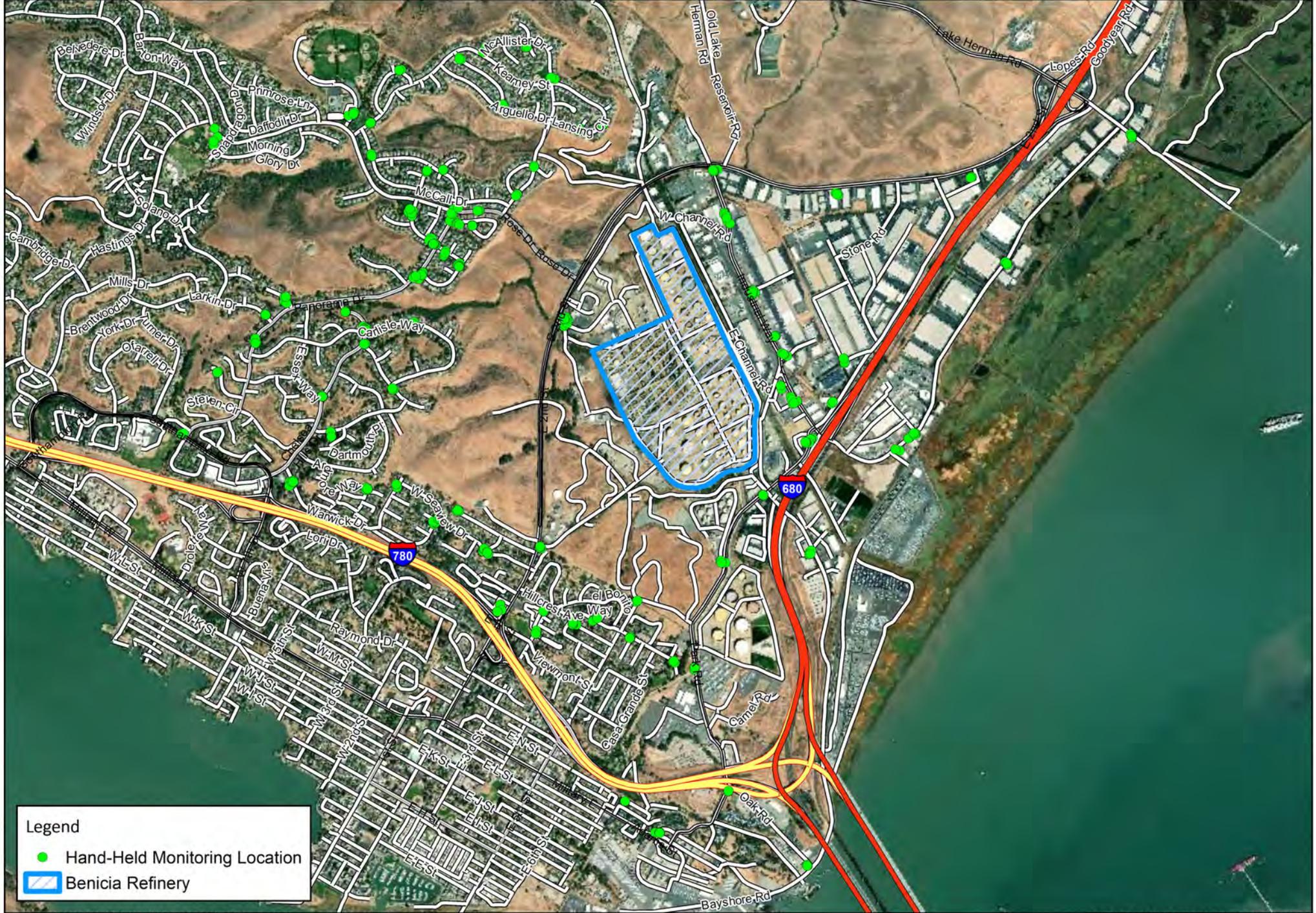
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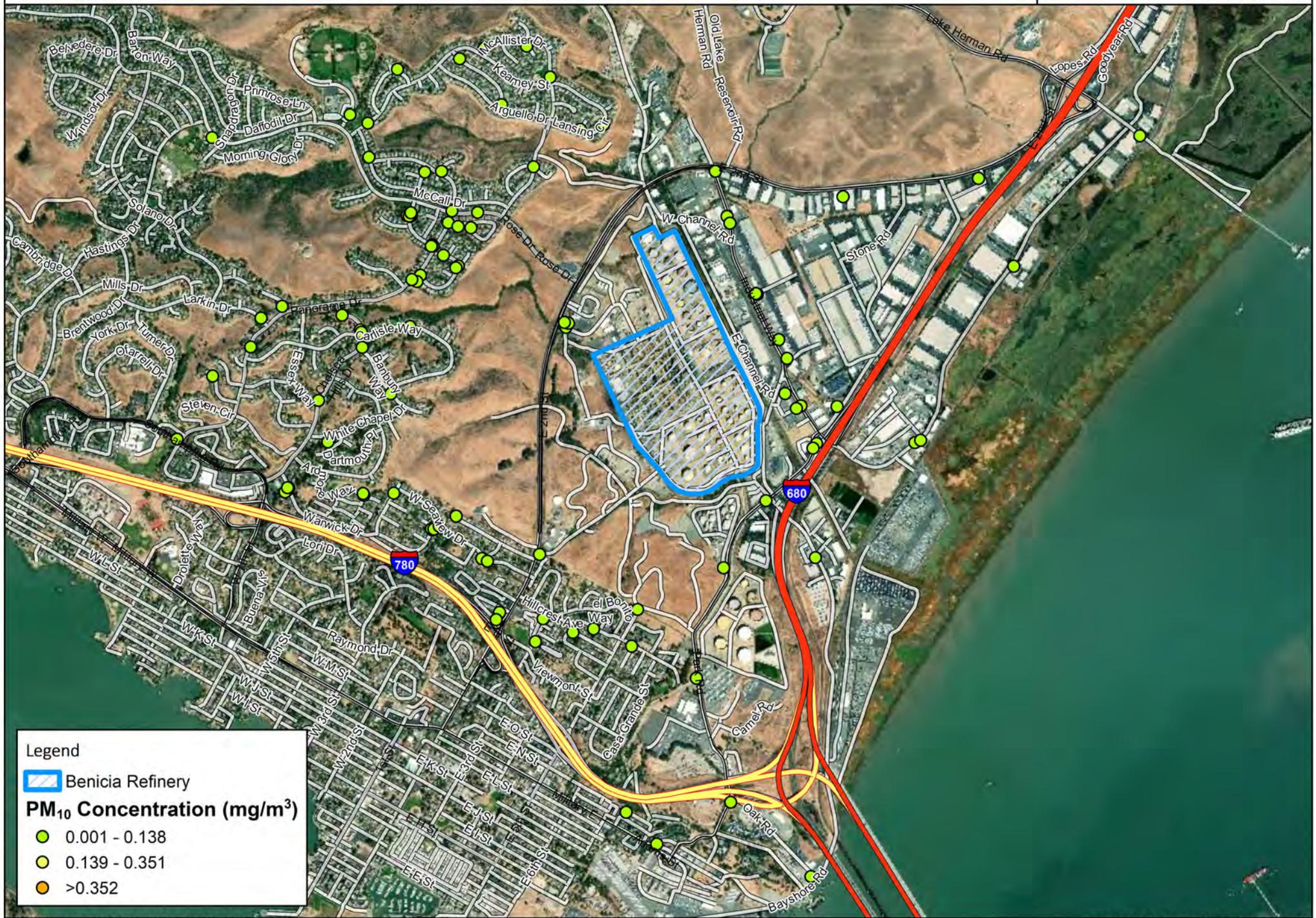
## CTEH Air Sampling and Monitoring Locations



**Legend**

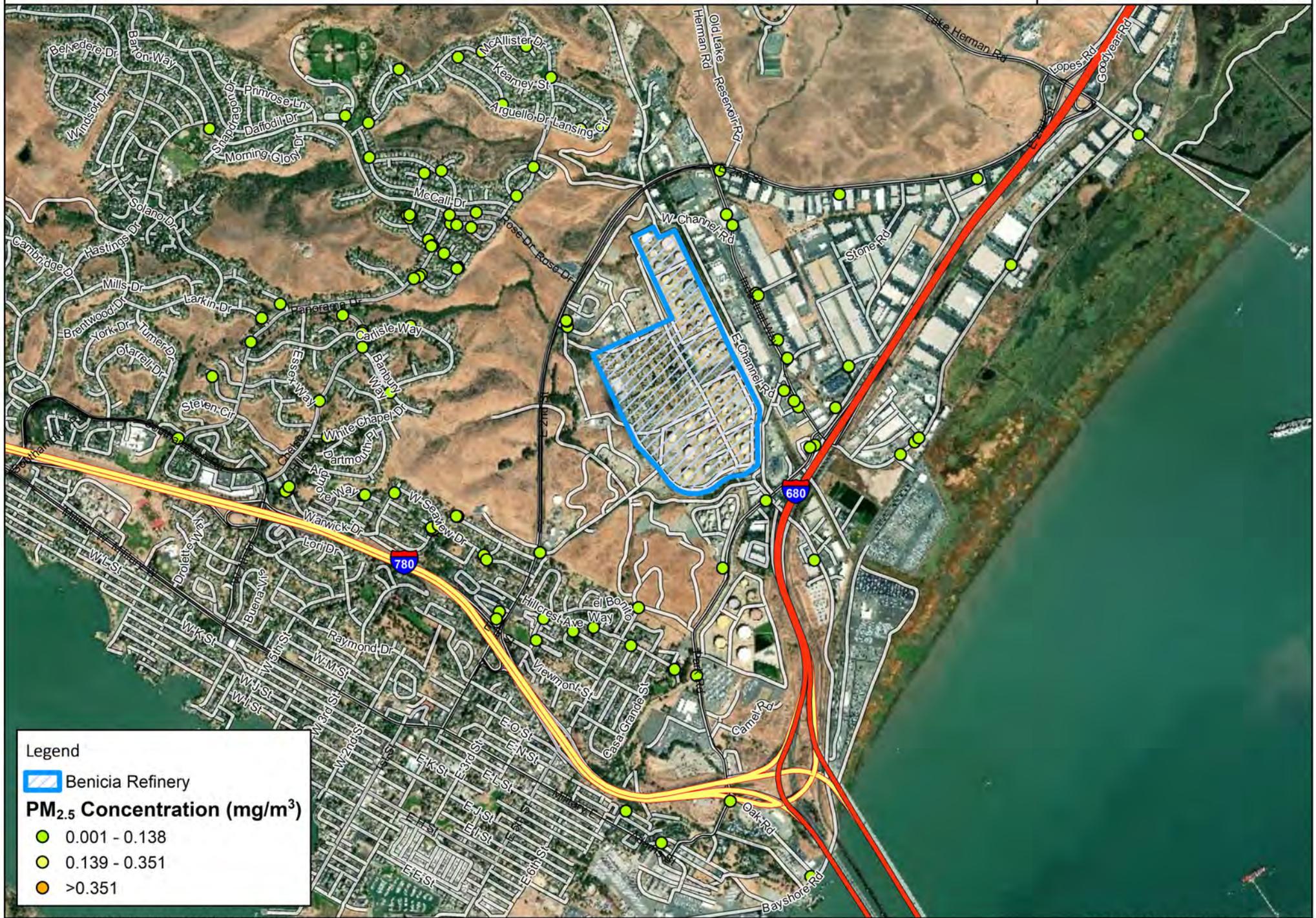
- Valero Benicia Refinery Location
- Benicia Refinery

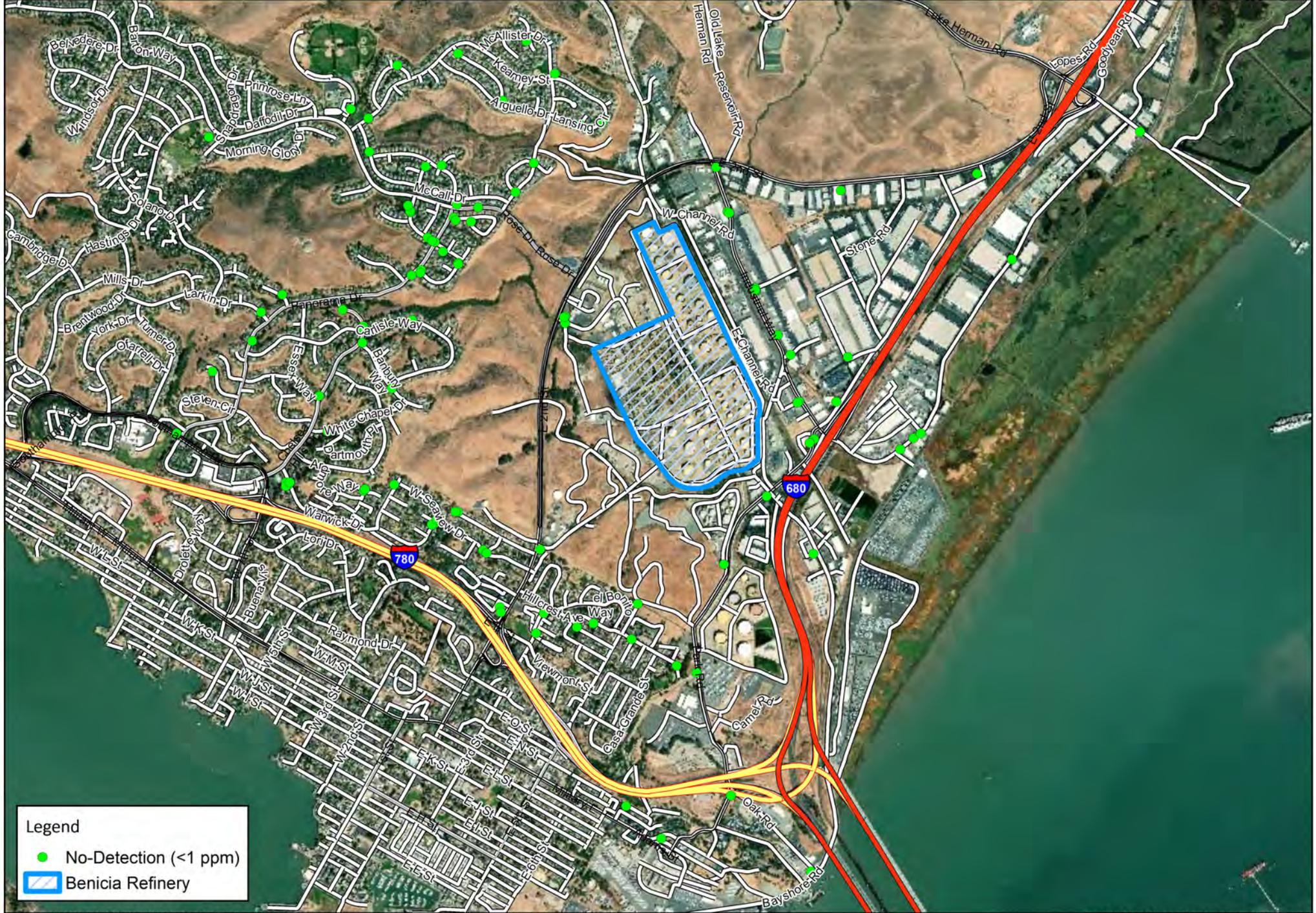




**Legend**

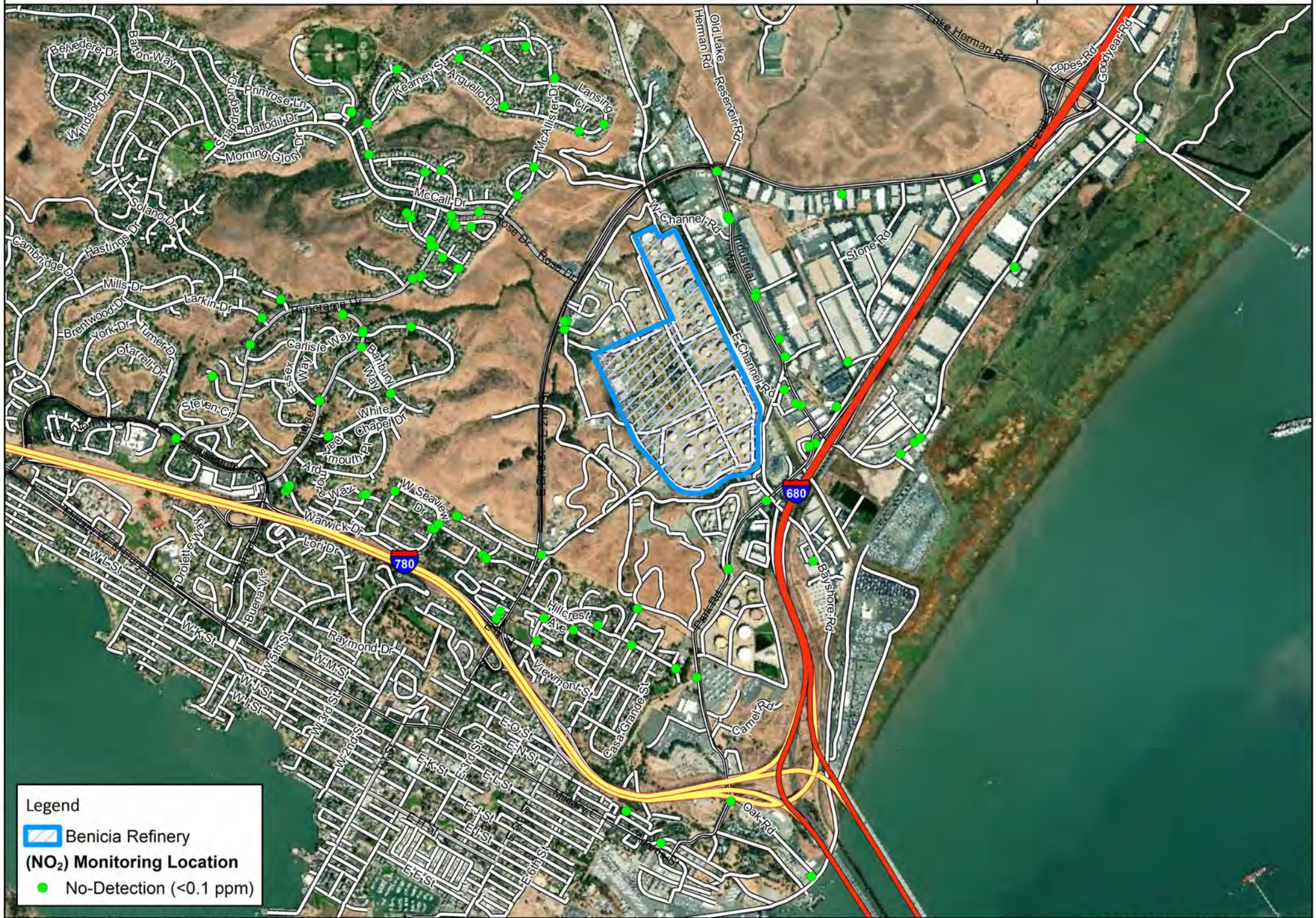
-  Benicia Refinery
- PM<sub>10</sub> Concentration (mg/m<sup>3</sup>)**
-  0.001 - 0.138
-  0.139 - 0.351
-  >0.352





**Legend**

- No-Detection (<1 ppm)
- ▭ Benicia Refinery



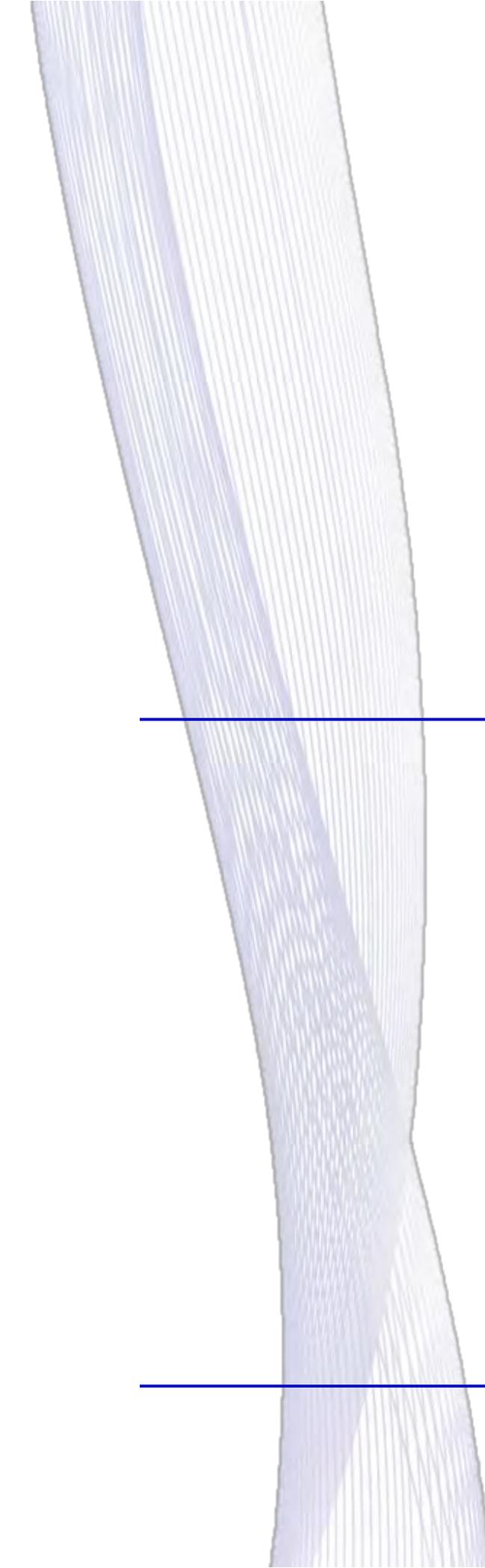
**Legend**

- Benicia Refinery
- (NO<sub>2</sub>) Monitoring Location
- No-Detection (<0.1 ppm)



**Legend**

- Air Sampling Location
- Benicia Refinery



# Attachment B

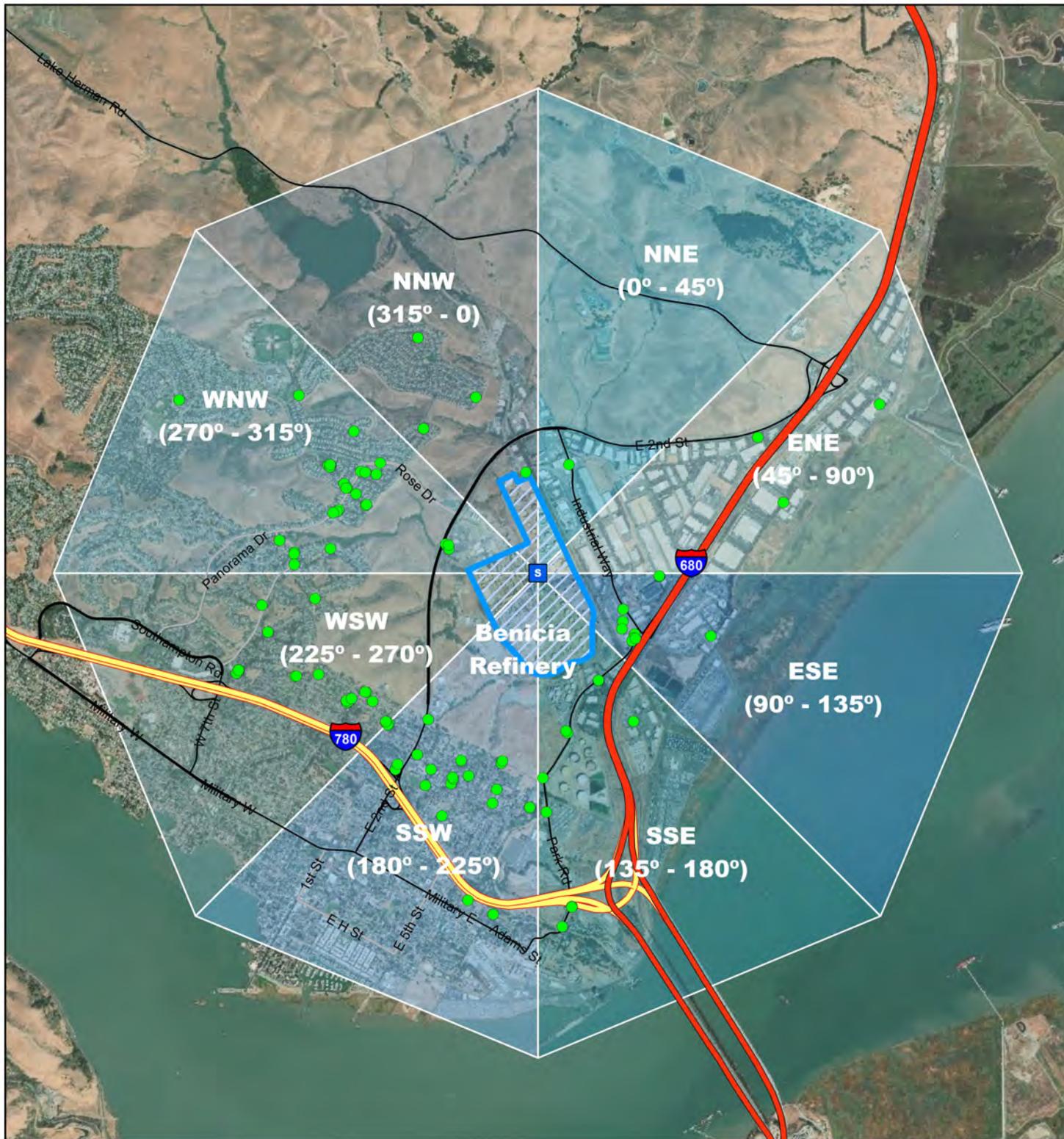
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## Directional Averages

**PM<sub>2.5</sub> Avg. for 24 Hour Period**  
**March 18 00:00 - March 19 00:00<sup>1</sup>**

Direction	# Readings	# Detections	Avg (mg/m <sup>3</sup> )	Range (mg/m <sup>3</sup> )	AQI Category Equivalent
ENE	3	3	0.0133	0.013 - 0.014	Moderate
ESE	10	10	0.019	0.01 - 0.05	Moderate
NNE	1	1	0.019	0.019	Moderate
NNW	4	4	0.015	0.009 - 0.028	Moderate
SSE	10	10	0.0251	0.013 - 0.04	Moderate
SSW	21	21	0.0222	0.012 - 0.034	Moderate
WNW	29	29	0.0246	0.007 - 0.039	Moderate
WSW	18	18	0.0247	0.01 - 0.032	Moderate

<sup>1</sup>The EPA has eliminated spatial averaging provisions as part of the annual National Ambient Air Quality Standards (NAAQS) to avoid potential disproportionate impacts on at-risk populations. Additionally, due to the uneven temporal distribution of particulate matter monitoring data at these locations, averages may be biased and are not directly comparable to the NAAQS.

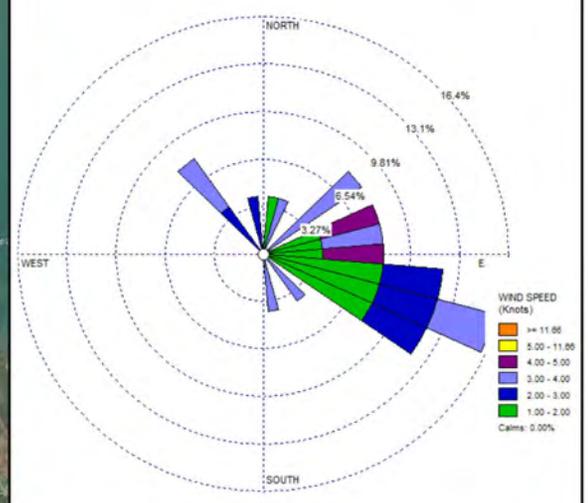


Benicia Refinery

PM<sub>2.5</sub> Real-Time Monitoring Location

**Monitoring Direction**

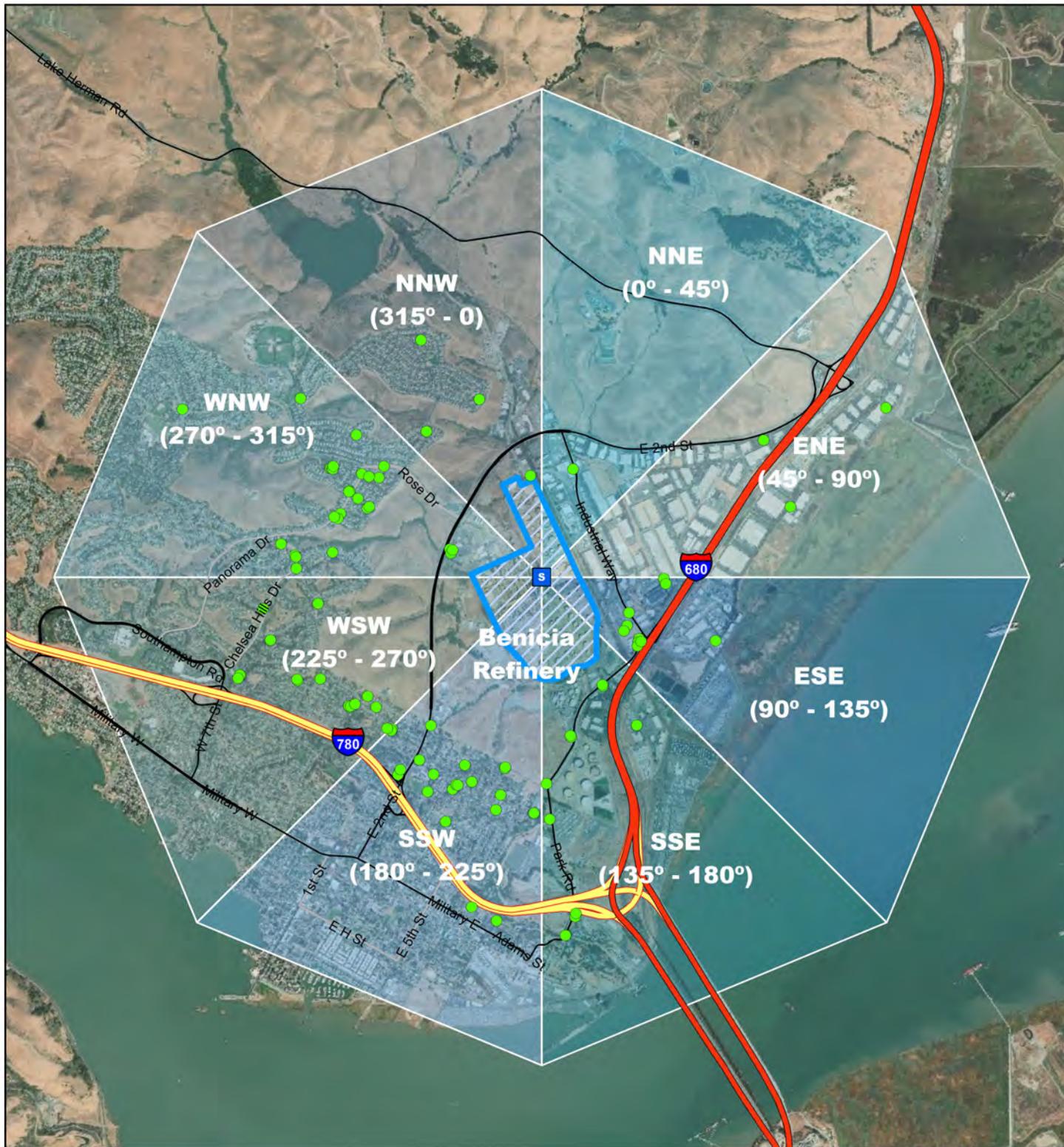
- ENE
- ESE
- NNE
- NNW
- SSE
- SSW
- WNW
- WSW



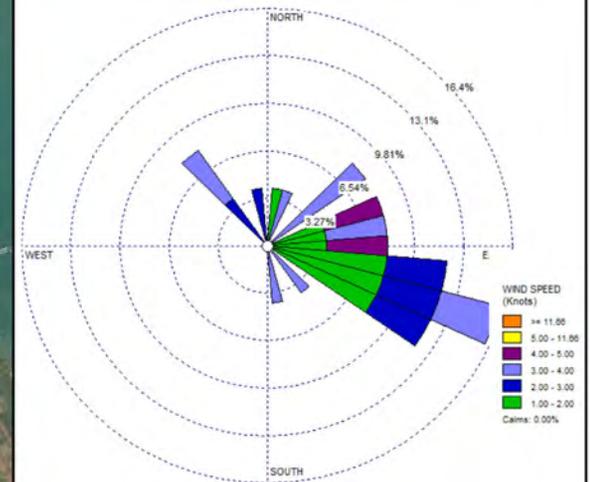
**PM<sub>10</sub> Avg. for 24 Hour Period**  
**March 18 00:00 - March 19 00:00<sup>1</sup>**

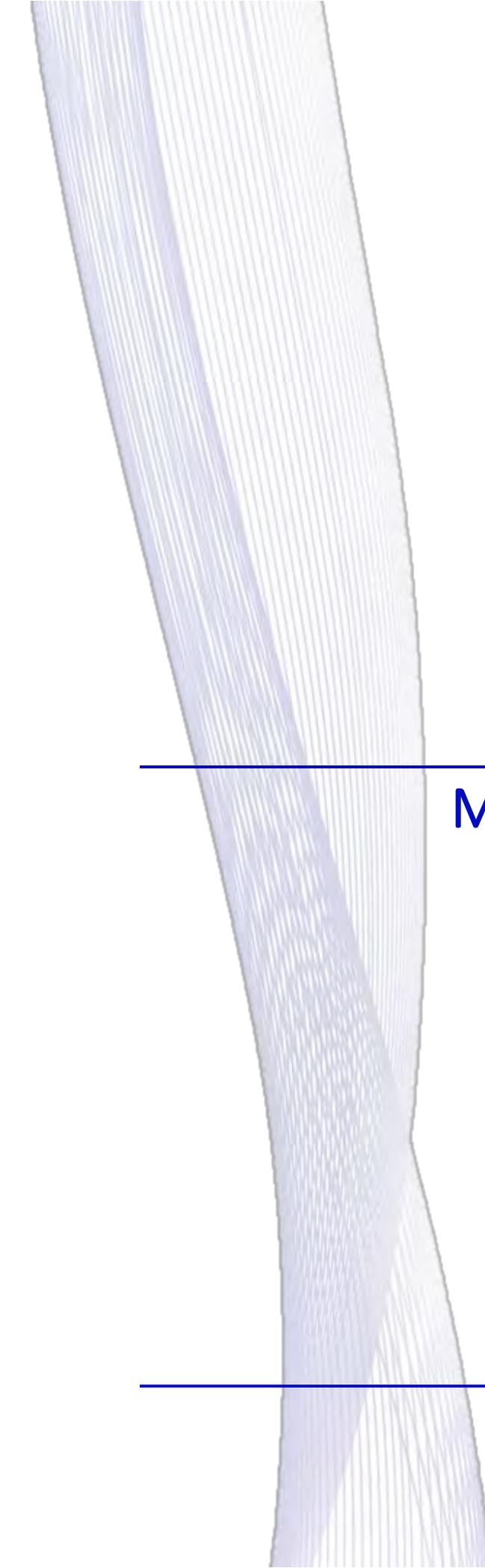
Direction	# Readings	# Detections	Avg (mg/m <sup>3</sup> )	Range (mg/m <sup>3</sup> )	AQI Category Equivalent
ENE	3	3	0.016	0.014 - 0.019	Good
ESE	10	10	0.0264	0.012 - 0.06	Good
NNE	1	1	0.028	0.028	Good
NNW	4	4	0.014	0.01 - 0.017	Good
SSE	10	10	0.0198	0.015 - 0.025	Good
SSW	1	1	0.01	0.01	Good
SSW	21	21	0.021	0.011 - 0.033	Good
WNW	29	29	0.0201	0.009 - 0.05	Good
WSW	17	17	0.019	0.011 - 0.024	Good

<sup>1</sup>The EPA has eliminated spatial averaging provisions as part of the annual National Ambient Air Quality Standards (NAAQS) to avoid potential disproportionate impacts on at-risk populations. Additionally, due to the uneven temporal distribution of particulate matter monitoring data at these locations, averages may be biased and are not directly comparable to the NAAQS.



- Benicia Refinery
  - PM<sub>10</sub> Real-Time Monitoring Location
- Monitoring Direction**
- ENE
  - ESE
  - NNE
  - NNW
  - SSE
  - SSW
  - WNW
  - WSW





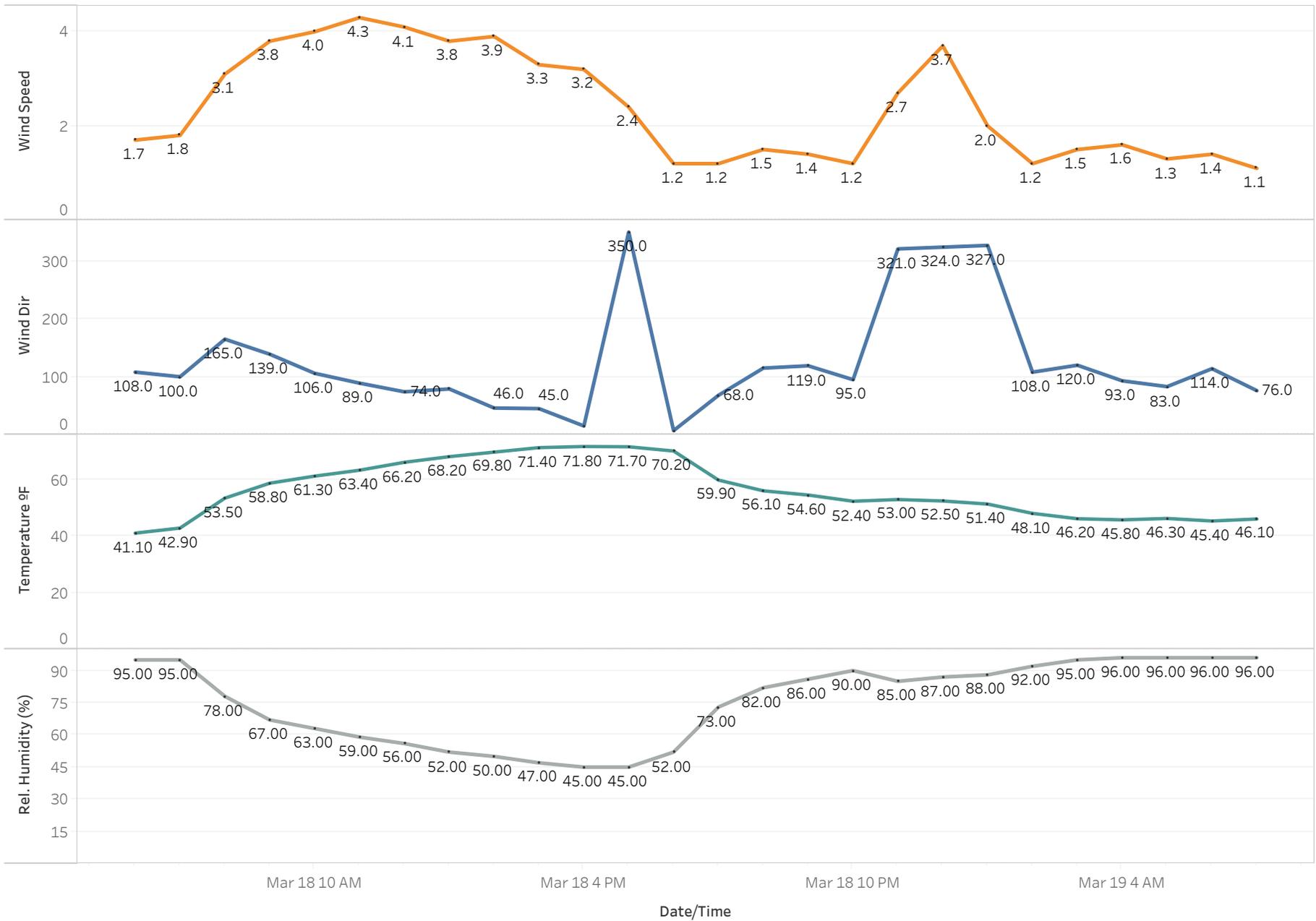
# Attachment C

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## Meteorological Conditions

Figure 8: CIMIS Concord Meteorological Conditions

Mar 17 06:00 - Mar 18 07:00

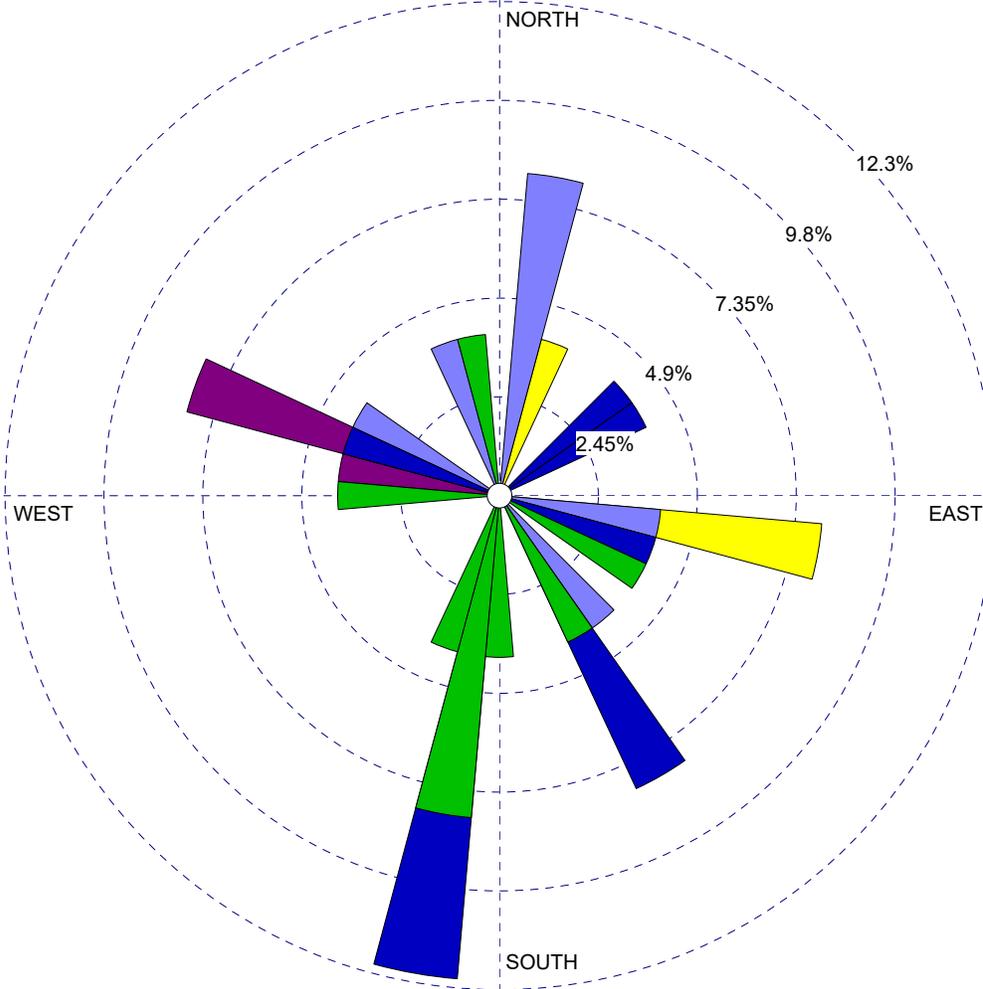


WIND ROSE PLOT:

Station #Weatherpak

DISPLAY:

Wind Speed  
Direction (blowing from)



WIND SPEED  
(Knots)

- >= 11.66
- 5.00 - 11.66
- 4.00 - 5.00
- 3.00 - 4.00
- 2.00 - 3.00
- 1.00 - 2.00
- Calms: 4.00%

COMMENTS:

DATA PERIOD:

**Start Date: 3/17/2019 - 06:00**  
**End Date: 3/18/2019 - 06:00**

COMPANY NAME:

MODELER:

CALM WINDS:

**4.00%**

TOTAL COUNT:

**25 hrs.**

AVG. WIND SPEED:

**2.24 Knots**

DATE:

**3/19/2019**

PROJECT NO.:

**111342**