Phillips 66 – Wilmington Refinery

Regulation 1180 Air Monitoring Plan

November 26, 2018

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List of Acronyms

SCAQMD – South Coast Air Quality Management District

HARP – Hotspots Analysis Reporting Program

BTEX – Benzene, Toluene, Ethylbenzene, Xylenes

FTIR – Fourier Transform Infrared Spectrometer

H_2S – Hydrogen Sulfide

LDL – Lower Detection Limit

PPB - Parts Per Billion

QA/QC – Quality Assurance / Quality Control

OEHHA – Office of Environmental Health Hazard Assessment

MET – Meteorological Station

QAPP – Quality Assurance Project Plan

SO_2 – Sulfur Dioxide

NOx – Nitrogen Oxides

UV-DOAS – Ultraviolet Differential Optical Absorption Spectroscopy

UDL – Upper Detection Limit

Overview

On December 1, 2017, the South Coast Air Quality Management District (SCAQMD) adopted Regulation 1180 which requires Los Angeles refineries to develop and submit an Air Monitoring Plan to establish and operate a fence-line monitoring system. The SCAQMD also published guidelines for refineries to meet the fence-line monitoring requirements. Phillips 66 Wilmington used these guidelines to develop the following monitoring plan that complies with the fence-line monitoring provisions of SCAQMD Rule 1180. This includes meeting all downwind fence-line siting requirements, uptime requirements; and reportable, quantifiable detection levels as specified in Rule 1180. The critical tasks addressed in the development of the plan are included in the following sections:

Section 1 will present an evaluation of commercially available technologies used for fence-line monitoring.

Section 2 presents an evaluation of emission sources and community impact associated with emissions from the Phillips 66 Wilmington Refinery. This includes an evaluation of the emission sources and the use of dispersion modelling to evaluate downwind impacts to communities.

Section 3 presents the proposed site locations for the fence-line air monitoring systems at the Phillips 66 Wilmington Refinery and an evaluation of specific, fence-line air monitoring systems to be used to detect refinery emissions at the fence line.

Section 4 presents an overview of the presentation of the fence-line data to the public.

Section 5 presents the data management program for the fence-line monitoring system.

Section 6 presents the quality assurance and data quality control system that will be implemented for the monitoring program.

Section 1 - Assessment of Air Monitoring Technology

Overview

The following section presents an evaluation of the air monitoring technologies used as fence-line air monitoring systems at refineries. The evaluation is based on knowledge obtained from the use of fence-line air monitoring systems at the Phillips 66 Rodeo Refinery in Rodeo, California, as well as other locations where fence-line programs have been implemented. The Phillips 66 Rodeo Refinery has used open-path air monitoring systems for over 22 years and includes the use of Open-path FTIR, and UV air monitoring equipment.

Technology Descriptions

Open-path air monitoring systems use beams of light to detect and quantify gases. The systems work by sending a beam of light into the open air and receiving it at a detector. When gases are present in the beam, some of that light is absorbed, and the detector can distinguish between a beam received in clean air, versus a beam in which gases are present.

Gases have their own distinct way of absorbing light and may absorb light at several different wavelengths in the light spectrum. These gas-specific absorption characteristics serve as a unique fingerprint for the gas. By comparing known reference standards to the results from field measurements, the system can identify the gas based on which wavelength absorption patterns are present. Likewise, the quantity of light that was absorbed is a direct function of the concentration of the gas in the air. By analyzing the size of the absorption that took place, the system can estimate the average concentration of the gas along the beam path. A single, open-path analyzer can cover a path of up to 900 meters, making them ideal for use as a fence-line monitoring system where covering a significant linear distance is required.

The second type of air monitoring system used for fence-line monitoring programs are point sampling devices. The point sample monitoring systems are suited for use in areas where the concentrations of gases are below the detection limits of open-path technologies, for pollutants such as particulate matter and Hydrogen Sulfide (H2S) gas that cannot be detected by open-path technologies.

Each type of system has inherent advantages. Point systems have an operational advantage compared to open-path systems in that they will continue to operate during conditions when the open-path technologies are inoperable due to weather events (e.g., heavy fog or rain). This additional coverage can enhance the community benefit of the fence-line system during times when open-path systems are hindered by adverse environmental conditions. In addition, the systems can be deployed at strategic points along the fence line to capture emissions from the refinery. Open-path systems are ideally suited for applications where emissions from a source cover a long distance and a single monitoring system can cover the entire path length.

Open-path and point sampling technologies are further characterized by their specific operational parameters. In the case of open-path technologies, the systems are characterized by the type of light source used to detect gases (i.e., broad band sources vs. lasers) as well as the type of light used to detect the gases (i.e., ultra violet light vs. infrared light). Point sample devices are characterized by the type of pollutant detected (i.e., gases vs. particulate matter). Each of these subcategories are described below.

Open-path UV DOAS

The UV DOAS air monitoring system detects Benzene, Toluene, Ethylbenzene, Xylene and Sulfur Dioxide on a real-time basis using beams of ultraviolet light. A beam of ultraviolet light traverses open air and is collected at a light detector at the other end of the beam path. The system identifies gases by examining the wavelengths of UV light that have been absorbed by the gases present in the light beam. The concentration of gas in the air is proportional to the amount of light absorbed at specific wavelengths. The system uses a multivariate method to quantify data, which is a critical component in accounting for and reducing false detections. Each target gas has a reference library of gases covering the concentration range of the analyzer. It also includes libraries of potential interfering gases such as oxygen and ozone. In addition, the system can be challenged in the field by using either sealed or flow-through gas cells which provide a quality assurance check under actual conditions.

Open-path FTIR

The FTIR air monitoring system uses infrared light to detect gases. This system sends a beam of light into the open air to a reflector that sends the beam back along the same path. The unit has the capability to detect total hydrocarbons and other organic gases on a real-time basis. The analytical method employed by the FTIR is a multiple regression technique that separates the total amount of light absorbance by the various gases and outputs a result for each gas. The system has the ability of undergoing data and quality assurance checks in the field by monitoring known ambient gases or by using gas standards. The open-path FTIR can be operated as either a single path or multiple path configuration.

Multi-path UV DOAS

The multi-path UV DOAS air monitoring system detects Benzene, Toluene, and Xylene gases on real-time basis using ultraviolet light. A beam of ultraviolet light traverses open air and is reflected back to the base unit using a reflector at the other end of the beam path. The light source is mounted on an auto positioning system that allows the system to target multiple reflectors. The system identifies gases by examining the wavelengths of UV light that have been absorbed by the gases present in the light beam. The concentration of gas in the air is proportional to the amount of light absorbed at specific wavelengths.

Black Carbon Monitors

The black carbon air monitoring system detects particles in the air associated with vehicle emissions such as diesel exhaust, soot from wood burning, and particles associated with forest fires. The system uses an aethalometer to continuously collect and analyze aerosol particles.

Hydrogen Sulfide Monitors

Hydrogen Sulfide point sensors will be used to detect and quantify this gas on a real-time basis. The systems are designed to detect H2S at concentration ranging from 0 to 10 parts-per-million and have the ability to detect the gas at concentrations lower the odor threshold for humans.

Meteorological Station

In addition to the air monitoring equipment, a meteorological MET station will be installed at the refinery. The station will provide wind speed, wind direction, temperature, relative humidity and rainfall measurements. In either open path or point detection, using the data in combination with the metrological data from a MET station located on site is helpful in determining where sources originate from and in which direction the gases are moving. The basic difference is demonstrated in Figure 1.1. In this figure, a gas plume is generated from a source and released into the air. As the gases are released, they are carried by the wind and begin to disperse and move away from the source. As seen in the figure, the concentration of gases in the plume will be highest in the center of the plume and closest to the source, while gas concentrations will be less at the edge of the plume as the distance from the source increases. The shape of the plume can be affected by changing terrain and meteorological conditions, but in general, this dispersion pattern is an accurate depiction of what happens after a gas release.

Backup Air Monitoring System

A mobile air monitoring system composed of an extractive FTIR, an extractive UV-DOAS, a black carbon monitor, and a H_2S monitor will be installed for use at the refinery. The mobile system will be deployed in the event the main fence line system goes offline for longer than 24 hours. The system will used when there is an equipment breakdown, power outages, weather events, and other unplanned scenarios.

Figure 1.1 Demonstration of Open-Path Average Concentration vs Point Sampler Detection

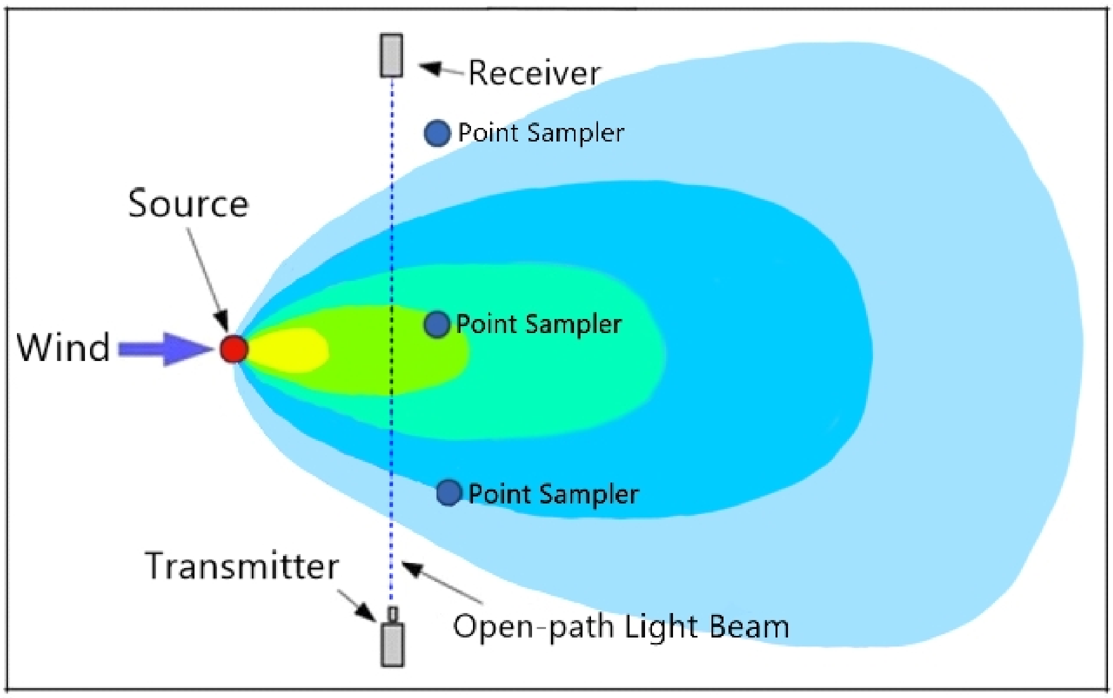


Table 1.1 summarizes the monitoring technologies proposed to comply with the Rule 1180 monitoring requirements, along with the technology capabilities, common potential interferences for each instrument type and restrictions.

Table 1.1 –Monitoring Equipment Overview

Equipment	Capabilities	Interferences	Measurement Errors	Restrictions
Open-FTIR	Detects alkanes	Water and CO2 which can be compensated for with analytical software	Monitoring uses multiple regression to analyze data	Heavy Fog and Rain
Open-path UV	Detects Benzene, Toluene, Xylene, Ethylbenzene, and Sulfur Dioxide	Ozone and Oxygen which can be compensated for with analytical software	Monitor uses partial least squares regression to analyze data	Heavy Fog and Rain
Multi-path UV	Detects Benzene, Toluene and Xylene along multiple paths	Ozone and Oxygen which can be compensated for with analytical software	Analytic software compensates for interfering gases.	Heavy Fog and Rain
Black Carbon Monitor	Detects Black Carbon Particulate Matter	None	None	None
Hydrogen Sulfide Detector	Detects Hydrogen Sulfide gas; No Loss of data quality due to rain or fog	None	None	None
Meteorological Station (MET)	Wind direction and speed, temperature, dew point, rain gauge	None	None	None

Section 2 – Evaluation of Emission Sources and Community Impact

In order to determine the optimal location to site fence-line air monitoring equipment at the Phillips 66 Wilmington Refinery, annual emissions of pollutants were determined for input into a dispersion model, which was then used to determine downwind impact on local communities. The process of evaluating emission sources and determining their potential impact on downwind communities followed guidance outlined by the SCAQMD. The emission source information was compiled from the Hotspots Analysis and Reporting Program (HARP) and used to determine source location. A map of the emission sources for the Phillips 66 Wilmington Refinery is shown in Figure 2.1.

It was decided to specifically focus on atmospheric dispersion models that could accommodate the complex nature of wind flow patterns over buildings and structures. AEROMOD was selected due to its international acceptance either as an industry standard and/or regulatory use. AERMOD is a model developed with the support of the AMS/EPA Regulatory Model Improvement Committee (AERMIC) whose objective has been to include state-of the-art science in regulatory models. AERMOD is a dispersion modelling system with three components, namely: AERMOD (AERMIC Dispersion Model), AERMAP (AERMOD terrain pre-processor), and AERMET (AERMOD meteorological pre-processor). AERMOD is an advanced, new-generation model. It is designed to predict pollution concentrations from continuous point, flare, area, line, and volume sources.

In addition, AERMOD offers new and potentially improved algorithms for plume rise and buoyancy, and the computation of vertical profiles of wind, turbulence and temperature while retaining the single, straight-line trajectory limitation. AERMET is a meteorological pre-processor for AERMOD. Input data can come from hourly cloud cover observations, surface meteorological observations, and twice-a-day upper air soundings. Output includes surface meteorological observations and parameters, P vertical profiles of several atmospheric parameters. AERMAP is a terrain pre-processor designed to simplify and standardize the input of terrain data for AERMOD. Input data includes receptor terrain elevation data. The terrain data may be in the form of digital terrain data. The output includes, for each receptor, location and height scale, which are elevations used for the computation of air flow around hills. A disadvantage of the model is that spatial, varying wind fields due topography or other factors cannot be included. Input data types required for the AERMOD model include: source data, meteorological data (pre-processed by the AERMET model), terrain data, building dimensions (to accommodate for building downwash effects) and information on the nature of the receptor grid.

Modelling was performed in two different modes using data from the Long Beach Airport from the time period of January 1, 2012 through December 31, 2016. Emission source data was generated using the P66 Harp2 database which included 277 emission sources at the P66 Wilmington refinery. First seasonal wind roses for the refinery were generated using the meteorological data. The resulting wind roses are shown in Figure 2.2. Next, an initial downwind community impact was performed by modelling an annual average unit release from the center of the refinery to get an idea of the predominant wind directions for the dispersion of pollutants. This also gave an idea of which fence lines were going to receive the major impact. The result of this modelling is shown in Figure 2.3.

The emissions were then modelled using AERMOD as described above. The modelling output gave annual and highest daily average concentrations of modelled pollutants on receptors outside of the refinery boundary. The following were considered when assessing the potential impact of the pollutants at the fence line of the refinery):

- Pollutant is emitted at greater than 5000 lbs./year

- Pollutant can be detected by open-path, fence-line technologies
- The pollutants present a specific health risk to the community
- The source of the pollutants is primarily fugitive in nature (not stack)
- The pollutants that meet this criterion are listed in Table 2.1, and Figures 2.3 through 2.13

Figure 2.1 – Emission Sources at Phillips 66 Wilmington Refinery

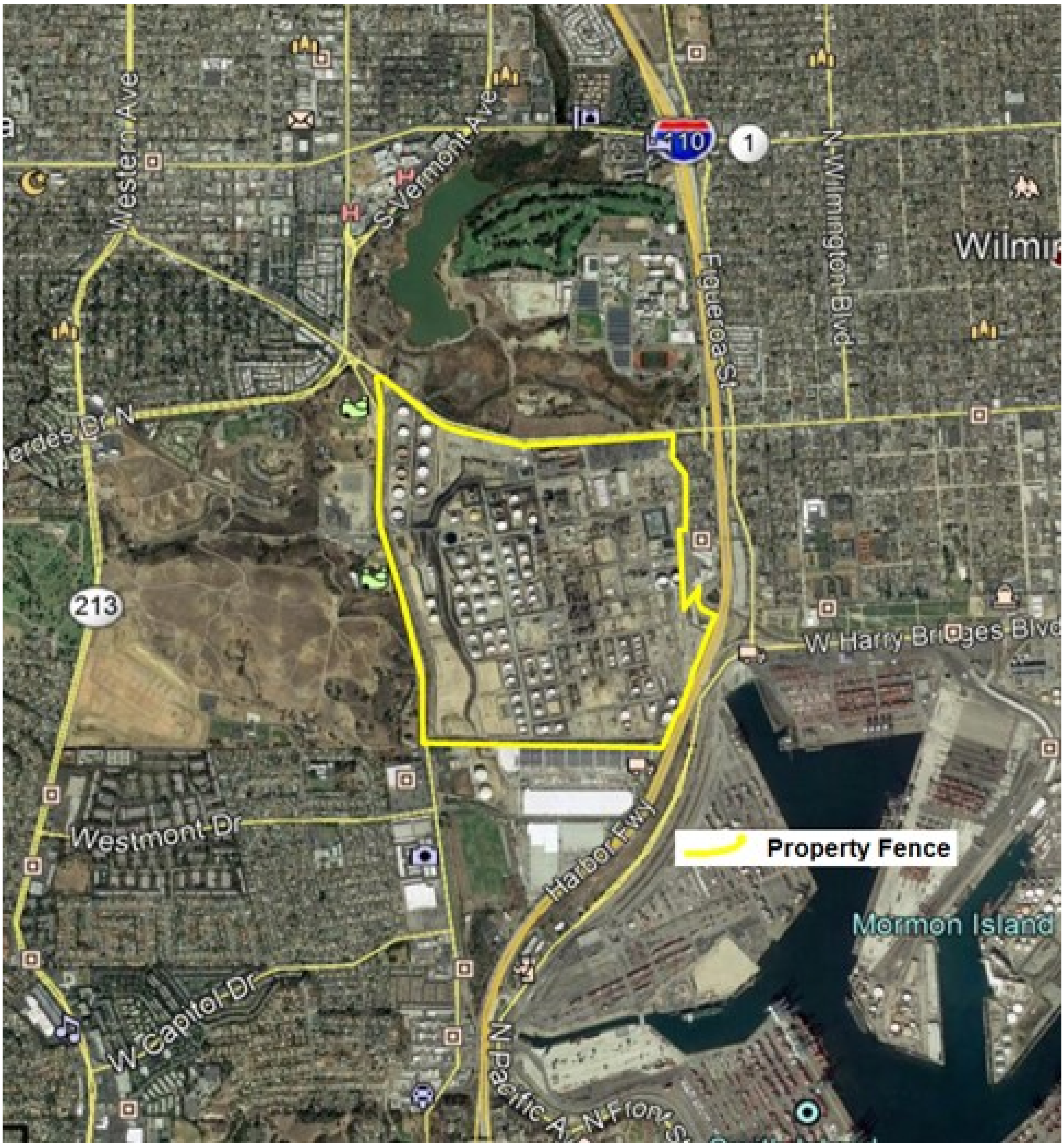


Figure 2.2 – Seasonal Wind Roses at Phillips 66 Wilmington Refinery

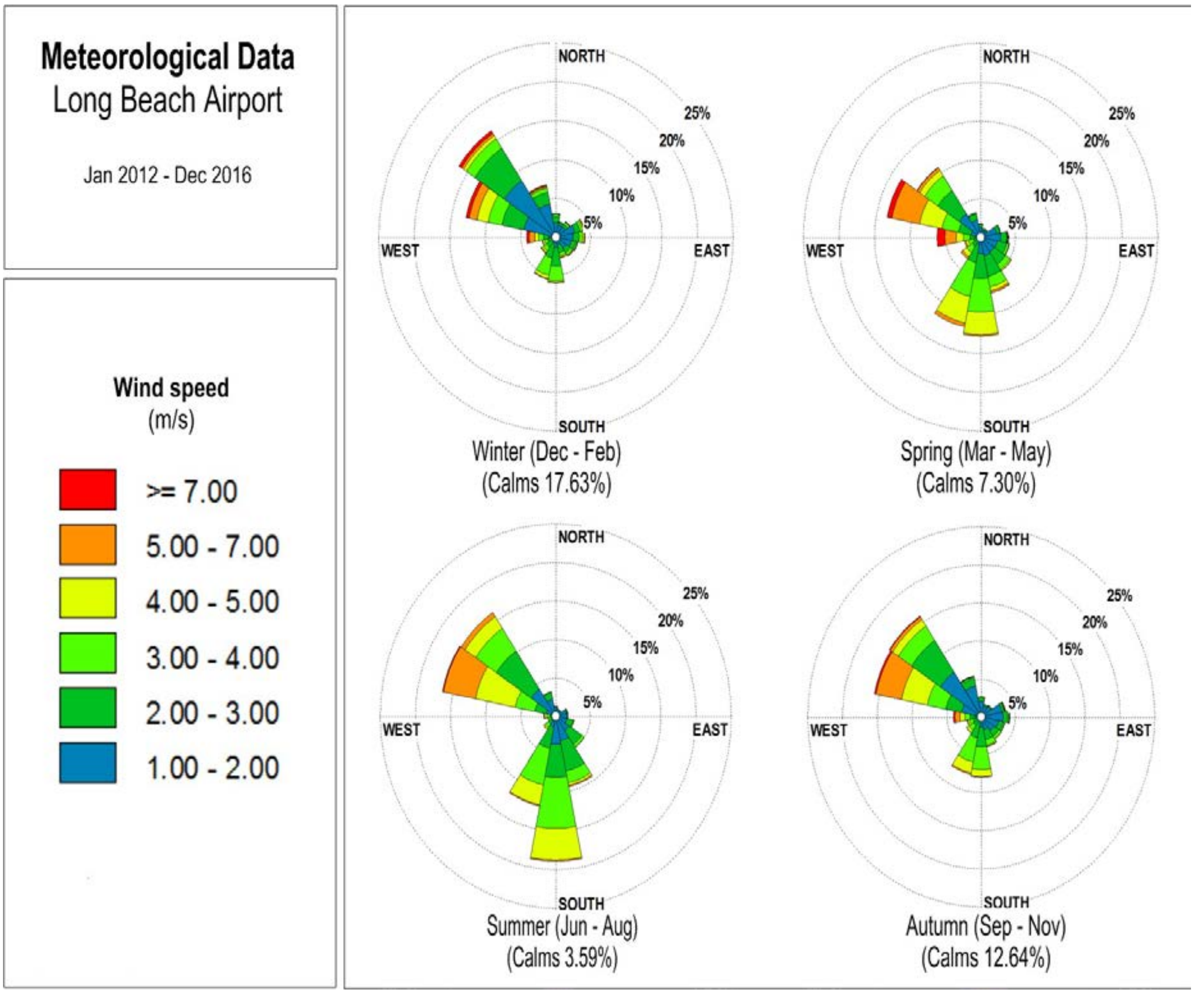


Figure 2.3 – Downwind Emission Impact

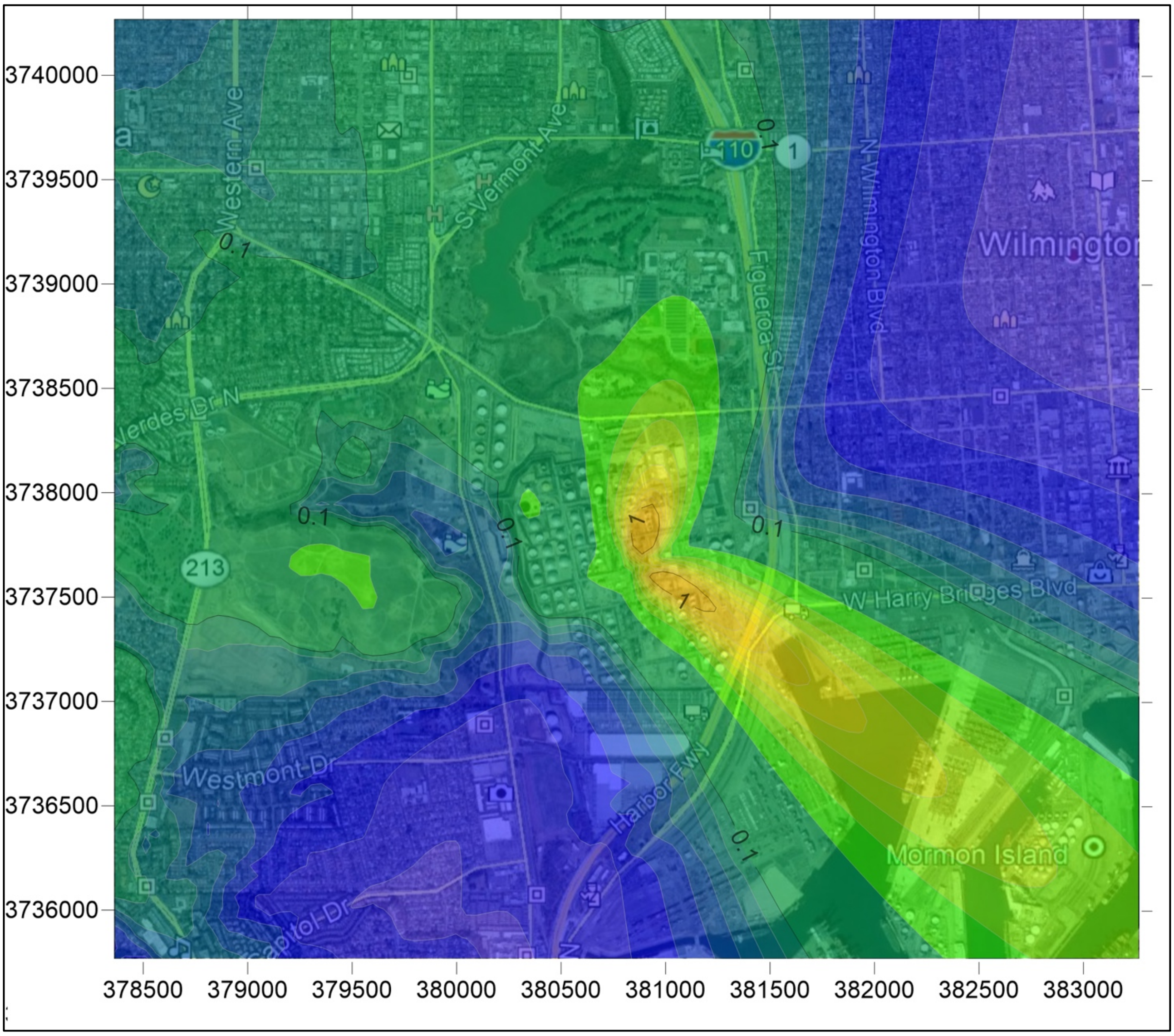


Table 2.1 – Pollutants included in Modelling

Pollutant	Pollutants Detected by Open-path Technologies	Primarily Fugitive Emissions	Emissions Greater than 5,000 Pounds Per Year	Present a Specific Health Risk
Ammonia	Yes - FTIR	Yes	Yes	Yes
Benzene	Yes - FTIR	Yes	No	Yes
Cyclohexane	Yes - FTIR	Yes	No	No
Black Carbon*	No - Point Source	Yes	No	Yes
Ethyl Benzene	Yes - OPUV	Yes	No	Yes
Hexane modelled as Total VOCs	Yes - FTIR	Yes	Yes	No
Hydrocyanic Acid	Yes - FTIR	Yes	Yes	Yes
Hydrogen Sulfide**	No - Point Source	Yes	No	Yes
Methanol	Yes - FTIR	Yes	Yes	No
Propylene	Yes - FTIR	Yes	Yes	Yes
Toluene	Yes - OPUV	Yes	No	Yes
Xylene	Yes - OPUV	Yes	No	Yes

* Black Carbon was modelled using diesel particulate matter and the monitoring technology is a point sample method. ** The monitoring technology for Hydrogen Sulfide is also a point sample method.

Figure 2.4 – Maximum Hourly Ammonia Emission Concentrations

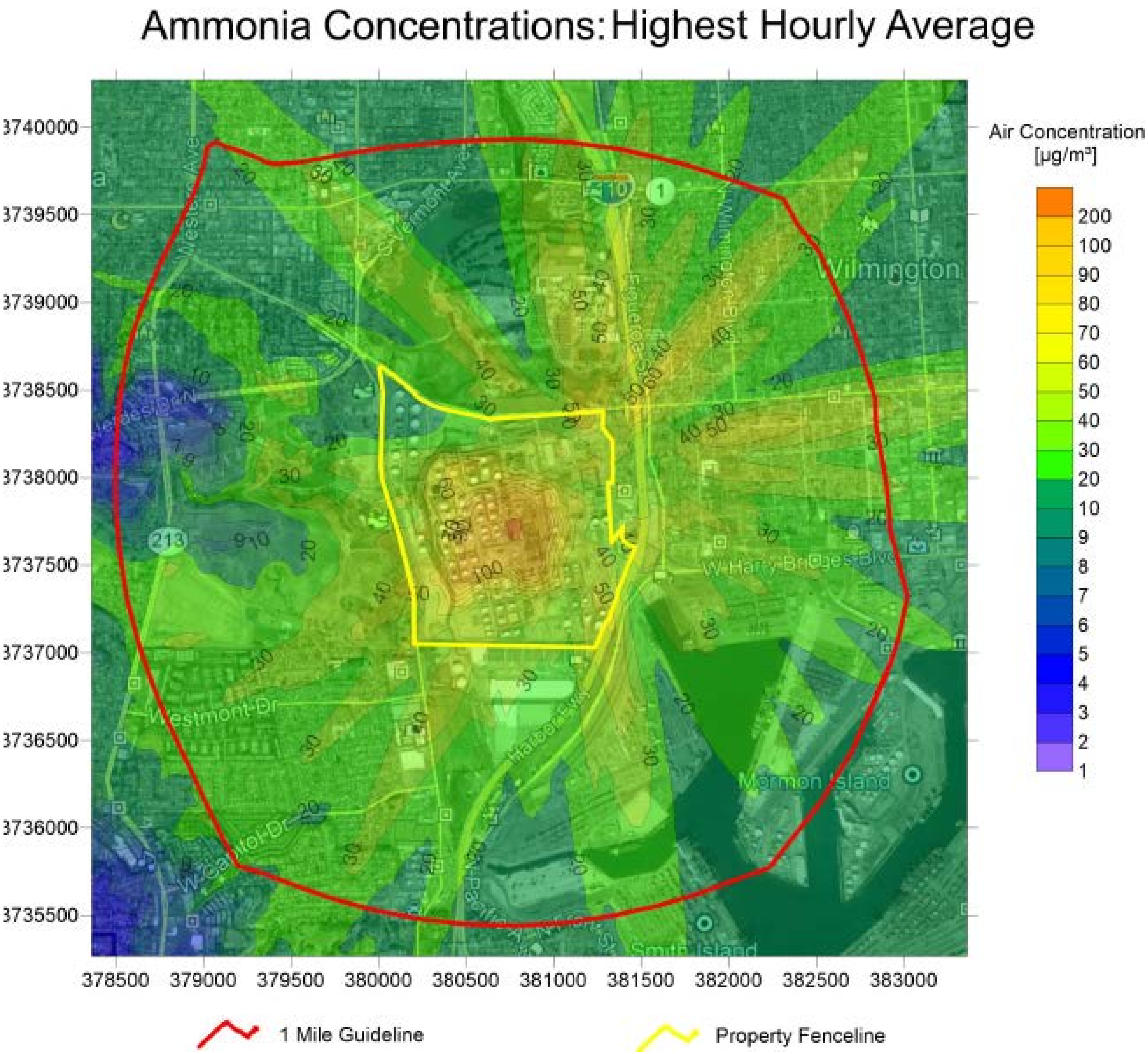


Figure 2.5 – Maximum Hourly Benzene Emission Concentrations

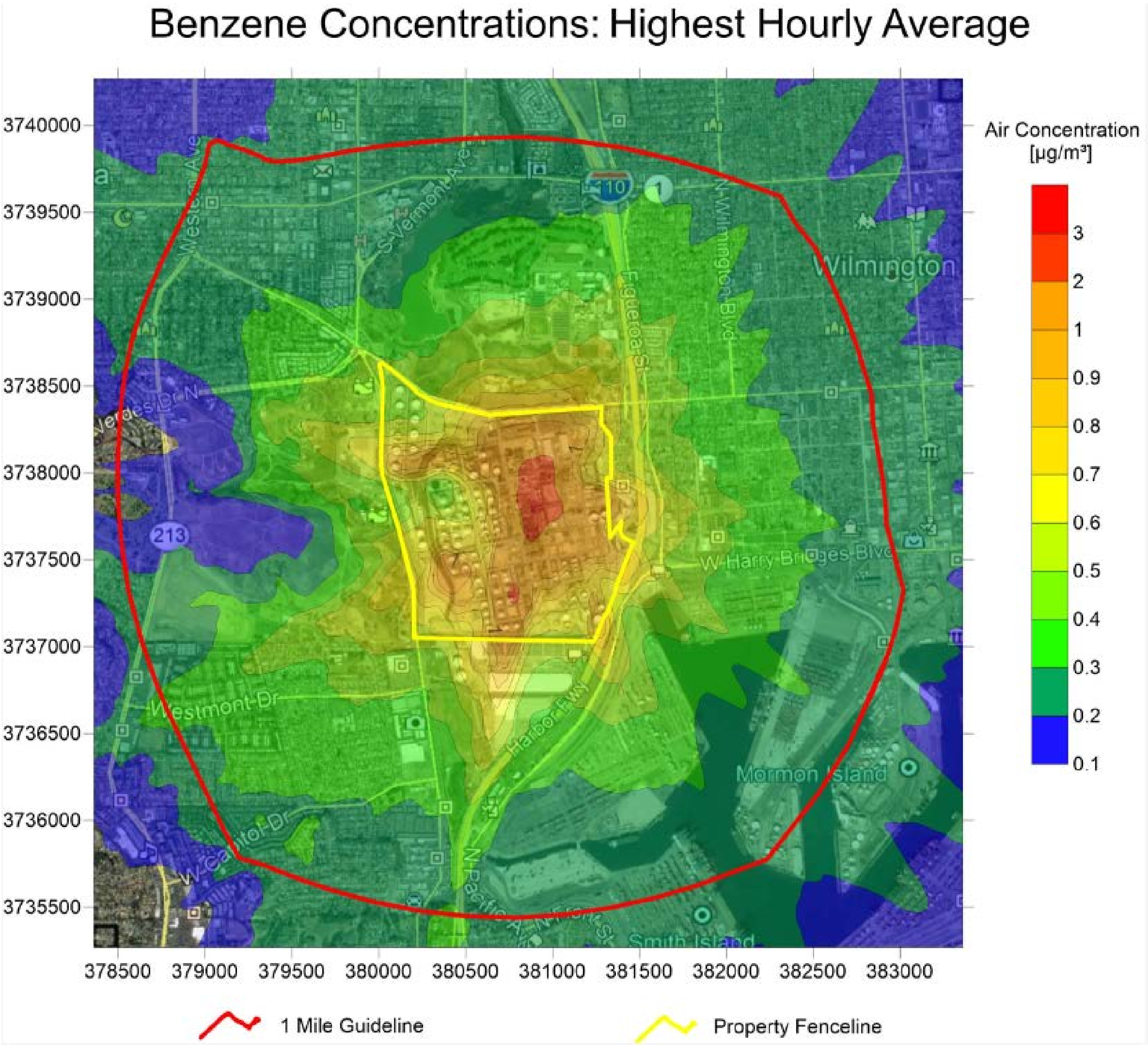


Figure 2.6 – Maximum Hourly Emission Concentrations

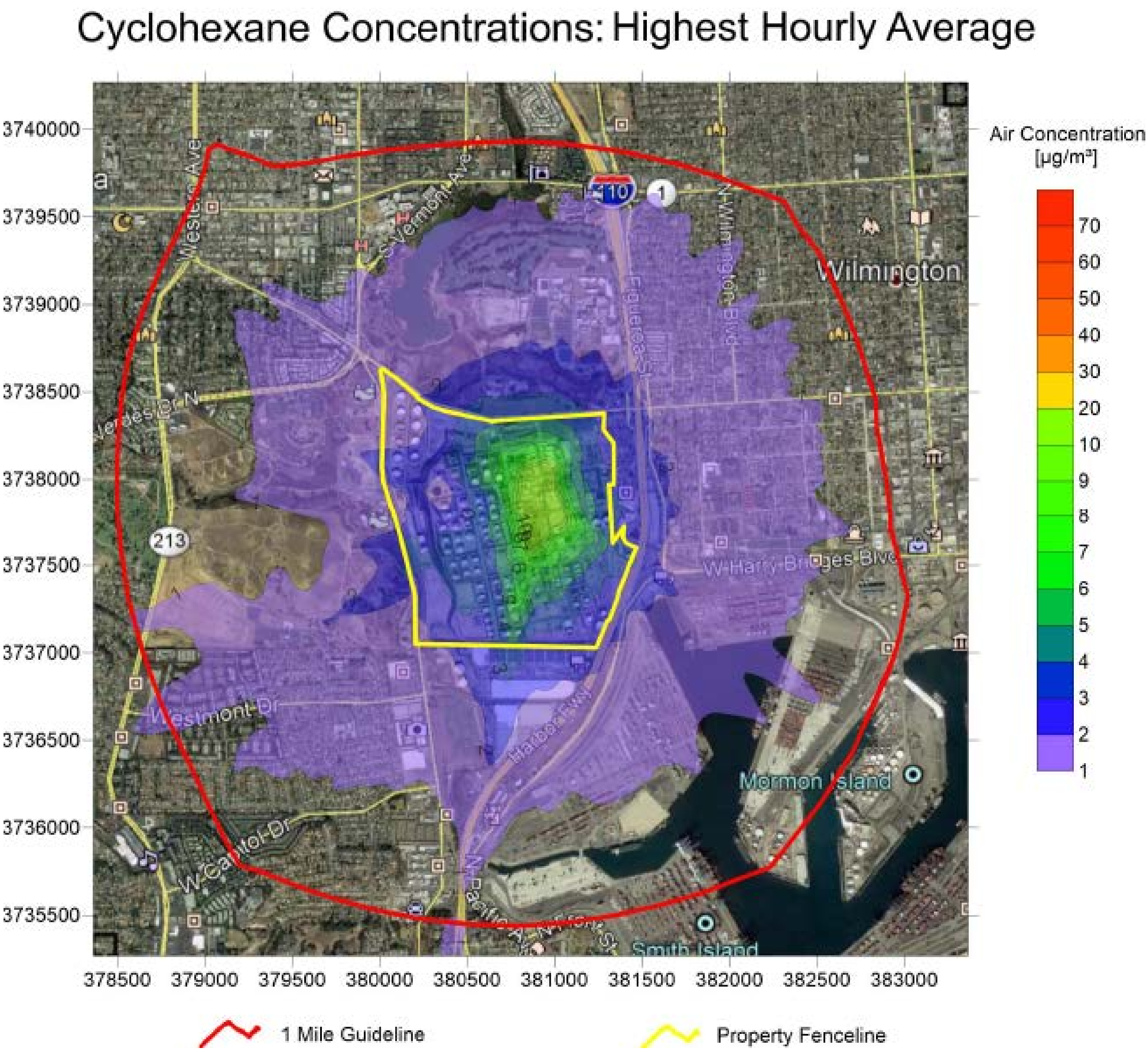


Figure 2.7 – Maximum Hourly Diesel Particulate Matter (DPM) Emission Co

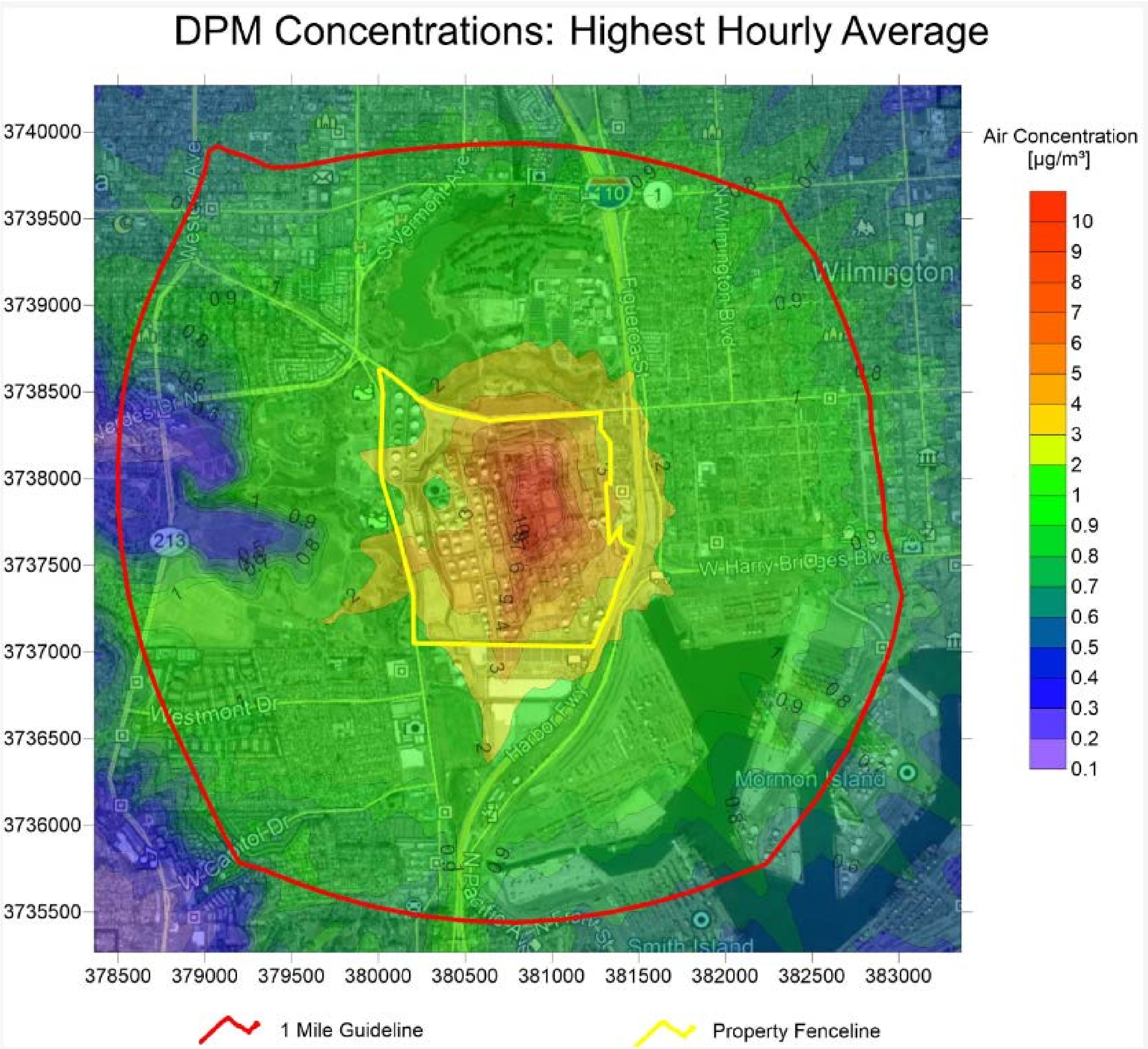


Figure 2.8 – Maximum Annual Ethyl Benzene Emission Concentrations

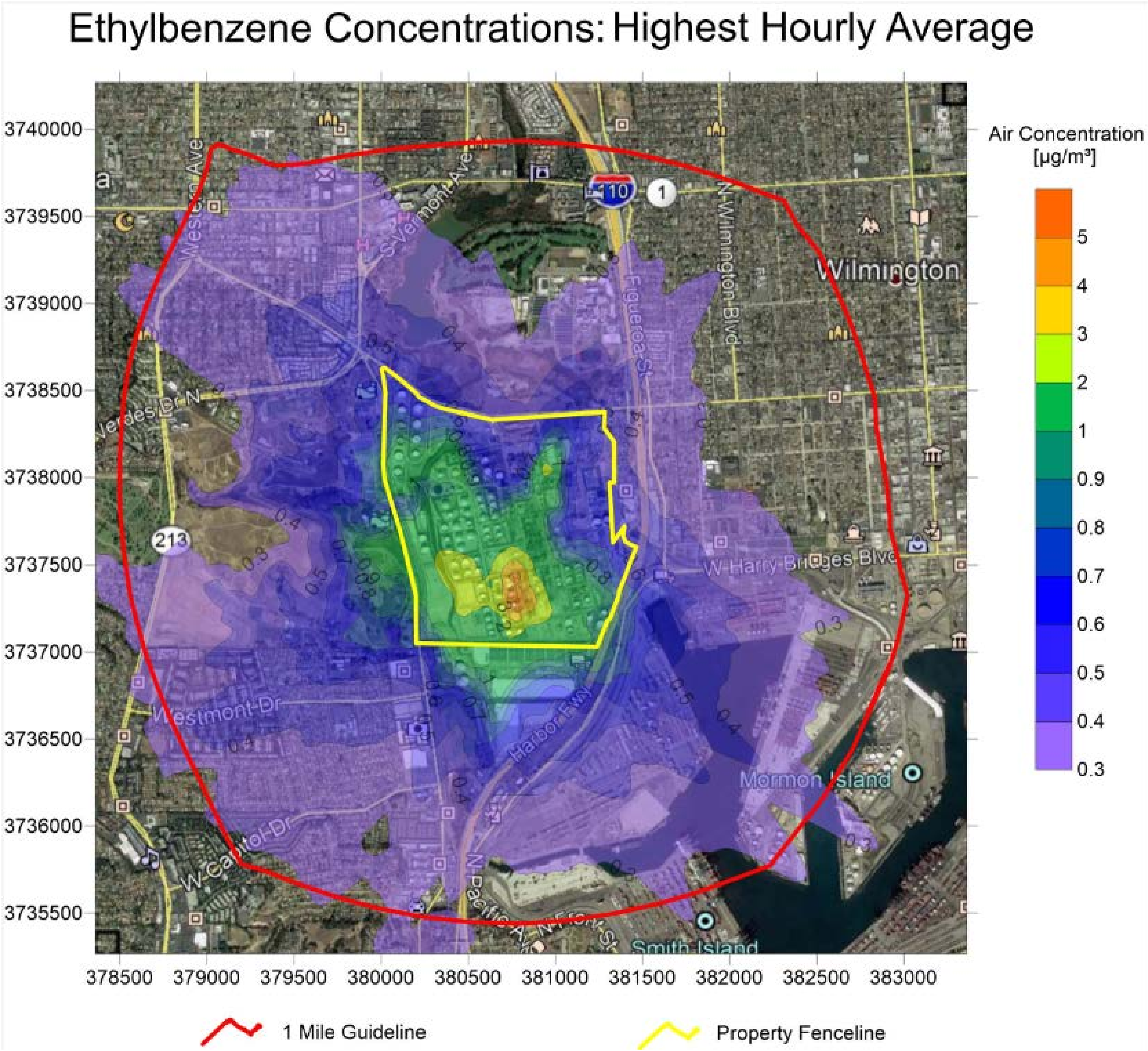


Figure 2.9 – Maximum Hourly Hexane Emission Concentrations

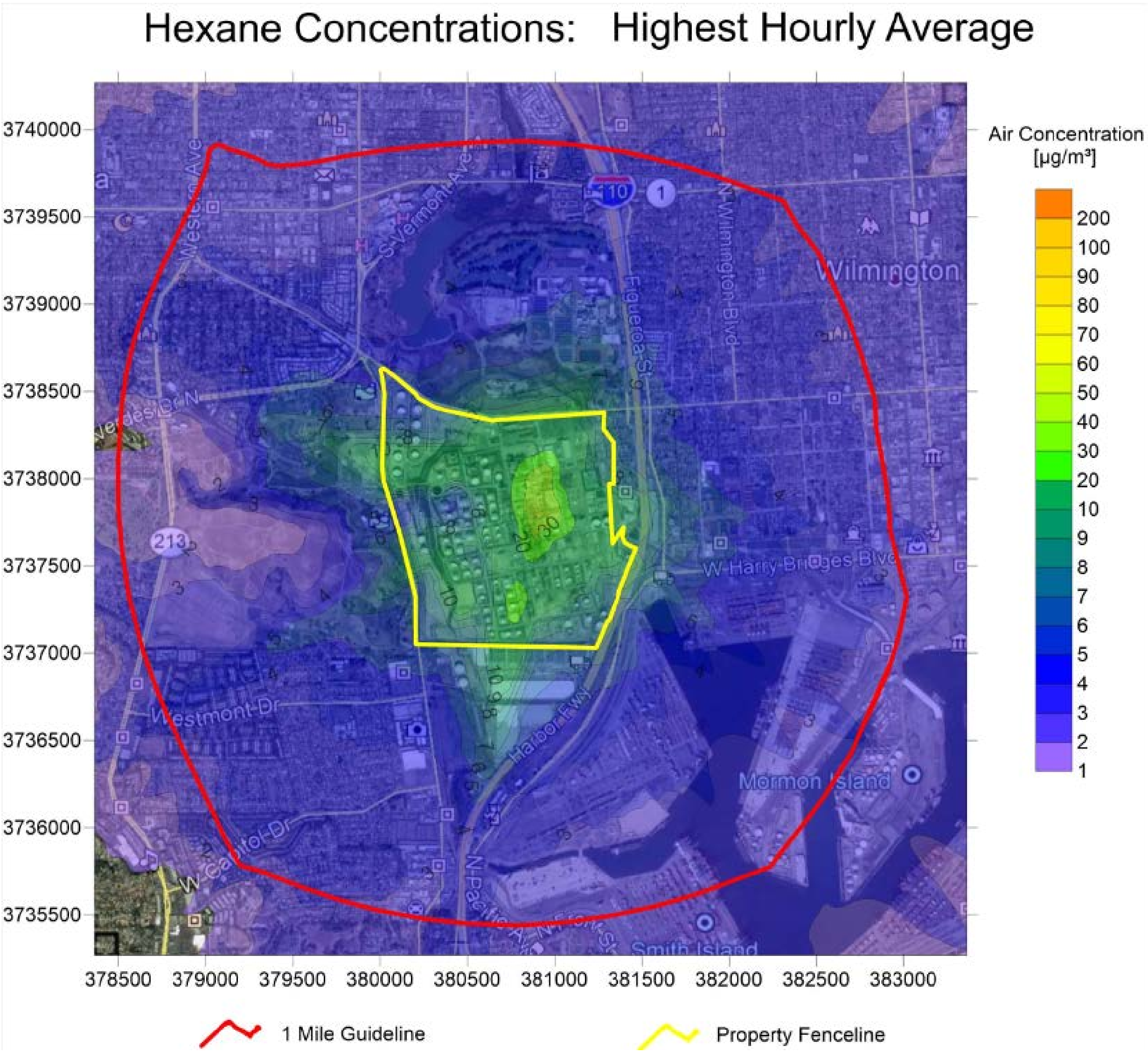


Figure 2.10 – Maximum Hourly Hydrocyanic Acid Emission Concentrations

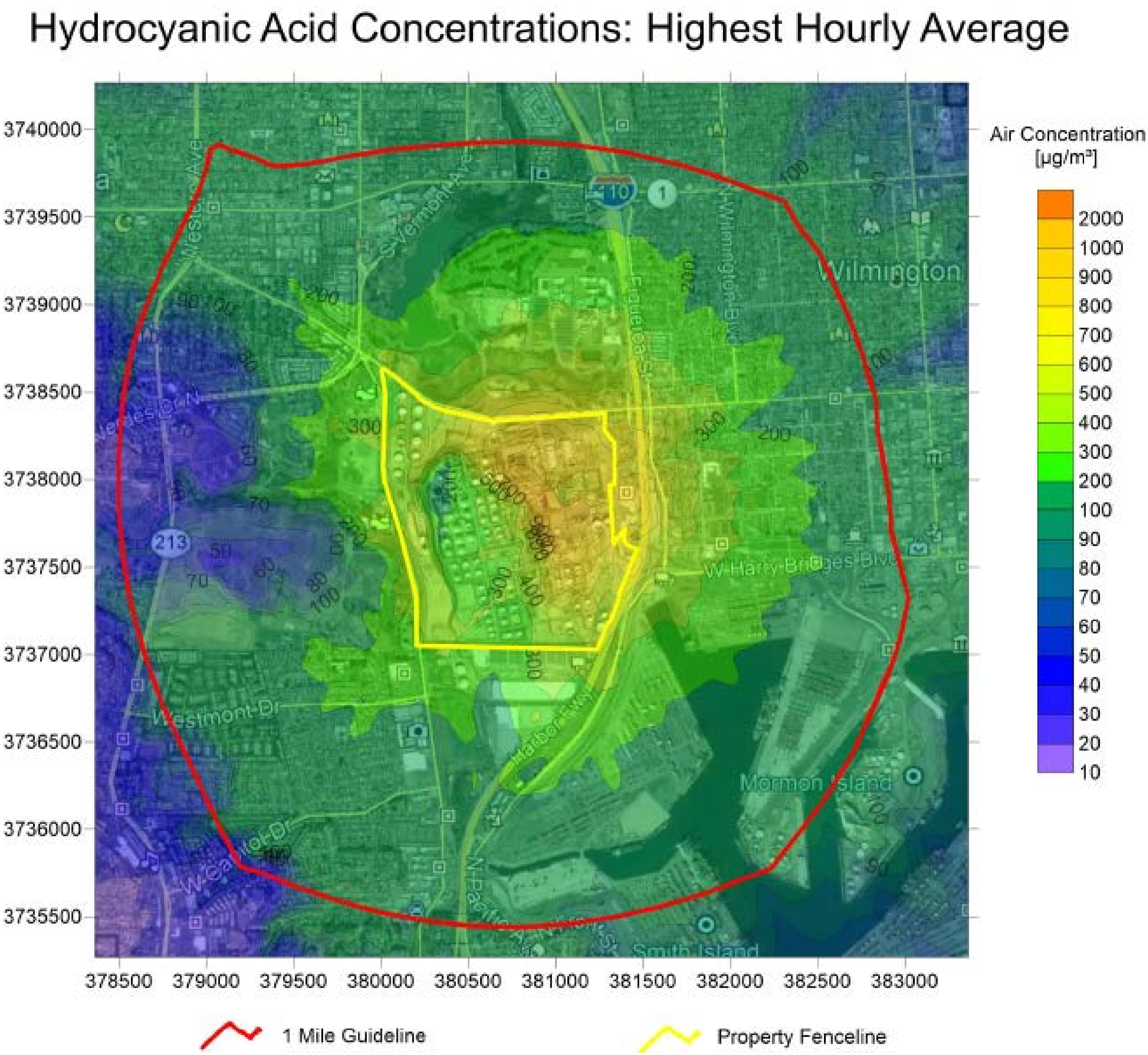


Figure 2.11 – Maximum Hourly Hydrogen Sulfide Emission Concentrations

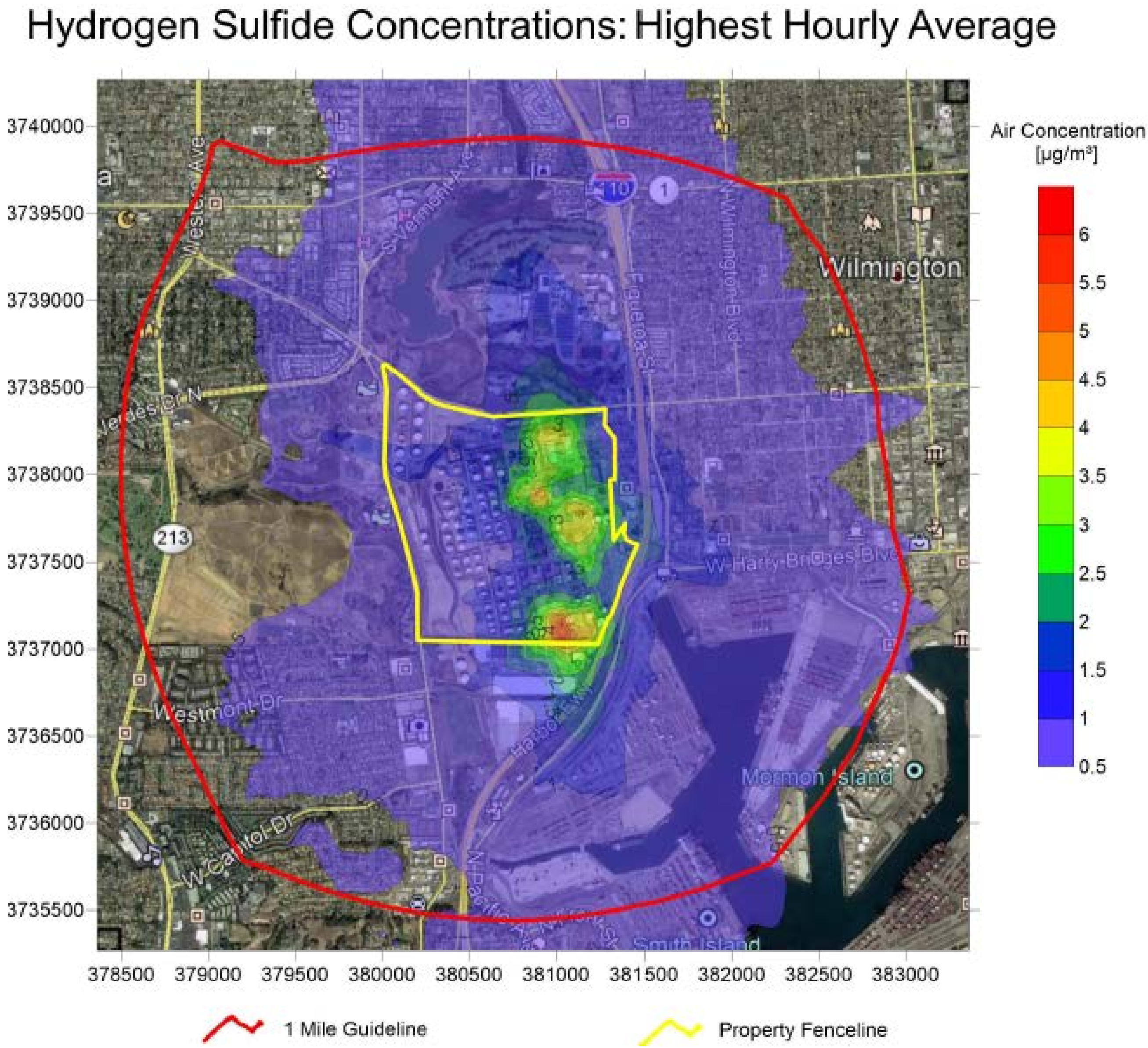


Figure 2.12 – Maximum Hourly Methanol Emission Concentrations

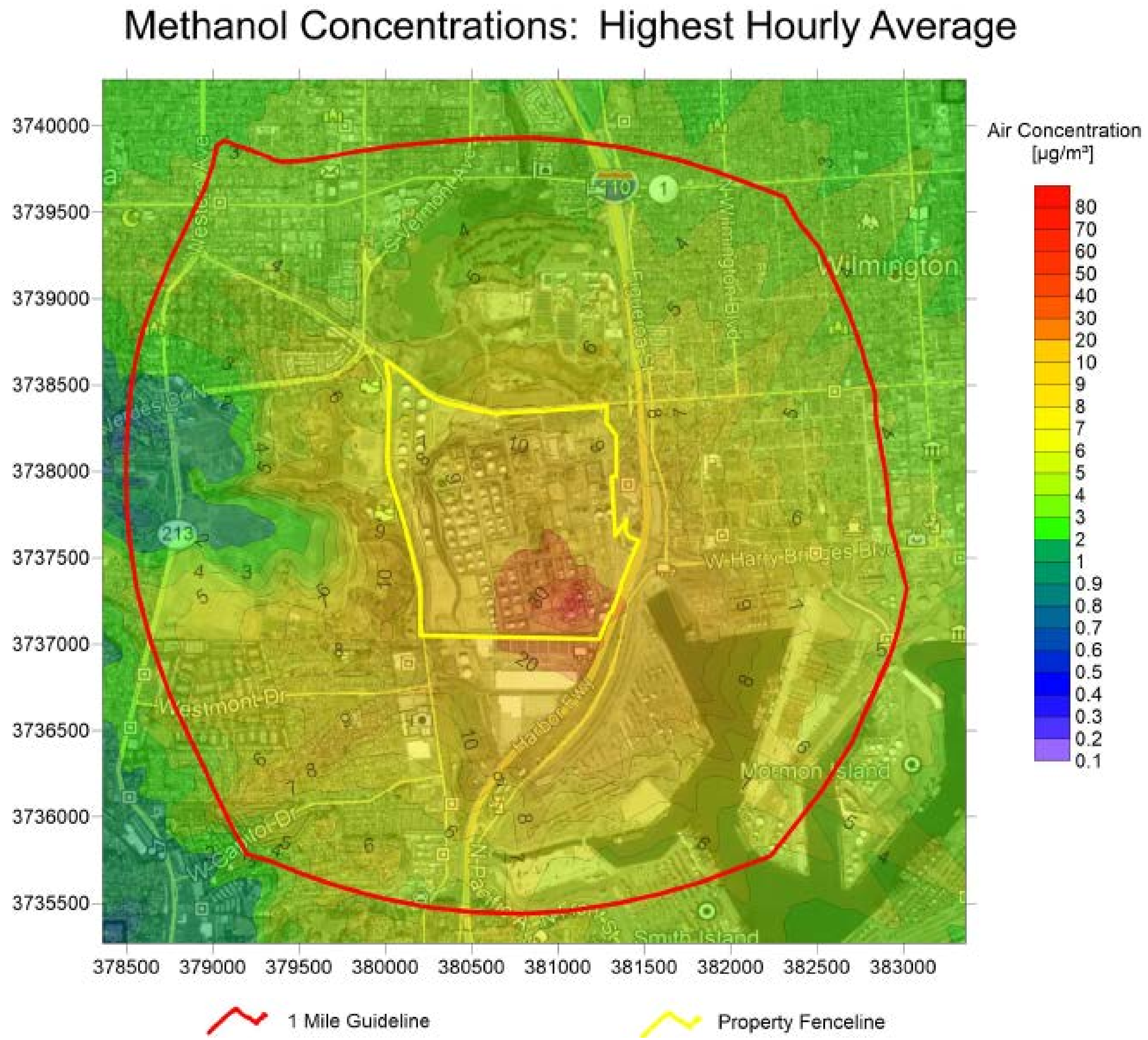


Figure 2.13 – Maximum Hourly Propylene Emission Concentrations

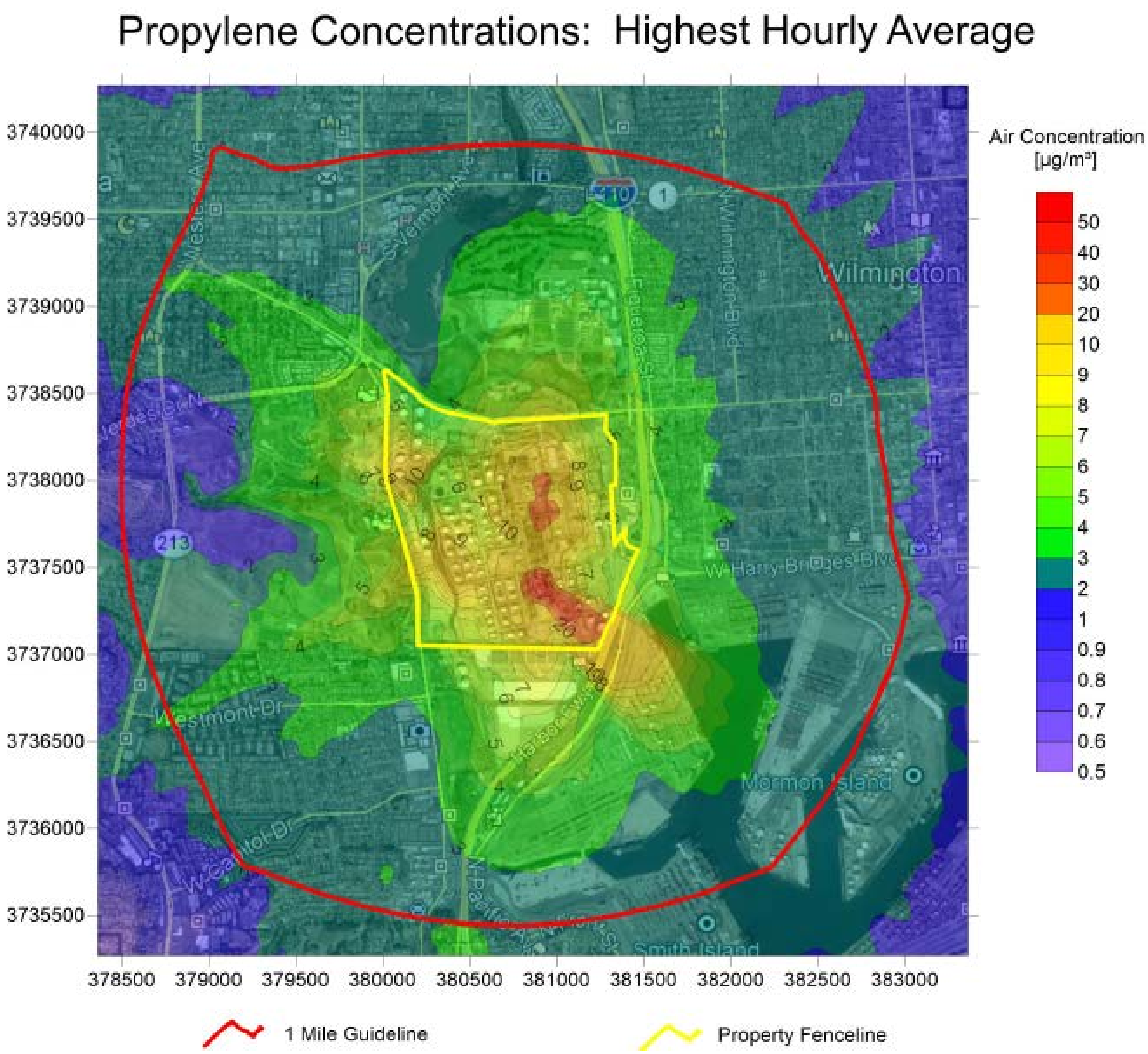


Figure 2.14 – Maximum Hourly Toluene Emission Concentrations

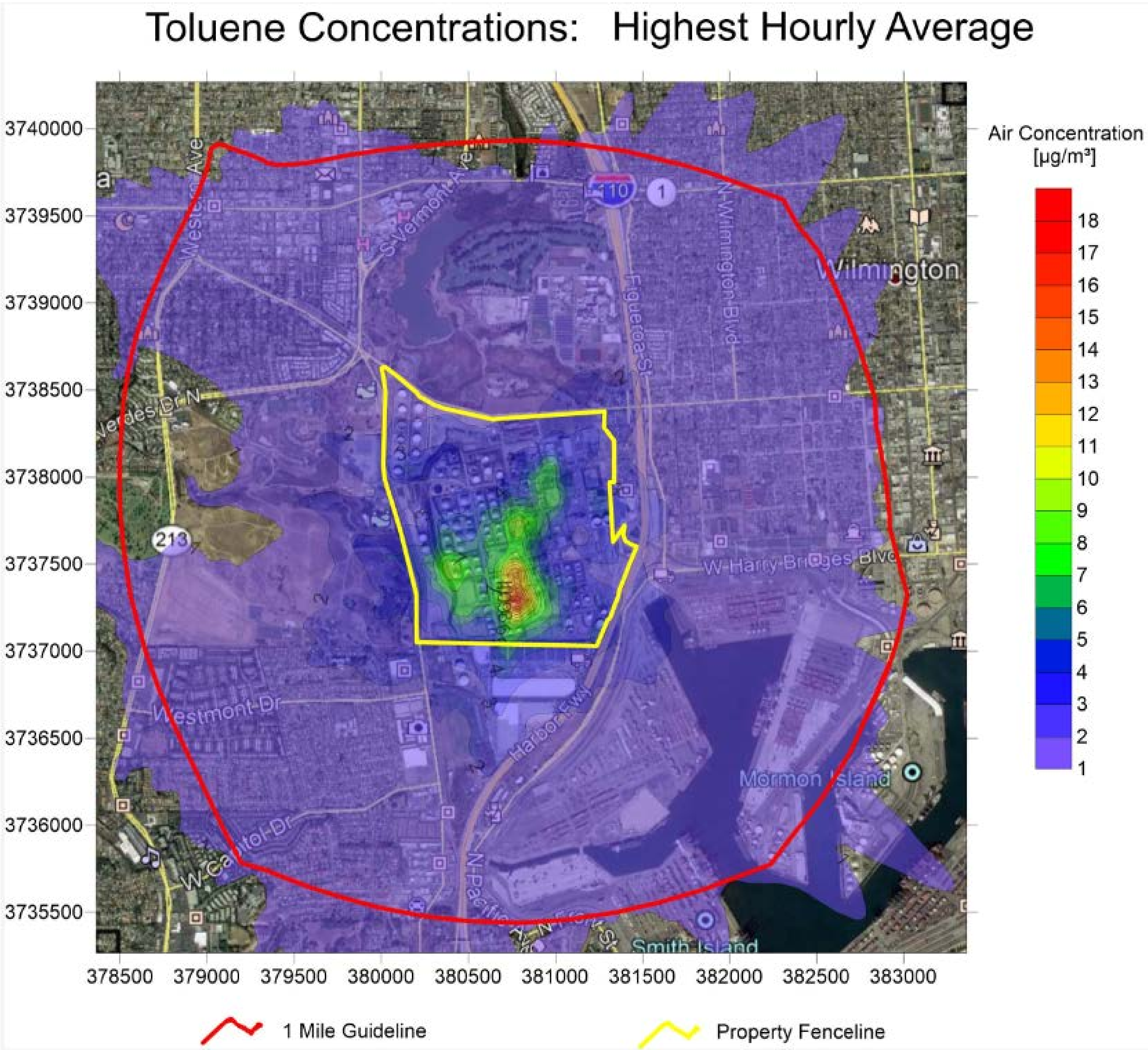


Figure 2.15 – Maximum Hourly Xylene Emission Concentrations

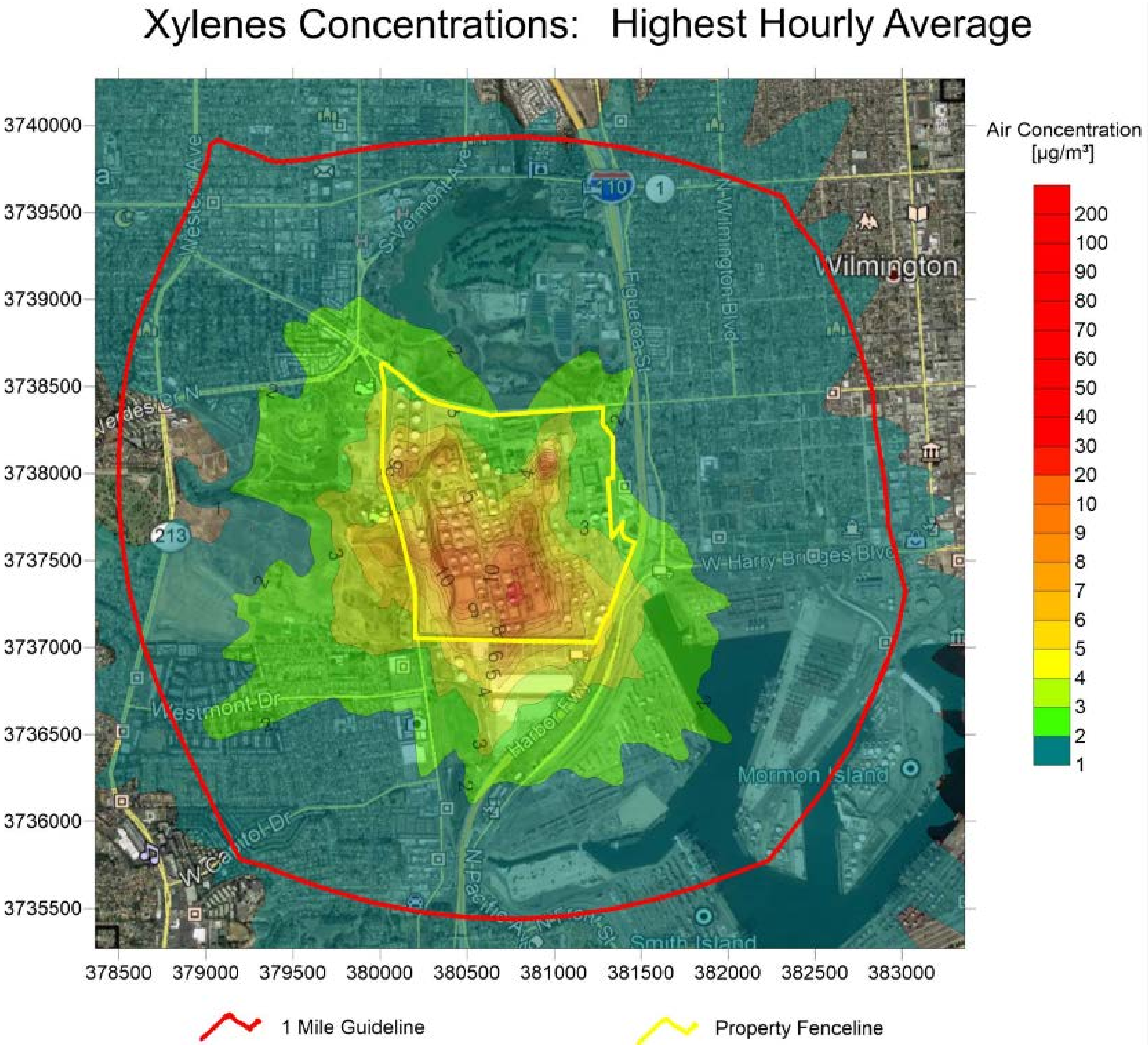


Figure 2.16 – Maximum Annual Ammonia Emission Concentrations

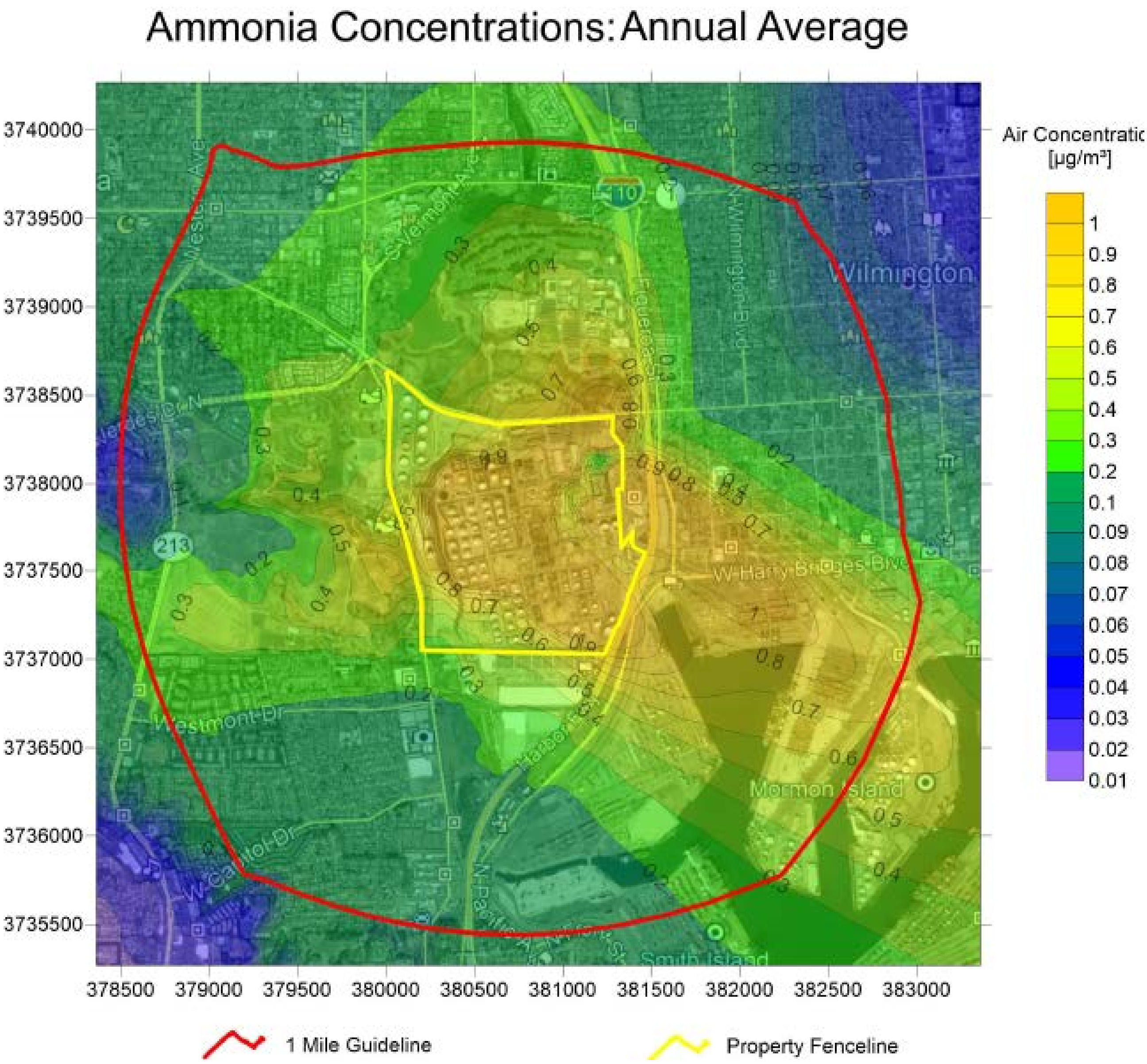


Figure 2.17 – Annual Benzene Emission Concentrations

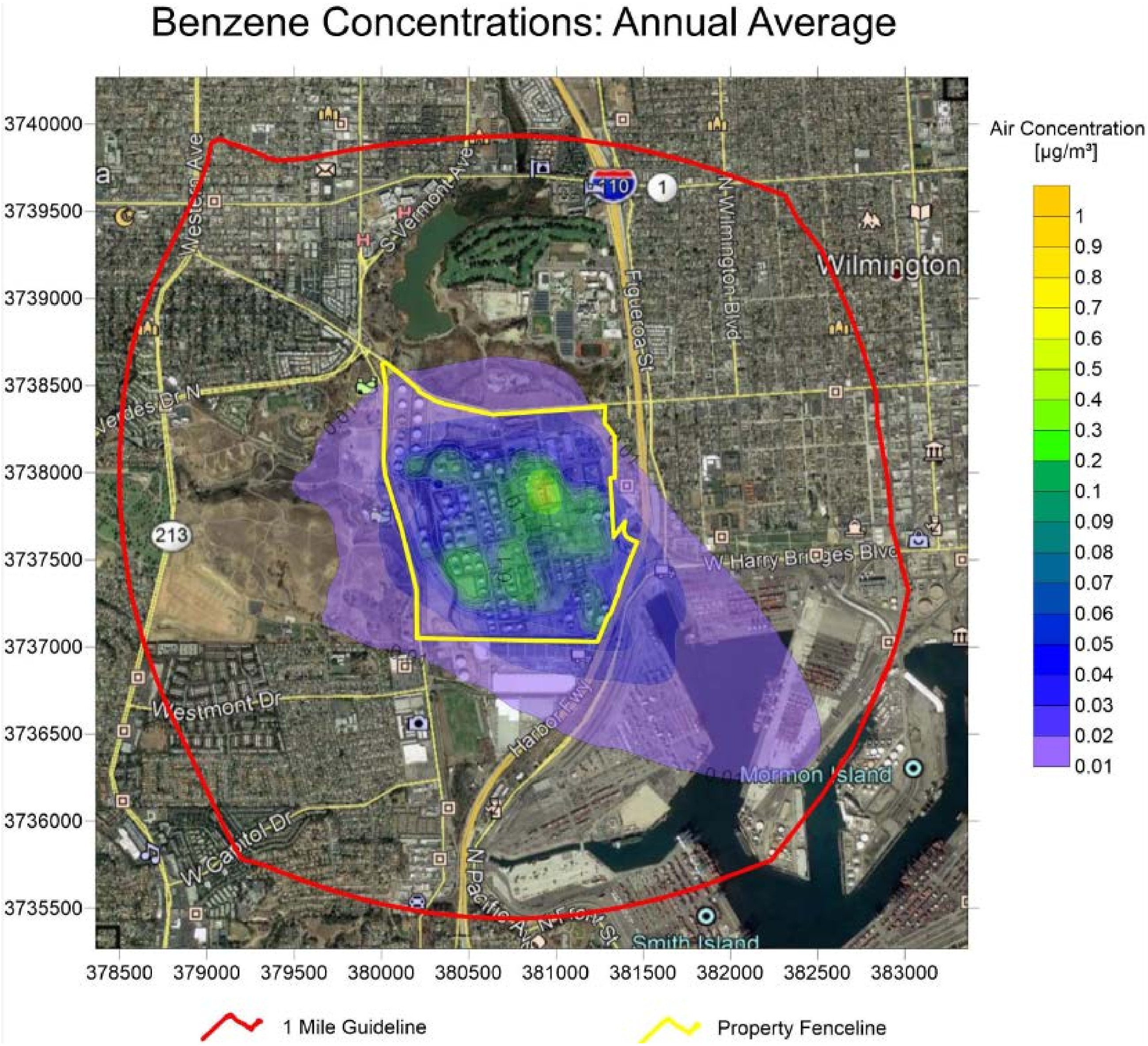


Figure 2.18 – Annual Cyclohexane Emission Concentrations

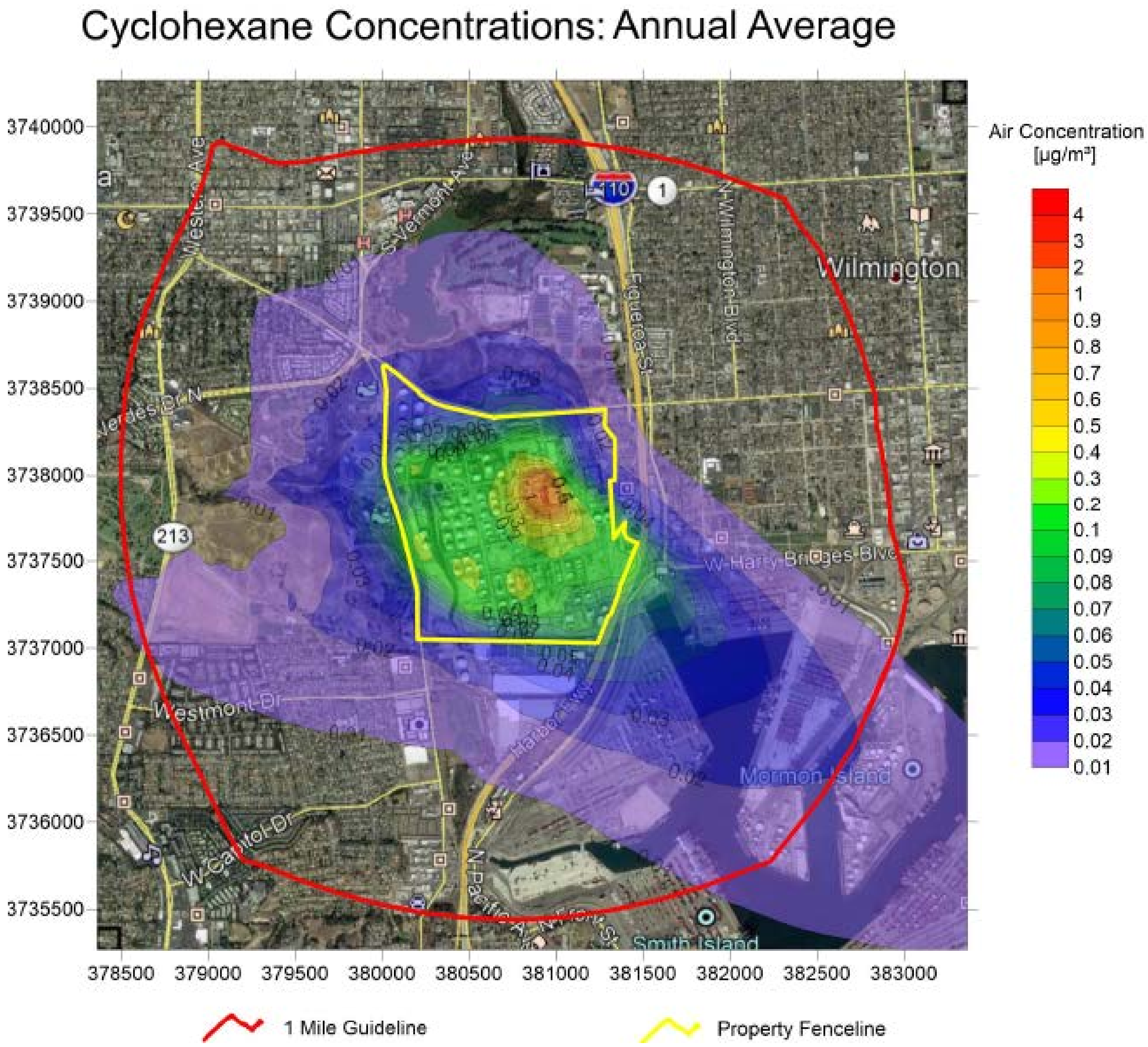


Figure 2.19 – Annual Diesel Particulate Matter (DPM) Emission Concentrations

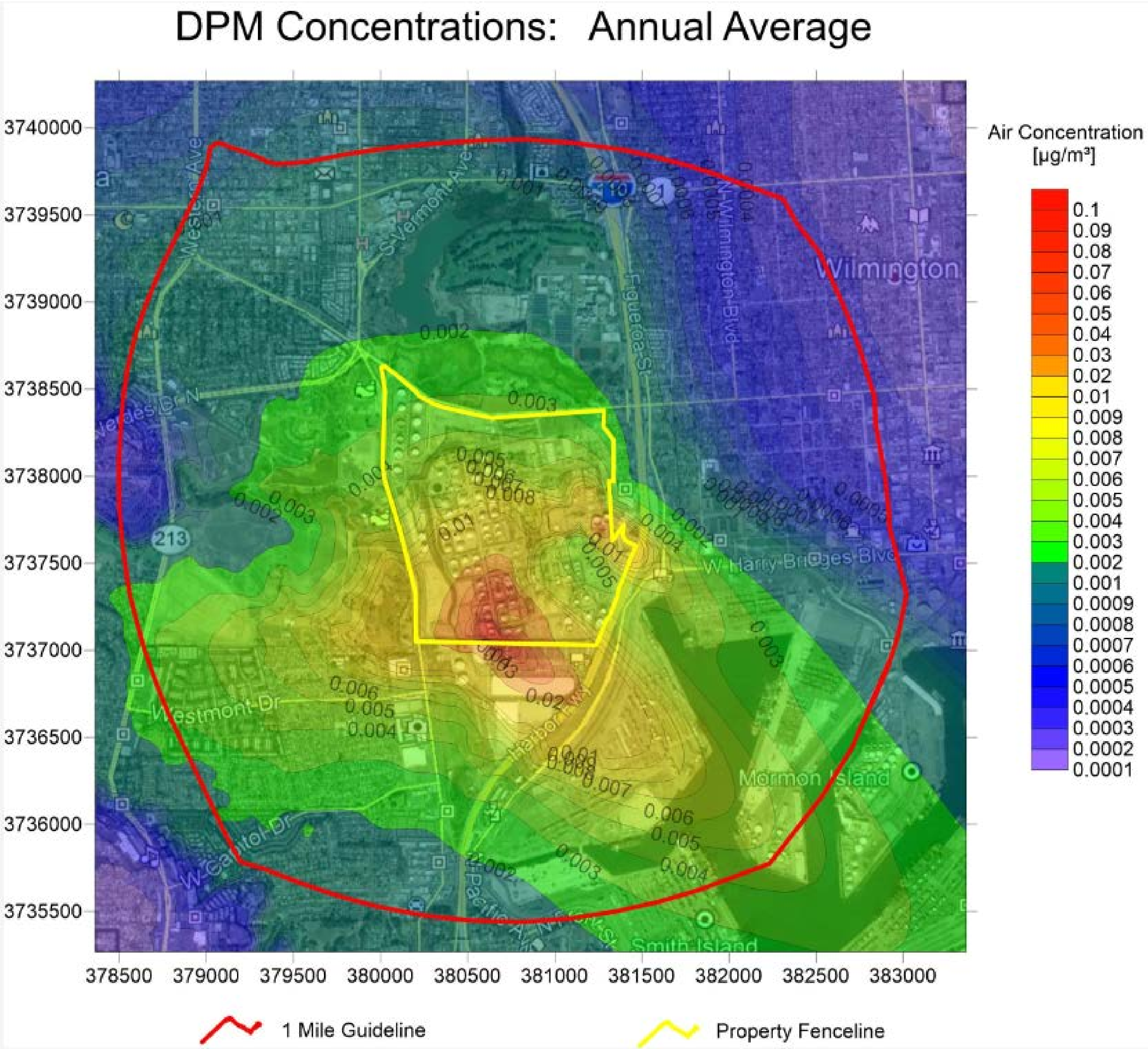


Figure 2.20 – Annual Ethyl Benzene Emission Concentrations

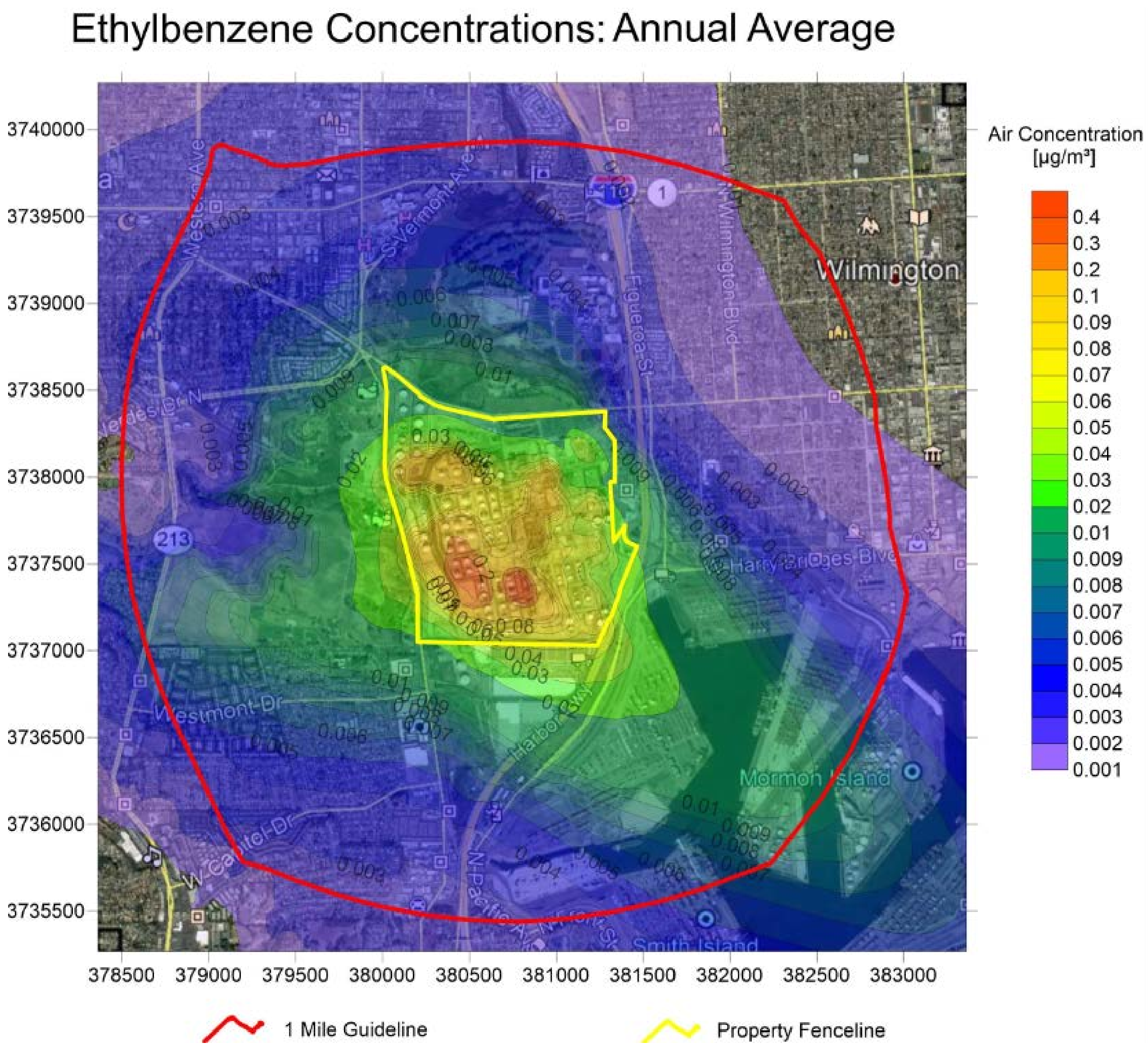


Figure 2.21 – Annual Hexane Emission Concentrations

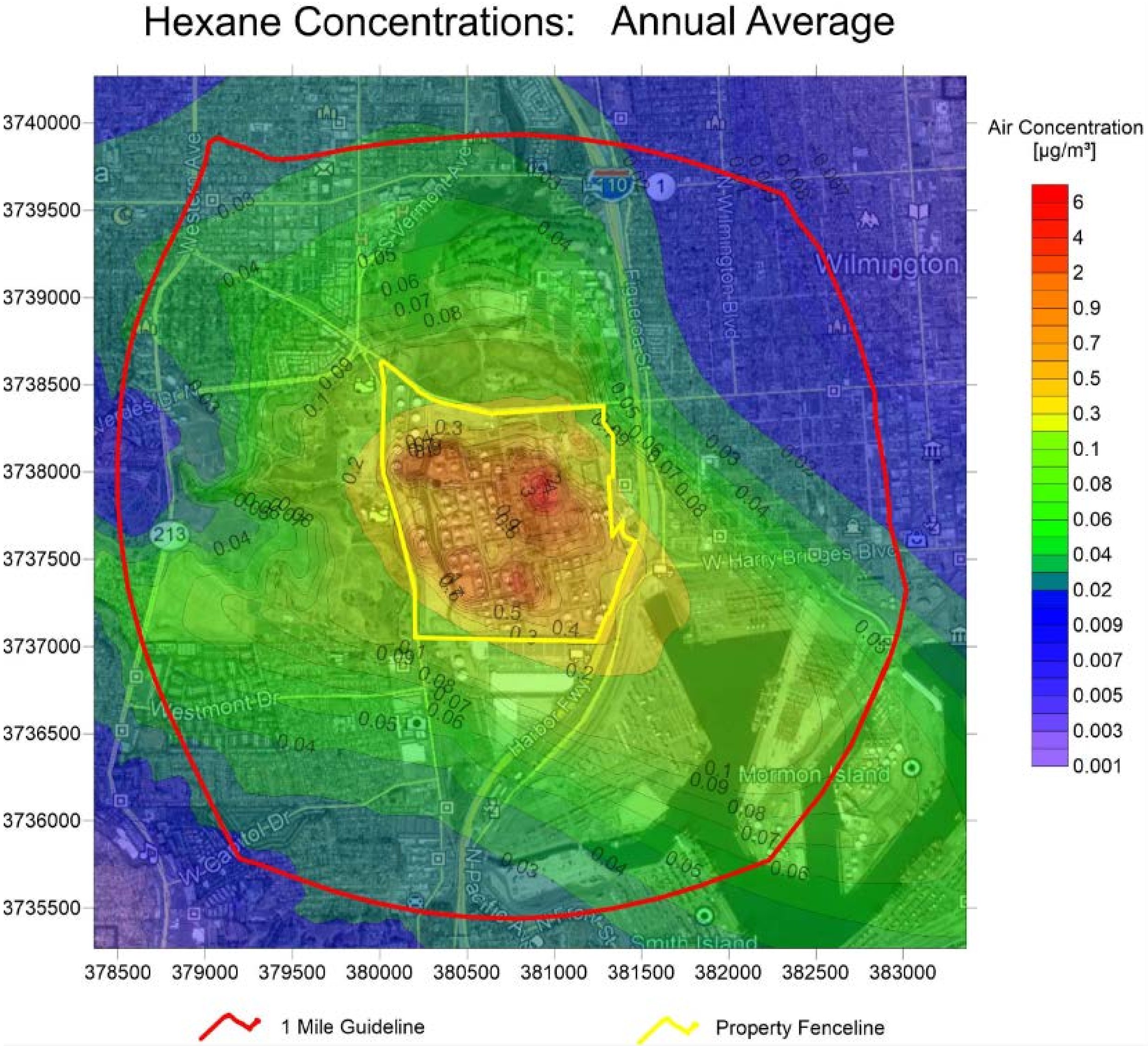


Figure 2.22 – Annual Hydrocyanic Acid Emission Concentrations

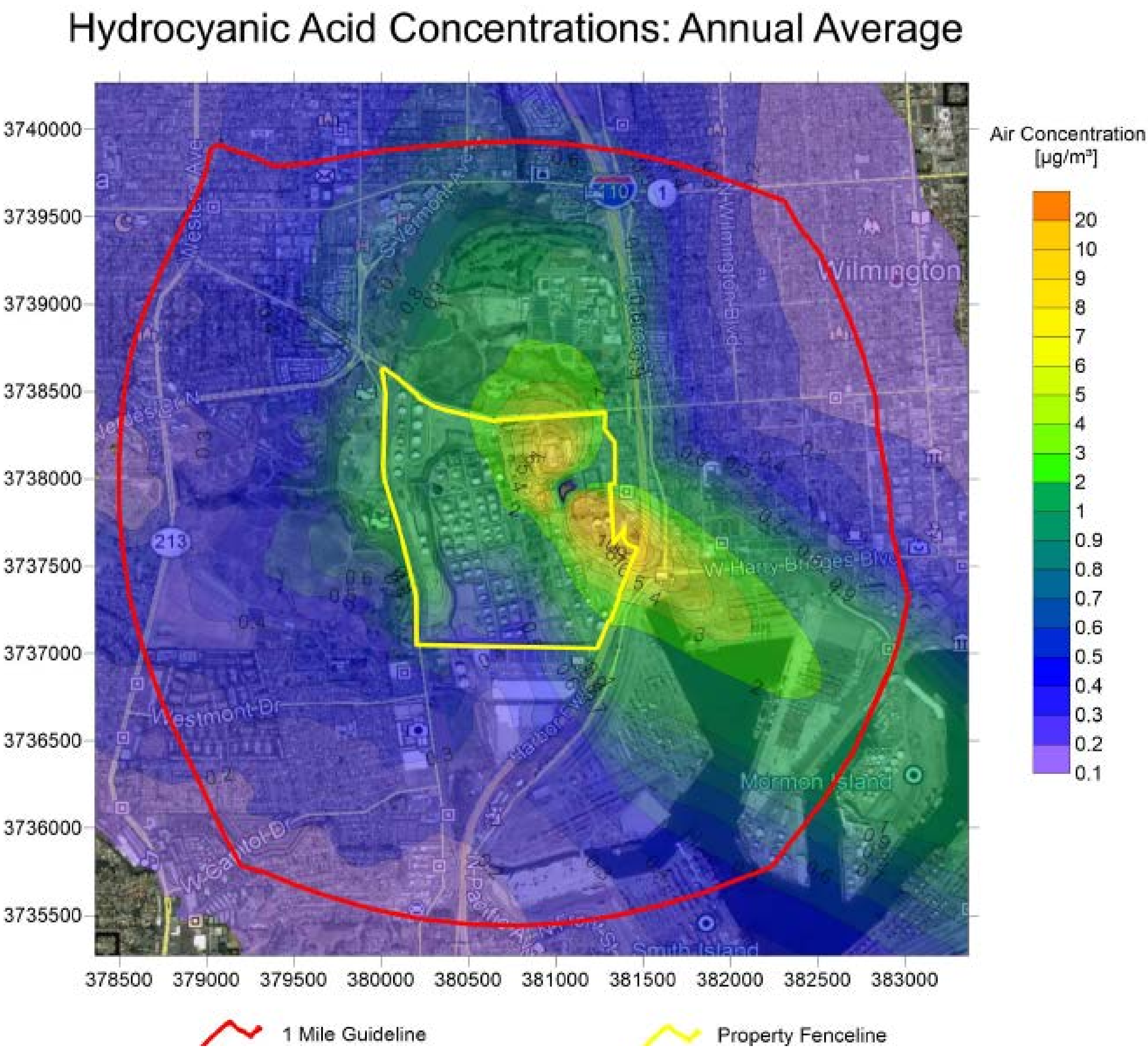


Figure 2.23 – Annual Hydrogen Sulfide Emission Concentrations

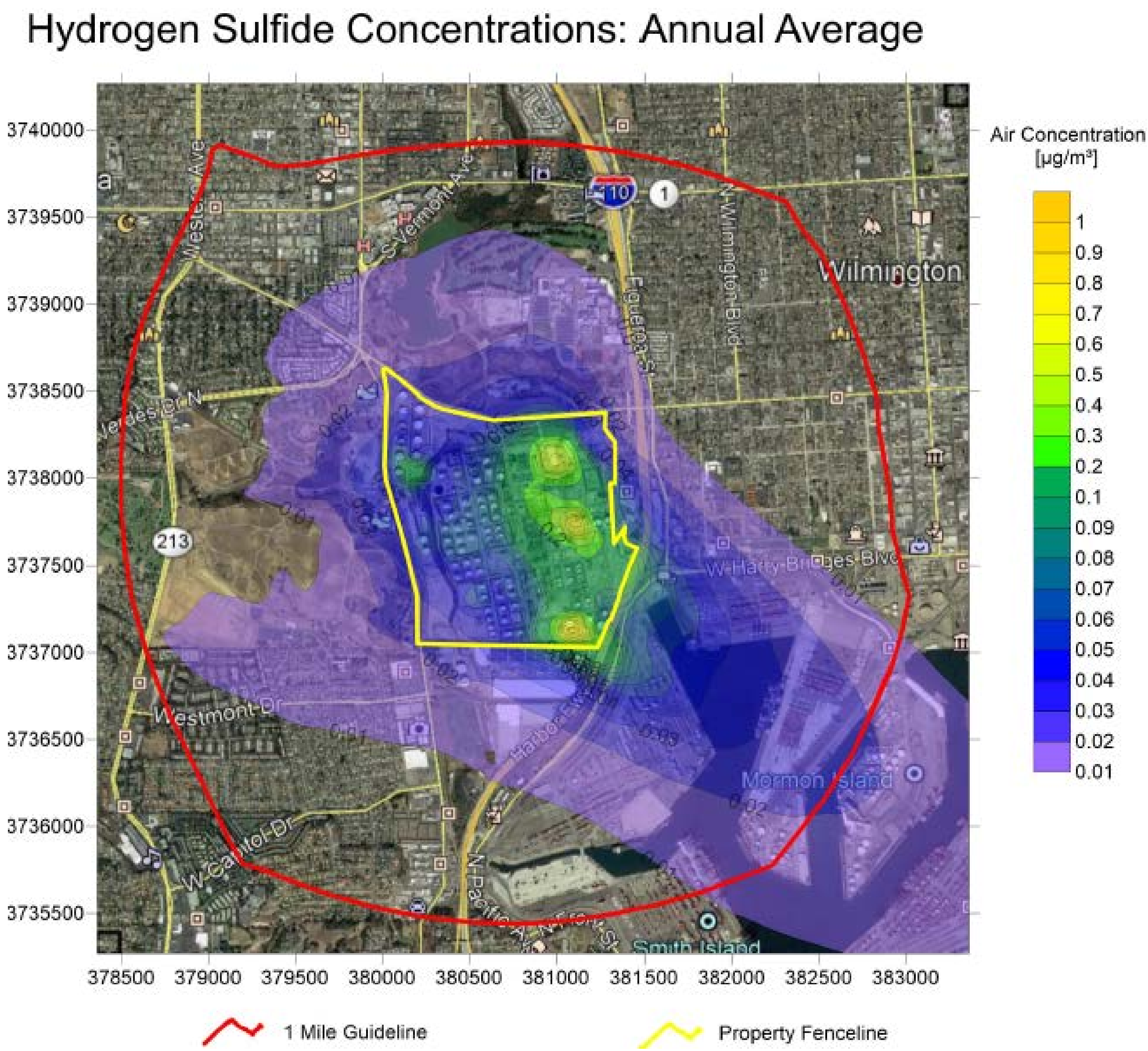


Figure 2.24 – Annual Methanol Emission Concentrations

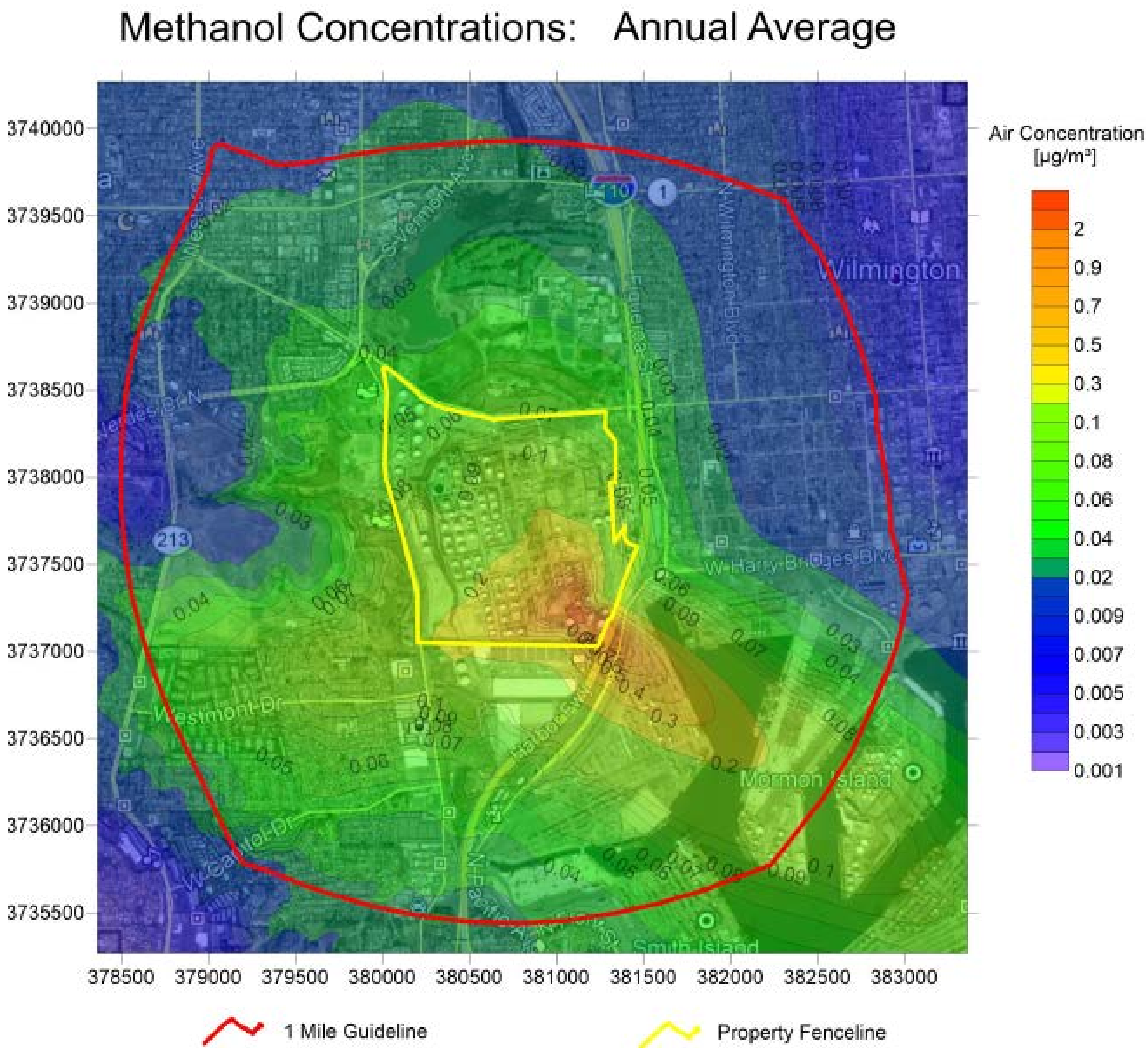


Figure 2.25 – Annual Propylene Emission Concentrations

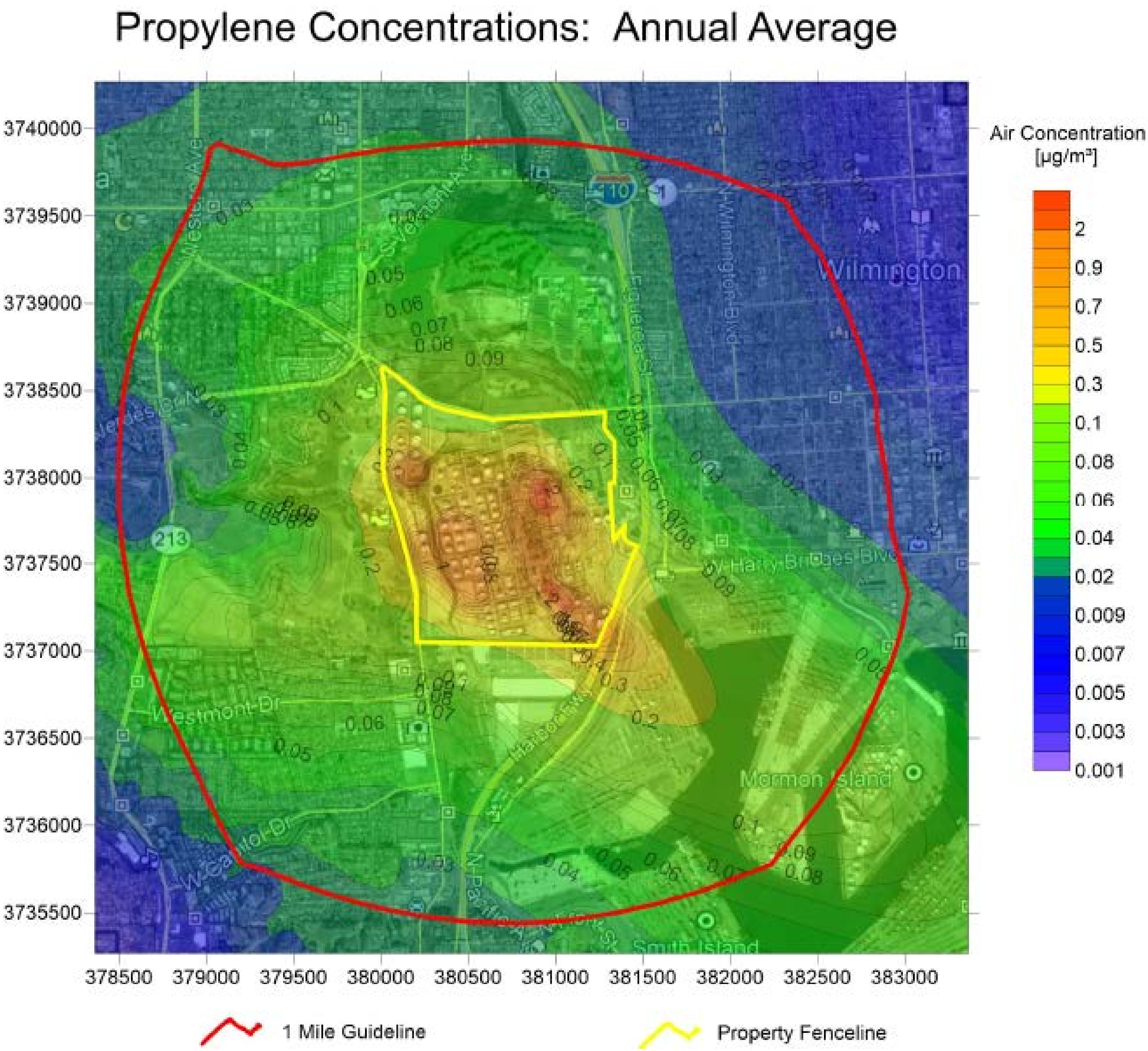


Figure 2.26 – Annual Toluene Emission Concentrations

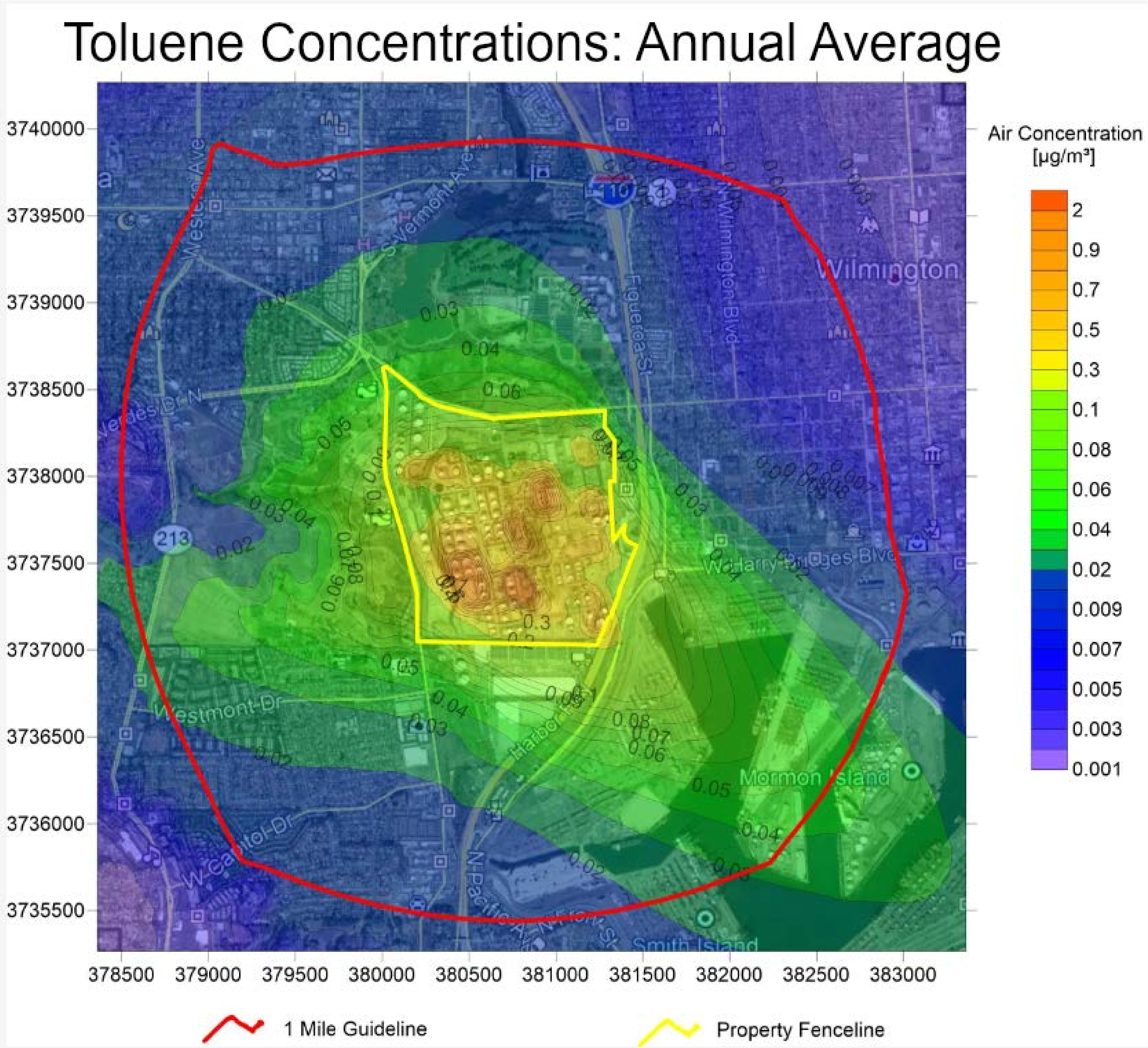
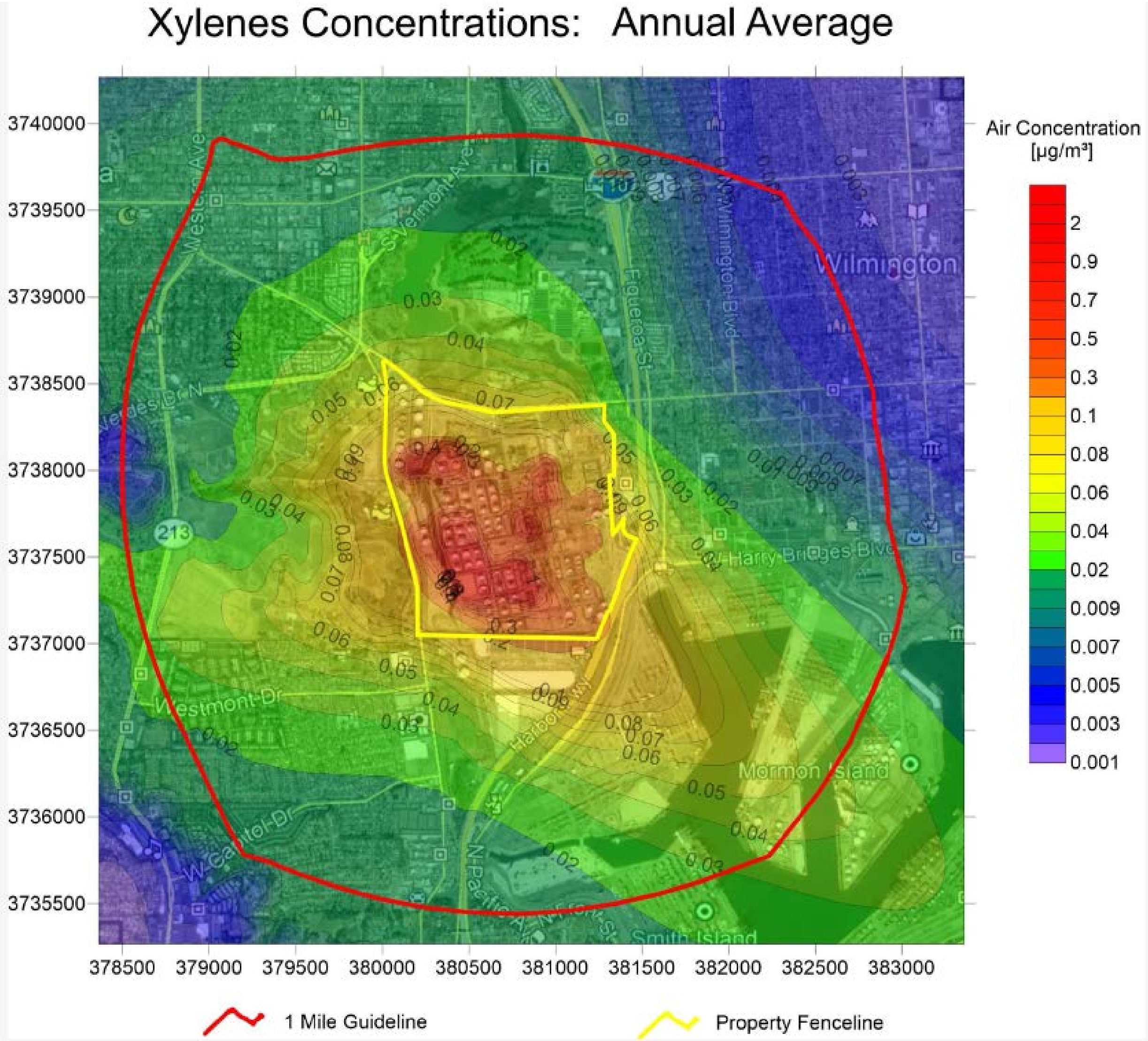


Figure 2.27 – Annual Xylene Emission Concentrations



Section 3 - Proposed Site Locations for Fence-line Monitoring Systems

Selection of Pollutants to be Monitored

Table 3.1 presents the maximum hourly concentration and the portion of the fence line impacted by each of the pollutants modelled. Once the modelling was complete, the target pollutants underwent further screening to determine if they would be detectable by commercially available open-path, fence-line air monitoring systems at the fence line of the refinery. All portions of the fence line that were within one mile of a community were considered for open-path, fence-line monitoring. If the modelling indicated the maximum concentration of pollutants was within the detection limits of an open-path air monitoring system, then the appropriate technology was selected for use along that portion of the refinery fence line. In addition, if the selected technology has the capability to detect additional gases that are present as possible emissions from the refinery, they were added to list of monitored pollutants for that system. The rational for including the additional pollutants is that, although they are not expected to be detected on a routine basis, they could be detected in the event of an unplanned release. Table 3.2 presents the pollutants that will be included for fence-line monitoring at the Phillips 66 Wilmington Refinery.

Table 3.1 – Maximum Hourly Impact of Pollutants Modelled

Compound	Acute Inhalation REL (ug/m3)	Max One Hourly Concentration at Nearest Communities (ug/m3)	Max One Hourly Concentration at Fence line (ug/m3)	Fence Line
Ammonia	3200	40	50	East
Benzene	27	0.5	1	East
Cyclohexane	-	2	5	South, North
Black Carbon	-	1	4	North
Ethylbenzene	2000	0.5	1	South, West
Hexane	7000	7	10	South, West
Hydrocyanic Acid	340	300	500	East
Hydrogen Sulfide	42	1	4	South
Methanol	28000	10	30	South
Propylene	3000	5	20	South West
Toluene	37000	2	5	South
Xylene	22000	3	9	West

Table 3.2 - Gases and Specific Monitoring Technologies

Monitoring Technology	Pollutant	Lower Detection Limit	Upper Detection Limit
Open-Path FTIR	1,3 Butadiene	3.0 ppm-m	636,000 ppm-m
	Acrolein	6.0 ppm-m	120 ppm-m
	Acetaldehyde	5.0 ppm-m	130 ppm-m
	Ammonia	0.9 ppm-m	192,000 ppm-m
	Carbonyl Sulfide	1.5 ppm-m	66,000 ppm-m
	Cyclohexane	10 ppm-m	2,000 ppm-m
	Formaldehyde	3.0 ppm-m	16,800 ppm-m
	Hexane	10 ppm-m	2,000 ppm-m
	Hydrocyanic Acid	13.5 ppm-m	1,600 ppm-m
	Methane	5.0 ppm-m	10,000 ppm-m
	Methanol	4.2 ppm-m	840 ppm-m
	Propylene	10.0 ppm-m	200 ppm-m
	Styrene	3.0 ppm-m	130 ppm-m
	Total Non-Methane VOCs	10.0 ppm-m	10,000 ppm-m
Open-path UV	Benzene	0.7 ppm-m	10,000 ppm-m
	Ethyl Benzene	2.65 ppm-m	30,000 ppm-m
	Sulfur Dioxide	1.25 ppm-m	10,000 ppm-m
	Toluene	1.05 ppm-m	15,000 ppm-m
	Xylene	0.86 ppm-m	3,600 ppm-m
Point Monitoring	Black Carbon	0.05 ug/m3	250 ug/m3
Point Monitoring	Hydrogen Sulfide	2 ppb	20 ppm

Note: The detection limits for the open-path air monitoring system are reported as path integrated concentrations and may vary due to environmental conditions and sample path length.

Site Location of Monitoring Equipment

It should be noted the fence-line monitors being installed as described in this Monitoring Plan will complement and enhance air emission monitoring currently being done on the fence line and on emission sources throughout the refinery for compliance with SCAQMD and EPA rules. This includes but is not limited to the following air monitoring systems:

- Passive diffusion tubes are located around the refinery fence line to be analyzed for benzene beginning in 2018, as required by EPA's Refinery Sector Rule.
- Continuous emission monitors measure NOx emissions from heater and boiler stacks, SO_2 emissions from sulfur plants, and sulfur in fuel gas as required by both SCAQMD and EPA rules.

- Several hundred thousand valves, pumps and connections are monitored throughout the refinery to detect any low-level hydrocarbon leaks by a team of trained inspectors as required by SCAQMD and EPA rules.

Based on the modelling analysis, the majority of emissions are transported from the refinery in either a North Westerly direction or a South Easterly direction. For this reason, the design of the location of the open-path, fence-line systems are intended to capture pollutants transported in these directions where a community is within one mile of the refinery fence line. In addition, consideration of additional open-path air monitoring will be considered for any community or public facility (i.e. school or community college) located within one mile of the refinery fence line. Point sample monitoring equipment for Black Carbon will be located within the refinery where in areas with the highest annual concentration. The following analysis presents the siting evaluation for each sector of the refinery:

West Side of Refinery – Based on the air dispersion, modelling emissions from the refinery will impact the community northwest of the refinery a significant amount of the time. For this reason, open-path monitoring equipment will be placed along paths covering the northwest side of the refinery. The systems will include open-path FTIR, and UV air monitoring systems to cover the pollutants listed in Table 3.2. The UV air monitoring system will have the capability to sample multiple beam-paths during the data collection cycle.

East Side of Refinery – Based on the air dispersion, modelling emissions from the refinery will impact the community east of the refinery a significant amount of the time. For this reason, open-path monitoring equipment will be placed along paths covering the northeast side of the refinery. The systems will include open-path FTIR, and UV air monitoring systems to cover the pollutants listed in Table 3.2. Black Carbon and H_2S point monitoring systems will be placed at both corners of the east side of the refinery.

North Side of the Refinery – The section of the Northern portion of the refinery that impacts the community to the Northwest will be covered by the open-path, fence-line system. This will include open-path FTIR and UV air monitoring systems to cover the pollutants listed in Table 3.2. There is no residential community located due North of the refinery within one mile of the refinery. However, there is a community college located within one mile north of the refinery. This fence line will include open-path FTIR, and UV air monitoring systems to cover the pollutants listed in Table 3.2. The UV air monitoring system will have the capability to sample multiple beam-paths during the data collection cycle.

South Side of the Refinery – The south side of the refinery is outside of the predominant wind directions of the refinery and the annual pollution concentrations are below the detection limits for fence-line air monitoring systems. However, there is a community located less than one half of a mile due Southwest of the refinery. To cover this population, a multi-path UV air monitoring system will be located at the Southwest corner of the refinery. In addition, Black Carbon and H_2S point monitoring systems will also be placed at this location as the modelling indicates this area has the highest level of diesel particulate matter at the refinery.

* Note - The installation and operation of the Multi-path UV air monitoring systems at the Northeast and Southwest corners of the refinery, are pending agreement between the SCAQMD and Phillips 66.

Figure 3.1 presents the proposed locations for the fence-line air monitoring systems at the Phillips 66 Wilmington Refinery. To minimize the possibility of blocking the light beams, the height of all ground level platforms will be at least 3 meters above ground. The height of monitoring platforms or reflectors placed on existing structures will be determined based minimizing the possibility of beam blockage. Table 3.3 describes the specific monitoring equipment and pollutants coverage for each quadrant of the refinery.

Figure 3.1 - Map of Fence-Line monitoring

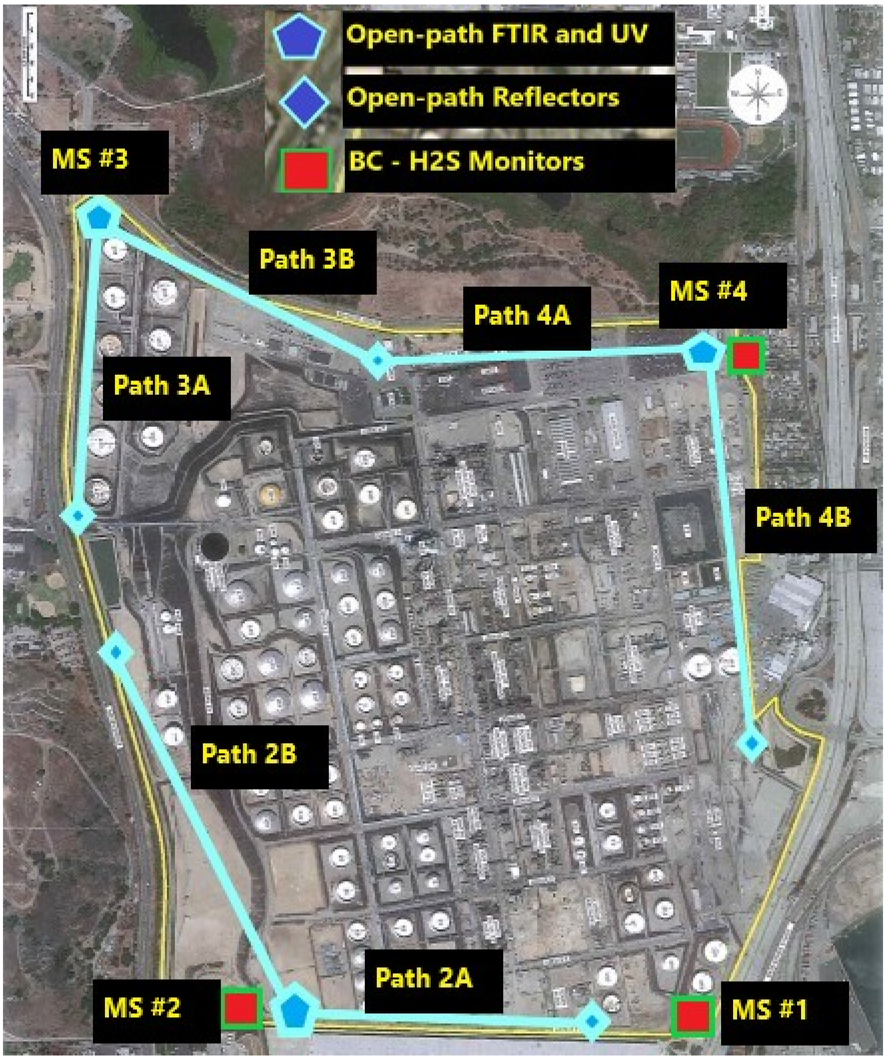


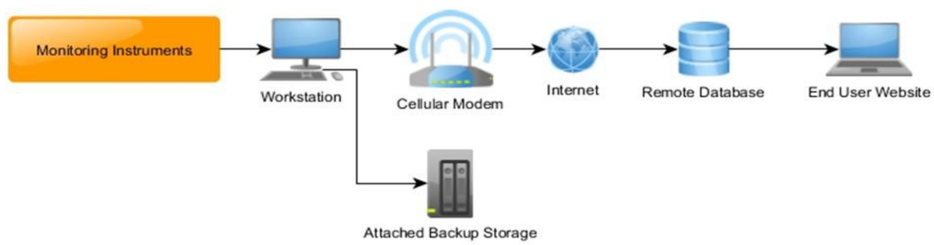
Table 3.3 - Description of Equipment of Pollution Coverage

Monitoring Station	Path #	Path Distance (Approximate)	Monitoring Equipment	Pollutant Measured
MS #1	NA	NA	Black Carbon and H2S Point Monitor.	Black Carbon, H_2S
MS #2	Path 2A	600	Open Path FTIR and UV. Black Carbon and H2S Point Monitor.	Gases Listed in Table 3.2
MS #2	Path 2B	700	Open Path FTIR and UV. Black Carbon and H2S Point Monitor.	Gases Listed in Table 3.2
MS #3	Path 3A	600	Open Path FTIR and UV.	Gases Listed in Table 3.2
MS #3	Path 3B	625	Open Path FTIR and UV.	Gases Listed in Table 3.2
MS #4	Path 4A	600	Open Path FTIR and UV. Black Carbon and H2S Point Monitor.	Gases Listed in Table 3.2
MS #4	Path 4B	650	Open Path FTIR and UV. Black Carbon and H2S Point Monitor.	Gases Listed in Table 3.2

Section 4– Data Presentation to the Public

All air monitoring equipment specified for the Phillips 66 fence-line system will collect data on five-minute averages and be transmitted to an Internet website where the real- time results can be viewed by the public. Figure 4.1 provides an example of how the monitoring data will be communicated.

Figure 4.1 - Data Communication System



The website will be developed with input from the various stakeholders within the community and may evolve in the future as stakeholder needs change. The community website will include a message board to inform the public of relevant information as needed. For example, the message board may be updated when an analyzer is undergoing maintenance, QA/QC checks or in other conditions where an analyzer is not in an operational state for an extended period. In addition, the public will be able to send emails suggesting enhancements to the public access website or any other issue of interest to the community. Data from the fence-line monitors will be transmitted to an internet website where the near-real-time results can be viewed.

General Description of the Community Website

As part of the fence-line monitoring program, a public website will be created to educate the public on the information provided by the fence-line monitoring system in both English and Spanish languages. The site will present air monitor readings and is designed as an educational tool to inform the community about Carson's air quality, plus answer questions about the air monitoring system used to capture these readings. It will include a tutorial about where these readings come from, what they mean and how the public can learn more. The website will include four major sections:

- Learning Center
- Resources and Contacts
- Real-time Data
- Reports and Archives

Learning Center

The website will include a learning center to educate the public on the information provided on the site, which will include the following elements:

- Where the fence-line monitors are located
- Why these locations were selected

- What chemicals are being monitored
- What equipment is being used
- Terms and Definitions

Resources and Contacts

Resources and contact information will be provided for the general public to inquire about this website, the monitoring program, and resources associated with the possible health effects of the toxics being monitored. Resource links will include:

- The P66 24-hour Community Hotline
- The contractor operating and maintaining the fence-line system
- The South Coast Air Quality Management District (SCAQMD)
- The California EPA Air Resources Board (CARB)
- The California Division of Occupational Safety and Health (Cal/OSHA)
- The California Office of Environmental Health Hazard Assessment
- The U.S. Environmental Protection Agency
- The World Health Organization

Real-time Data Display

Data will be displayed using real-time 5-minute data as well as 1-hour and 8-hour averages. In addition, the website will include a method for the general public to sign up for notifications for status updates associated with the community website. Status updates will include notifications when; instrument readings are above preset levels, instrument is off-line or inoperable; when maintenance is being performed on the instruments or any other significant event associated with the fence-line monitoring programs occurs.

Reports and Archives

The public will be provided access to an archive of air quality monitoring reports gathered by the air quality monitoring system. Regular program reports will be published on a monthly basis. Additional air monitoring reports will be published following a refinery incident.

Section 5 – Data Management

Data generated by the fence-line monitoring equipment will undergo review throughout the measurement and reporting process. Included in this process are automated QA/QC checks that occur before data is reported on the real-time website. Under normal circumstances a five-minute average measurement will appear on the website within 10 minutes of the end of the measurement period. However, the data uploaded may be impacted by internet traffic. An automated system conducts the Quality Assurance checks before the data is reported to the website. The site will also make available a rolling 24-hour trend of the five-minute data for each gas reported. Table 5.1 lists the real-time data quality checks.

Table 5.1 – Real-time Data Quality Checks

Real-Time Check	Check	Action
Low Signal Alarm	Signal threshold test	If signal is below threshold value: 1) Real-time website reports "Low Signal" to analyzer. Automated email is sent to P66 and the fence-line contractor
Instrument Error Code	Instrument Error Code	Real-time website reports "off-line" message. Email sent to P66 and fence-line contractor. Website message board updated to inform community that analyzer troubleshooting underway. Website updated when system is back on line.
Instrument Workstation Off-line	Instrument Communication Check	Real-time website reports "off-line" message. Email sent to P66 and fence-line contractor. Website message board updated to inform community that computer workstation troubleshooting underway. Website updated when system is back on line.
Internet Connection Lost	Backup Connection enabled	Email sent to P66 and fence-line contractor. Community is not notified because backup connection will be enabled.
High Detection	Valid Data Detection Above Threshold	Real-time website indicates detection above alarm threshold by color change for gas. Notification sent to P66 and fence-line contractor. Contractor will examine raw data to validate detection. P66 will initiate investigation into source. Message Board on website will be updated with information as available.

The entire fence-line monitoring system is continually monitored for system performance. This includes the instruments, workstations, and Internet communication hardware. If at any time an element of the system fails to meet performance criteria, a message is generated to key personnel at P66 and the Contractor who will begin activities to correct the problem. If an issue cannot be immediately corrected, the real-time website will be updated with a notification explaining the problem and the corrective action activities. Table 5.2 lists elements and the performance thresholds.

Table 5.2 - Real-time Instrument Performance Checks

Problem	Notification	Action
Analyzer has low signal	Notification sent to Contactor and P66	Website updated with low signal message for specific analyzer.
Analyzer off-line	Notification sent to Contactor and P66	Website updated with analyzer off-line message. Technician dispatched to correct issue.
Workstation fails	Notification sent to Contactor and P66	Website updated with analyzer off-line message. Technician dispatched to correct issue.
Internet communication failure	Notification sent to Contactor and P66	Backup Internet connection activated.

In addition to the real-time data checks, data from the fence-line system will be reviewed and validated on a monthly basis with the results stored in a separate portion of the monitoring database from the raw data. Data review and validation include but are not limited to the following:

- Non-field data such as calibration data.

- Spurious data associated with power or mechanical issues.

- Data with a light signal below predetermined threshold.

Data that has been flagged as non-valid will be retained along with a notation for the reason it was flagged. Table 5.3 summarizes the process by which monitoring data is reviewed and post processed.

Table 5.3 – Monthly Data Validation Checks

Post Process Data Check	Check	Action
Non-field Data Check	Maintenance logs and QA/QC logs will be checked to see when systems were not in normal operating mode.	Quality Assurance Manager will flag any data that meets these criteria. Data will be excluded from QA/QC report.
Spurious Data	Instrument error codes will be checked and flagged if instrument error codes are recorded.	Quality Assurance Manager will flag any data that meets these criteria. Data will be excluded from QA/QC report.
Low Signal	Data will be reviewed for low signal. If low signal is recorded, data will be flagged and reason for low signal will be recorded (weather, system misalignment etc.)	Quality Assurance Manager will flag any data that meets these criteria. Data will be excluded from QA/QC report.
Gas Detection Validation	Spectroscopist will review data detections.	Quality Assurance Manager includes any verified detections in QA/QC report.

Section – 6   Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs)

The QAPP and SOPs will be living documents that will be updated and revised as the P66 and its contractors gain experience operating, maintain and managing their fence-line monitoring system. These documents will be reviewed periodically and revised and reapproved as needed. This will include an annual review and 5-year updates or more frequently if significant changes are made. The QAPP and SOPs will be submitted for review and approval by SCAQMD when the final equipment is selected for the fence-line program. The plan will be review by a third-party auditing process that will be reviewed by SCAQMD. Finally, it is understood that SCAQMD may periodically audit the QAPP and SOPs. The following items will be included in the QAPP.

Outline - Quality Assurance Project Plan for Fence-Line Monitoring Program

Document Control Page
Signatory Page
Table of Contents
Distribution List

Section #1 - Project Management

- Fence-line Monitoring Task Organization
- Key Refinery Personnel
- Key Contactor Personnel
  - Contractor Program Manager
  - Contractor Quality Assurance Manager
  - Contractor Data Processing Manager
  - Contractor Field Technician

Section #2 - Description of the Fence-Line Program

- Objective of the monitoring program
- Site Map
- Physical Description of equipment location including GPS Coordinates, elevations, and monitoring equipment
- Upper and Lower Detection Limits for each pollutant based on sample path

Section #3 – Description of Hardware

Analyzer Description:

- Open-path FTIR
- Open-path UV DOAS
- H2S Point Monitor
- Black Carbon Point Monitor
- Meteorological Station

Data Collection Equipment

- Workstations
- Routers
- Remote Restart Equipment
- Cloud Based Data Storage

Section #4 - Quality Management System

Instrument Quality Assurance Quality Control

- Level 0 Continuous Real-time Operational Checks
    - Monitor instrument error codes
    - Monitor light signal from open-path monitors
- Level 1 Monthly Checks
    - Evaluate system noise
    - Calibration checks
- Level 2 Quarterly Checks
    - Detection limit checks
    - Precision, linearity, accuracy checks
- Level 3 Annual Checks
    - Annual servicing of instruments
    - Preventive maintenance
    - Validate systems are meeting original factory acceptance specifications

Data Management Quality Assurance Quality Control

- Level 0 – Continuous Real-time Checks
    - Real-time validation of the data using two methods for quantification
- Level 1 - Daily Review of Data
    - Operational staff daily review
- Level 2 – Weekly Review Data
    - Validation staff review considering historical and similar measurements
- Level 3 – Monthly Review of Data
    - Supervisor level review with consideration of interrelationships with other data

Monitoring Program Response

- Level 0 - Real Time System Checks
    - Real-time notification of instrument error code
    - Real-time notification light signal from open-path monitoring
- Level 1 - Daily System Checks
    - Check community website three times per day
- Level 2 - Monthly Report and Review of Operational Performance
    - Review on-stream efficiency
- Level 3 - Annual Audit
    - Annual independent audit of fence line monitoring program

Section #5 - System Maintenance

Maintenance and service based on real-time error code
Monthly maintenance check of instruments
Quarterly preventive maintenance
Annual service from certified manufacture representative

Section #6 – Training

Field work training:

- System alignment
- Routine analyzer maintenance
- QA checks on site

Data analysis

- Verification of detections
- Data validation

Section #7 – Document Control

Management and Organization

- Quality Assurance Project Plan for Fence-Line Monitoring Program
- Organizational chart
- Personnel qualifications and training
- Support contract

Site Information

- Site maps
- Equipment registers

Field work

- SOPs
- Field notebooks
- Sample handling check sheets
- Maintenance check sheets
- QA check sheets

Raw data

- Description of raw data files generated by instruments

Data Reporting

- Realtime website
- Monthly reports

Data Management

- Database structure
- Data management flowchart
- Database backup plan

Quality Assurance

- Site audits
- Corrective action reports
- System audits
- Data quality assessment