

RULE 364. REFINERY FENCELINE AND COMMUNITY AIR MONITORING
(Adopted 5/21/2020)

A. Applicability

This rule shall apply to petroleum refineries.

B. Exemptions

None.

C. Definitions

See Rule 102, Definitions, for definitions not limited to this rule. For the purposes of this rule, the following definitions shall apply:

“Community Air Monitoring System” means a combination of equipment that measures and records air pollutant concentrations in communities near a petroleum refinery that is currently refining or storing oil products.

“Fenceline Air Monitoring System” means a combination of equipment that measures and records air pollutant concentrations at or near the property boundary of a petroleum refinery.

“Petroleum Refinery” means a facility that is permitted to process petroleum, as defined in the Standard Industrial Classification Manual as Industry No. 2911.

“Real-time” means the actual or near actual time during which pollutant levels occur at or near the property boundary of a petroleum refinery or in a nearby community.

“Refinery Fenceline Air Monitoring Guidelines” means a written framework to be used by the Control Officer to evaluate a refinery fenceline air monitoring plan, as shown in Attachment A.

D. Requirements – Fenceline Monitoring Plan

1. No later than August 21, 2020, the owner or operator of a petroleum refinery shall submit to the Control Officer a written fenceline air monitoring plan for establishing and operating a real-time fenceline air monitoring system.
2. All fenceline air monitoring plans shall be consistent with the attached Rule 364 Refinery Fenceline Air Monitoring Guidelines. At a minimum, the fenceline air monitoring plan shall provide the following detailed information:
 - a. Equipment to be used to continuously monitor, record, and report air pollutant levels for the pollutants specified in Table 1 – Pollutants For Fenceline Air Monitoring in real-time, at or near the property boundary of the petroleum refinery;
 - b. Equipment to be used to continuously record wind speed and wind direction data in at least one on-site location at the petroleum refinery;
 - c. Siting and equipment specifications;
 - d. A timeline and procedures for implementing the fenceline air monitoring plan, including information pertaining to the installation, operation, maintenance, and quality assurance, for the fenceline air monitoring system;

- e. Procedures for air monitoring equipment maintenance and failures. The procedures for equipment maintenance and failures shall include a plan that describes the maintenance activities necessary to maintain proper performance of the fenceline air monitoring equipment and a plan that deals with equipment failures. At a minimum, the maintenance and failure plan shall describe the following:
 - 1. Routine maintenance requirements for equipment;
 - 2. A planned schedule for routine maintenance performed on equipment;
 - 3. Length of time that equipment will not be operating during routine maintenance activities;
 - 4. Notification procedures to inform the Control Officer of any failures to accurately provide monitoring data for 24 hours or longer; and
 - 5. Temporary air monitoring measures that will be implemented in the event of an equipment failure or during routine maintenance activities, and that will be used until the fenceline air monitoring system is restored to normal operating conditions;
 - f. Procedures for implementing quality assurance by a qualified independent party, including quality control and audits of the fenceline air monitoring systems;
 - g. Methods for dissemination of data collected by the equipment specified in Sections D.2.a and D.2.b to the public, local response agencies, and the District as expeditiously as possible.
3. The fenceline air monitoring plan shall address real-time air monitoring for the air pollutants specified in Table 1 on a continuous basis.

TABLE 1 - POLLUTANTS FOR FENCELINE AIR MONITORING

<i>Air Pollutants</i>
Benzene
Toluene
Ethylbenzene
Xylene
Sulfur Dioxide
Hydrogen Sulfide

E. Requirements – Fenceline Monitoring Plan Review and Updates

- 1. The Control Officer shall notify the owner or operator in writing whether the fenceline air monitoring plan is approved or whether modifications are necessary. Determination of approval status for the fenceline air monitoring plan shall be based on, at a minimum, submittal of information that satisfies the criteria in Section D.
 - a. If modifications are necessary, the owner or operator shall resubmit the fenceline air monitoring plan within 30 days after the notification by the Control Officer. The resubmitted plan shall include any information necessary to address deficiencies identified by the District.
 - b. The Control Officer may either approve the revised and resubmitted fenceline air monitoring plan or modify the plan and approve it as modified.
- 2. The owner or operator of a petroleum refinery shall revise and submit an updated fenceline air monitoring plan to the Control Officer as follows:

- a. Forty-five (45) days before the date of implementation of any planned facility, equipment, process or administrative modification that could result in changes to an approved fenceline air monitoring plan.
 - b. Ten (10) days after the date of any unplanned facility, equipment, process or administrative modification that could result in changes to an approved fenceline air monitoring plan.
 - c. Sixty (60) days after the date of receiving information that an approved fenceline air monitoring plan does not adequately measure one or more pollutants identified in Table 1. This includes equipment failures that result in a failure to accurately provide continuous, real-time air monitoring information for more than 30 days.
3. Failure to comply with the requirements of Section E.2 shall result in revocation of an approved fenceline air monitoring plan. Thirty (30) days after revocation of an approved fenceline air monitoring plan, the owner or operator shall submit a new fenceline air monitoring plan to the Control Officer that meets the requirements of this rule.

F. Requirements – Fenceline Air Monitoring System

Beginning no later than 365 days after the fenceline air monitoring plan is approved by the Control Officer, the owner or operator of a petroleum refinery shall complete installation and begin operation of a real-time fenceline air monitoring system in accordance with the approved fenceline air monitoring plan.

G. Requirements – Recordkeeping

The owner or operator shall maintain records of all information required under this rule for at least five years and shall make the information available to District staff upon request. Records for at least the two most recent years shall be kept onsite.

H. Requirements – Refinery Fenceline and Community Air Monitoring Fees

- 1. Pursuant to California Health and Safety Code §42705.6, an owner or operator of a petroleum refinery shall pay the following fees associated with the refinery fenceline and community air monitoring system.
 - a. An owner or operator of a petroleum refinery shall make a payment to the District in the amount of \$7,500 for the review of a refinery fenceline monitoring plan. The review fee shall be submitted with the initial monitoring plan pursuant to Section D.1 and with any new monitoring plans pursuant to Section E.3 of this rule. All costs incurred by the District for the review and revision of a District-approved monitoring plan, pursuant to Section E.2, shall be reimbursable costs pursuant to Section I.C of Rule 210, Fees.
 - b. No later than November 21, 2020, the owner or operator of a petroleum refinery shall make a payment to the District in the amount to cover the shared cost of the initial installation of the co-located community air monitoring system. Consistent with California Health and Safety Code §42705.6, these costs shall be shared in a reasonably equitable manner.
 - c. In the event that the community air monitoring system is not co-located with a District-operated monitoring station and is an independent monitoring station, the owner or operator of a petroleum refinery shall make an additional payment to the District in the amount to cover any additional costs for the initial installation of the community air monitoring system. This fee shall be due and payable no later than sixty (60) days after written notification by the District.

- d. Beginning in calendar year 2021, the owner or operator of a petroleum refinery shall make a payment to the District in the amount to cover the cost of the annual operation and maintenance of the community air monitoring system. Consistent with California Health and Safety Code §42705.6, if the community air monitoring system is co-located with a District-operated monitoring station, these costs will be shared in a reasonably equitable manner. Invoices for the annual operation and maintenance fee will be issued during the month of January. If the fees required by this section are not paid in full within sixty (60) days of the invoice date, a ten percent (10%) penalty shall be imposed for every thirty (30) days, or portion thereof, that the payment is overdue.
2. Any fee prescribed in this rule shall be adjusted annually by the Control Officer based on the change in the California Consumer Price Index (CPI) for the preceding year, as determined pursuant to Section 2212 of the Revenue and Taxation Code.
3. The refinery fenceline and community air monitoring fees required in this section are in addition to permit and other fees otherwise authorized to be collected from such facilities. Any subsequent owner(s) or operator(s) of a petroleum refinery shall be responsible for all unpaid fees listed in this rule. The Control Officer may initiate action to revoke the permit for any unpaid fees listed in this rule.
4. No later than January 1, 2026 and every five years thereafter, the Control Officer shall conduct a refinery fenceline and community air monitoring assessment to evaluate adequate coverage and/or need for equipment upgrades. The Control Officer shall also reassess the fees required by this section to ensure that the fees are consistent with the requirements of California Health and Safety Code §42705.6.



air pollution control district
SANTA BARBARA COUNTY



**Rule 364, Attachment A:
Refinery Fenceline
Air Monitoring Guidelines**
May 2020 – Final

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1. Executive Summary

The Santa Barbara County Air Pollution Control District (District) is proposing to adopt District Rule 364 – Refinery Fenceline and Community Air Monitoring. The purpose of District Rule 364 is to require a real-time fenceline air monitoring system at the only petroleum refinery in the District and to fund a refinery-related community air monitoring system that provides air quality information to the public and local response agencies about levels of various air pollutants in the community.

A fundamental requirement of Rule 364 is that a fenceline air monitoring plan must provide detailed information about the installation, operation, and maintenance of a fenceline air monitoring system. A fenceline air monitoring system is defined as a combination of equipment that measures and records air pollutant concentrations at or near the property boundary of a petroleum refinery. An effective fenceline air monitoring system should be capable of measuring routine emissions from the refinery and detecting leaks, as well as unplanned releases from refinery equipment and other sources of refinery-related emissions. The fenceline air monitoring system would inform refinery operators and the public about air pollution impacts to the nearby community.

Developing an air monitoring plan requires three important steps:

- 1) Identification of emissions sources and affected communities,
- 2) Deriving a fenceline air monitoring system that can provide real-time information about certain air pollutant levels, and
- 3) Effectively communicating this information using data management technology and displays.

An approvable fenceline air monitoring plan shall meet the following key objectives:

- Provide information about various air pollutant levels that are measured in real-time in durations short enough to adequately address significant emissions changes from refinery operations;
- Gather accurate air quality and meteorological data to identify both the time(s) and location(s) of various air pollutant levels near refinery operations and provide a comparison of these levels to other pollutant levels monitored in the area;
- Track long-term air pollutant levels, variations, and trends over time at or near the property boundaries of the petroleum refinery;
- Provide context to the data so that local communities can distinguish air quality in their location from other locations in the area and understand the potential health impacts associated with local air quality near petroleum refinery operations;
- Provide a notification system for communities near refineries when emissions exceed thresholds (e.g., RELs - Reference Exposure Levels); and
- Provide quarterly reports summarizing the measurements, data completeness, and quality assurance.

Rule 364 sets-forth requirements for air monitoring plans. The air monitoring plan shall include detailed information for the following:

- An evaluation of routine emission sources at the refinery (e.g., utilizing remote sensing or other measurement techniques or modeling studies, such as those used for health risk assessments);
- An analysis of the distribution of operations and processes within the refinery to determine potential emission sources;
- An assessment of air pollutant distribution in surrounding communities (e.g., mobile surveys, gradient measurements, and/or modeling studies used for health risk assessments);
- A summary of fenceline air monitoring instruments and ancillary equipment that are proposed to continuously measure, monitor, record, and report air pollutant levels in real-time near the petroleum refinery facility perimeter (i.e., fenceline);
- A summary of instrument specifications, detectable pollutants, and minimum and maximum detection limits for all air monitoring instruments;
- Proposed monitoring equipment siting and selected pathways (when applicable) for fenceline instruments, including the justification for selecting specific locations based on the assessments mentioned above;
- Operation and maintenance requirements for the proposed monitoring systems;
- An implementation schedule consistent with the requirements of Rule 364;
- Procedures for implementing quality assurance and quality control of data;
- A web-based system for disseminating information collected by the fenceline air monitoring system;
- Details of the proposed public notification system; and
- Demonstration of independent oversight.

This information will assist the Control Officer in determining the approval status of an air monitoring plan during the plan review process required by Rule 364.

2. Fenceline Air Monitoring Systems

A fenceline air monitoring system shall take into account the geospatial layout of the refinery site, potential release sources, local meteorology, atmospheric dispersion characteristics of the compounds of concern, the relative risk to likely receptors based on these criteria, and other considerations outlined in Table 1 below.

Table 1: Fenceline Air Monitoring Plan Checklist

Fenceline Air Monitoring Coverage (or Spatial Coverage)	
<input checked="" type="checkbox"/>	Identify the facility's proximity to sensitive receptors affected by the refinery operation and provide the information below:
	Distance from facility to closest sensitive receptors
	Location of downwind and upwind communities
	Eminent sources of non-refinery emissions surrounding the facility
	Dispersion modeling *
<input checked="" type="checkbox"/>	Describe historical facility emission patterns and pollutant hotspots based on the following:
	On-site location of operations and processes, and their level of emissions
	Facility plot plans and topography
	Dispersion modeling *
<input checked="" type="checkbox"/>	Select sampling locations along the perimeter of the facility based on the information above. Also, provide the following:
	Locations where equipment will be sited (e.g., GIS coordinates) and measurement pathways
	Elevations of equipment and pathways
	A description of how the monitoring system will cover all nearby downwind communities
Fenceline Air Monitoring Equipment Description	
<input checked="" type="checkbox"/>	Select fenceline air monitoring equipment that is capable of continuously measuring air pollutants in real-time and provide the following:
	Specifications for the fenceline instruments (e.g., detection limits, time resolution, etc.)
	Explanation of the operation and maintenance requirements for selected equipment
	Substantiate any request to use alternative technologies
<input checked="" type="checkbox"/>	Monitor for the pollutants listed in Table 1 of Rule 364 and include the following:
	Specify pollutant detection limits for all instruments and paths measured
Quality Assurance	
<input checked="" type="checkbox"/>	Develop a Quality Assurance Project Plan (QAPP) that describes the following:
	Quality assurance procedures for data generated by the fenceline air monitoring system (e.g. procedures for assessment, verification and validation)
	Standard operating procedures (SOP) for all measurement equipment
	Routine equipment and data audits

Table 1 (continued)

Data Presentation to the Public	
<input checked="" type="checkbox"/>	Design a data display website that includes the following:
	Educational material that describes the objectives and capabilities of the fenceline air monitoring system
	A description of all pollutants measured and measurement techniques
	A description of background levels for all pollutants measured and provide context to levels measured at the fenceline
	Procedures to upload the data and ensure quality control
	Definitions of QC flags
	Hyperlinks to relevant sources of information
	A means for the public to provide comments and feedback; Procedures to respond to the feedback
	Archived data with data quality flags that explain changes due to QA/QC and provide chain of custody information
	Quarterly data summary reports, including relationship to health thresholds, data completeness, instrument issues, and quality control efforts
Notification System	
<input checked="" type="checkbox"/>	Design a notification system for the public to voluntarily participate in, that includes the following:
	Notifications for activities that could affect the fenceline air monitoring system (e.g., planned maintenance activities or equipment failures)
	Notifications for the availability of periodic reports that inform the community about air quality
	Triggers for threshold exceedances (e.g. Acute Reference Exposure Levels (RELs))
	Communication methods for notifications, such as, website, mobile applications, automated emails/text messages and social media

* Dispersion modeling shall be conducted using U.S. EPA’s Preferred and Recommended Air Quality Dispersion Model.

Details about these key considerations are explained below.

A. Multi-Pollutant Monitoring

Multi-pollutant monitoring is a means to broaden the understanding of air quality conditions and pollutant interactions, furthering capabilities to evaluate air quality models, develop emissions control strategies, and support research and health studies. Petroleum refineries and activities associated with them emit a wide range of air pollutants, including criteria pollutants (SOx and NOx), reactive organic compounds (ROCs), and toxic air contaminants (benzene, toluene, formaldehyde, and hydrogen sulfide).

Chemical compounds associated with health risk and those measured at other ambient air monitoring locations should be identified in the air monitoring plan. Identification of the health risk drivers can be informed by the health risk assessment studies performed at the refinery, as

well as other information regarding potential health risk near the refinery. Additional chemicals may be of interest to monitor as a part of the fence line air monitoring system and may be included in the reporting for additional public information.

The California Environmental Protection Agency's (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) is collaborating with the California Air Resources Board (CARB) and the Interagency Refinery Task Force to identify and develop information on chemicals emitted from refineries and their health effects in order to assist air agencies in developing plans for air monitoring at refineries in California. In March 2019, OEHHA published a report¹ that presents a comprehensive list of chemicals emitted from California refineries, including emissions that occur routinely in daily operations as well as accidental and other non-routine emissions. The list prioritizes the chemicals according to their emissions levels and toxicity, providing a list of chemicals that would be top candidates for air monitoring near refineries according to the volume of the chemicals emitted and their toxicity. The presence of a chemical on this comprehensive list does not necessarily mean it is released from all refineries at all times or in significant quantities.

Based on the OEHHA report, the potential compounds emitted from refineries that pose the highest health risk in nearby communities were identified along with the appropriate monitoring technologies selected to measure them. The chemical compounds of interest for Rule 364 are the BTEX compounds (Benzene, Toluene, Ethylbenzene, Xylenes), Sulfur Dioxide (SO₂), and Hydrogen Sulfide (H₂S). Two of these pollutants, benzene and hydrogen sulfide, can cause acute health effects at low concentrations. To make sure that these pollutants are adequately detected, the fence line monitoring equipment shall have a minimum detection limit (MDL)² equal to or less than 1 part per billion (ppb) of benzene and 2 ppb of hydrogen sulfide.

B. Selection of Fence Line Air Monitoring Technologies

A fence line air monitoring system is a combination of equipment that measures and records air pollutant concentrations at or near the property boundary of the facility. The air monitoring plan must provide specifications for the instruments selected for a fence line air monitoring system, such as the detection limits of the equipment for each chemical and time-resolution capabilities. Also, the air monitoring plan must demonstrate that the instruments can measure all the pollutants identified in Rule 364. Multiple technologies may need to be employed to ensure adequate compound identification.

i. Open-path Technology

Fugitive emissions are emissions of gases or vapors from leaks and other unintended or accidental releases of emissions. Leaks from pressurized process equipment generally occur

¹ Analysis of Refinery Chemical Emissions and Health Effects – Report. March 20, 2019 (www.oehha.ca.gov/air/analysis-refinery-chemical-emissions-and-health-effects)

² Minimum Detection Limit (MDL) is defined as the minimum concentration or amount of an analyte that can be determined with a specified degree of confidence to be different from zero.

through valves, pipe connections, mechanical seals, or related equipment, usually originating from the process area. Fugitive emissions also occur from storage tanks that are used to store crude oil prior to refining, intermediates between refining processes, and refined product streams. Due to the large number of potential leak sources that are scattered over a wide area at refineries and difficulties in detecting and repairing these leaks, these fugitive emissions are best monitored over a large area or path using open-path technology.

Open-path technology is a well-established method to measure path-integrated gas concentrations in the open atmosphere. Open-path technology is a type of Optical Remote Sensing (ORS) where the instruments use a light signal to continuously detect and measure concentrations of chemical compounds along the distance covered by the light signal in real-time. The equipment can be set up in a bi-static configuration, where the light source and detector are located on opposite ends of the path, or in a mono-static configuration, where the light source and detector are co-located. In mono-static configurations, a retroreflector is used to reflect the light back across the path. Both set-ups provide path-averaged concentrations of multiple pollutants. As a result, open-path technologies can provide greater temporal and spatial resolution compared to conventional air monitoring techniques, making it ideal for long-term fence-line monitoring at refineries. For example, narrow pollutant plumes can be detected by an open-path system that might otherwise be missed by point monitors.

U.S. EPA has published a comprehensive assessment of various open-path ORS technologies, outlining the advantages and limitations of each measurement method.³ Optical methods such as Ultraviolet Differential Optical Absorption Spectroscopy (UVDOAS) and Fourier Transform Infrared (FTIR) monitors are advanced techniques that can measure BTEX compounds and sulfur dioxide. However, the UVDOAS instruments are able to detect BTEX compounds at lower concentrations compared to FTIR instruments, so UVDOAS is the preferred monitoring method. Although the open-path ORS techniques have been used for over 20 years, they are constantly improving by having lower detection limits and being able to detect additional compounds.

Based on the advantages that open-path technologies provide over conventional air monitoring techniques, District staff recommends the use of open-path technology for implementing a fence-line air monitoring system required by Rule 364. The selected open-path instruments should be able to record and store the measured spectral absorption and associated average concentrations of measured pollutants for retrospective investigations. Where open-path monitors are being operated, all factors that could affect air pollutant measurements, such as the maximum path length and potential interferences, must be discussed in the air monitoring plan.

³ www.epa.gov/sites/production/files/2018-08/documents/gd-52v.2.pdf

ii. Point Monitors

Conventional fenceline air monitoring techniques rely on point monitors that only provide concentration information from a single point in the survey area, greatly increasing the chances of missing surface emission hotspots or emission plumes. Therefore, even after collecting data from multiple points in the survey area, the point sampling approach may lack the spatial or temporal data necessary to obtain a complete picture of the emissions from large permitted sources.

Automated gas chromatographs (Auto-GCs) are typically considered the best point monitor option to measure specific VOC pollutant concentrations semi-continuously at a monitoring site. This technology has been developed by a number of manufacturers, and U.S. EPA has evaluated several commercially available auto-GCs in order to determine their suitability for use in air monitoring networks. The U.S. EPA published the results in the Photochemical Air Monitoring Station (PAMS) Gas Chromatography Evaluation Study Report.⁴ However, a substantial number of auto-GC units (or other point monitors) may need to be deployed to achieve sufficient spatial coverage along the property boundary or fenceline of a petroleum refinery.

iii. Emerging Technologies

In comparing the costs of an ORS-based measurement approach with traditional point monitoring approaches for long-term fenceline measurements, an ORS-based approach is likely to be more cost-effective at this time. However, a refinery owner or operator may demonstrate that other air monitoring techniques and/or technologies (e.g., emerging technologies) could be used in place of open-path technology depending on the pollutants that are monitored. For example, future sensor technology could allow cost-effective, real-time monitoring at numerous fixed locations along the perimeter of the petroleum refinery. In the event of an equipment failure or during extended maintenance activities, low-cost sensors can also serve as a temporary measurement technique until the main fenceline air monitoring system is restored to normal operating conditions.

Gaseous sensors are expected to improve in the future and fenceline air monitoring plans could be augmented to employ them. Therefore, the District may consider approving emerging technologies for future compliance with Rule 364. The petroleum refinery would submit a revised fenceline air monitoring plan if the changes to the fenceline air monitoring system are supported based on new information. This includes demonstrating that the proposed alternative air monitoring technology will meet the requirements of Rule 364 and provide adequate sensitivity and temporal and spatial coverage for the compounds identified in the rule.

⁴ RTI (2014). Gas Chromatograph (GC) Evaluation Study: Laboratory Evaluation Phase Report. Prepared for U.S. EPA PAMS Program. www3.epa.gov/ttnamti1/files/ambient/pams/labevalreport.pdf

C. Fenceline Sampling Locations, Coverage, and Time Resolution

Air monitoring plans must specify the following information related to the locations selected for the fenceline air monitoring equipment:

- Areas along the perimeter that are likely to detect compounds associated with petroleum refinery operations;
- Proximity of the proposed fenceline monitoring equipment to residences and other sensitive receptors, such as schools, hospitals, and community parks;
- Where equipment will be sited (e.g., GIS coordinates);
- Elevations at which equipment will be placed; and
- Length of each path that will be monitored with fenceline instruments.

The air monitoring plan must provide a discussion that explains the rationale for choosing the equipment siting specifications. The refinery operator must also address key considerations, such as the distance necessary to accurately measure emissions and critical transport areas around the perimeter of the refinery. To ensure that the monitoring system will attain a high level of accuracy, the following key factors should be discussed:

i. Local Meteorological Conditions

Meteorological conditions can significantly affect the concentration of air pollutants in a region. Therefore, it is important that the refinery considers the typical meteorological conditions (e.g., wind patterns, temperature, rainfall, cloud cover, etc.) of a site. Evaluating historical meteorological data will help in determining whether certain candidate equipment locations are likely to experience higher measured pollutant concentrations from an emissions source.

Wind can be the most critical meteorological element for the transport of refinery emissions to the surrounding communities. Often, peak concentrations occur during stable, low wind speed conditions when pollutants can build up and meander in any direction. Frequency distributions of winds and associated graphic analyses (i.e., wind roses) can be analyzed to evaluate predominant wind patterns, as well as diurnal and seasonal variability. Also, if a facility is in an area that is prone to fog, the facility operator should ensure the equipment for the fenceline air monitoring system is not easily impeded by the fog. Heaters and fans may be required to keep the instrument optics and reflector mirrors free of moisture to maximize data recovery.

ii. Pollutant Hotspots and Topography

It is essential for the refinery operator to identify potential pollutant hotspots within the facility to ensure fenceline monitoring of these emissions and to provide effective information to the neighboring communities. Therefore, in developing the air monitoring plan, the refinery operator should survey the facility with special attention to areas where emissions are most likely, such as tank storage, oil processing, wastewater treatment, and loading areas. Information gathered from the survey should be used to establish the facility's overall emissions profile.

The survey should also consider the elevation of potential pollutant hotspots. Concentrations of pollutants can be greater in valleys than for areas of higher ground. This is because pollutants can become trapped in low lying areas under certain weather conditions. Therefore, the topography of the petroleum refinery can affect the distribution and dispersion of pollutants from refinery operations. The petroleum refinery operator should design the fenceline air monitoring system to ensure fenceline air monitoring equipment is sited such that it captures the most critical transport and dispersion areas along the perimeter of the facility.

iii. Spatial Coverage of Monitors

The fenceline monitoring system should be designed to ensure adequate coverage of the area along the facility perimeter, to the extent feasible. Considerations such as the proximity of refinery emissions sources to sensitive receptors and type of pollutants to be measured could require additional open-path monitors for a facility. Also, information available from dispersion modeling, gradient sampling, and mobile measurements should be taken into consideration when assessing adequate coverage.

Sampling locations should have an open, unobstructed path. Ideally, each air monitoring path should be at least 1 meter vertically and horizontally from any supporting structure and away from dusty or dirty areas. The air monitoring plan must also identify potential disruptions of airflow and the effect of obstacles or traffic on the measured concentrations. Potential interferences caused by meteorological or process issues associated with the selected location must be addressed. Furthermore, the air monitoring plan should describe how the proposed fenceline air monitoring system will effectively provide relevant information for all nearby downwind communities given the expected meteorological conditions.

iv. Continuous and Real-Time Measurement of Air Pollutants

Continuous air monitoring at or near the property boundaries of a petroleum refinery can significantly improve rapid detection and communication of potential hazardous releases to refinery operators, responders, and the public. Additionally, it provides long-term data to determine trends in emissions (e.g., diurnal, seasonal variations). Therefore, the fenceline monitoring shall be operated continuously with a required time resolution of five-minute averaging when feasible and with a three-minute averaging period for hydrogen sulfide. High time resolution monitoring reduces the chance of pollutant hot spots being undetected over the measured area and can provide real-time emission information to refinery personnel and the nearby communities. If achieving the desired time-resolution is not feasible, refinery operators shall provide rationale in the air monitoring plan for any proposed time resolutions that differ from these guidelines (e.g., based on the equipment employed, the number of paths covered by each open-path system, or other operational limitations).

3. Meteorological Measurements

Exposure to air contaminants within an urban area can vary greatly due to the proximity to emission sources, the magnitude and specific type of emissions, structures and terrain influences, and meteorological conditions. Variability in wind speed and direction pose significant challenges for the analysis of the data from air quality monitoring programs and exposure assessments. Hence, an understanding and assessment of the general meteorological patterns in and around each facility is a critical component in not only the design of the measurement systems, but also interpreting the measurement results, including the transport and dispersion of air pollutants from the refinery to the community. Therefore, Rule 364 requires fenceline monitoring locations to continuously record wind speed and wind direction data. The District also recommends collecting ambient temperature and sigma theta values for wind.

In order to provide high quality data, the air monitoring plan must provide information on siting considerations and equipment to be employed for real-time meteorological data collection at high resolution (at minimum, matching the time resolution of the air quality monitors). Wind sensor quality, siting, and quality assurance shall meet the specifications and guidelines that are typically required by air quality regulatory measurements and modeling purposes (for reference, see the U.S. EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements).⁵

4. Quality Assurance / Quality Control (QA/QC)

The measurements from the fenceline air monitoring system shall reflect a commitment to quality data that is outlined in the air monitoring plan. The air monitoring plan shall address quality assurance, including training of personnel, routine maintenance and calibration checks, technical audits, data verification and validation, and data quality assessment.

The plan must also document the instrument manuals, Standard Operating Procedures (SOP), and a Quality Assurance Project Plan (QAPP). The QAPP provides a blueprint for conducting and documenting a program that produces quality results and outlines the specific goals of the monitoring network and instrumentation. The QAPP also summarizes how the data will be reviewed and managed by the refineries. The QAPP must outline a QA/QC plan that follows U.S. EPA guidelines⁶ and should provide clear definitions and procedures for QA/QC that are necessary to indicate why some data may be missing, suspect, or invalid. The critical functions to be addressed in the QAPP are summarized below:

- **Project background and management:** The QAPP should provide background information and define the problems to be addressed and the general goals of the

⁵ www3.epa.gov/ttn/amtic/files/ambient/met/Volume_IV_Meteorological_Measurements.pdf

⁶ U.S. EPA (2002). Guidance for Quality Assurance Project Plans. EPA/240/R-02/009. www.epa.gov/sites/production/files/2015-06/documents/g5-final.pdf

fenceline monitoring. The QAPP should describe project organization, quality objectives and acceptance criteria for measurement data, and plans for documentation, recordkeeping, and data dissemination.

- **Technical Approach:** The QAPP should demonstrate that the appropriate approaches and methodologies are employed for performing measurements, data handling, and quality control and address the design and implementation of the measurement systems.
- **Assessment/Oversight:** The QAPP should offer appropriate QA/QC steps for ensuring the effectiveness of the monitoring plan covering experimental design, representativeness of the data, instrument operation and data acquisition, calibration check procedures, data quality indicators, independent systems and performance audits, and peer-review.
- **Data Validation and Usability:** The QAPP should describe what steps will be taken to ensure that the individual data elements conform to the criteria specified in the monitoring plans.

All monitoring data must be collected, managed, and archived in a standard electronic format after necessary data processing and validation. Processing the data involves collecting the data, assuring its quality, storing the data in a standardized format, and interpreting the data for communication to the public. The most critical steps in this process include:

- Automatically retrieving data from the fenceline monitors containing the measured levels of each air pollutant along with meteorological parameters;
- Validating data file completeness and integrity;
- Transferring file contents to a database;
- Flagging data that do not meet pre-defined quality control limits;
- Copying quality assured data and indices into a database for use by the data display and dissemination program;
- Generating and recording logs to monitor system operation; and
- Notifications when measured concentrations are above pre-defined concentrations limits.

To ensure that the collected data meets the highest quality possible, each piece of monitoring equipment must be operated in strict accordance with an in-depth operating protocol. Standard Operating Procedures (SOPs) must be prepared for each specific measurement method to achieve the appropriate level of detail and standardization and to consequently ensure that the monitoring equipment provides high quality data. The SOPs should be informed by general operating instructions that are typically provided by the manufacturer of the equipment, by operational experience and audits, and by general operational guidelines and performance specifications that are available for U.S. EPA and State approved methods. The SOPs should address specific topics such as calibration procedures and quality control procedures (indicating standards and acceptance criteria), as well as data reduction (indicating validation procedures and reporting).

Rule 364 requires the measurements from the fenceline monitoring system to be available to the public on a real-time basis with QA/QC measures implemented to provide confidence in the data collected. Publicly available quarterly reports should reflect a higher level of data validation, including a manual review of the data by qualified personnel. The real-time and near-real-time disseminated measurement data should not be considered final, but it is important that the preliminary real-time measurement data distributed to the public be of an acceptable quality. Also, it is important that instrument failures are detected quickly to prevent grossly invalid data from being presented to the public. This can be accomplished by utilizing built-in status flags on the instrument operational parameters and by providing real-time data screening for outliers, impossible values, stuck values, negative values, rates of change, excessive short-term noise, etc. After accounting for all of the status flags, the system shall achieve a 90% or higher data recovery efficiency.

5. Data Display and Dissemination

The primary goal of Rule 364 is to collect real-time emissions data and share that data with the community, local responders, and industry so that it can be used to evaluate and adaptively manage the impacts of refinery emissions on the community. Therefore, it is essential that the collected data is made available and displayed online in a relevant and understandable manner to the public in real-time or near real-time. The air monitoring plan must include information and examples of how the quality-controlled data will be displayed and the steps taken to provide context to the real-time measurements to the public. Also, the air monitoring plan shall address means for providing automated, reliable, and understandable information, including the intent and limitations of the data collected and an explanation of how background concentrations and/or contributions from other sources may affect measured concentrations.

In order to make the data provided in this outreach as accessible as possible, the project website should use data visualization tools to graphically depict information using maps and time series plots of measured pollutants and wind data. The website should not simply provide graphical information about current conditions. It needs to allow the public to access historical data directly and in a user-friendly manner. The archived data should include data quality control flags, explain changes, and provide information to identify data that should be removed or was removed after QA/QC.

All preliminary data from the fenceline monitoring system must be submitted to the District as quickly as practicable and in an approved format. The refinery operators must also publish quarterly reports written at a public-friendly level on the data dissemination website. The quarterly data reports shall include rigorous review of calibration data, data processing calculations (such as conversion calculations of instrument signal to pollutant concentration), data consistency, field data sheets and logbooks, instrument performance checks, and equipment maintenance and calibration forms. All changes to the reported real-time data must be explained in quarterly reports. The major goals of the outreach program include:

- Developing multiple communication venues to ensure widespread access to environmental information and to appeal to the various communication preferences (e.g., text messages, email, website, etc.) among the end users;
- Promoting access to and awareness of the measurements and use of the real-time air pollution data through an active outreach and education program;
- Developing contextual material to assist interpretation and understanding of the real-time data and its limitations;
- Designing an effective public outreach program (e.g., informational meetings, workshops, etc.) that informs the public about the health impacts associated with emission levels detected by the fence-line air monitoring system and informs decisions related to reducing community exposure; and
- Identifying designated personnel to address District and public questions about monitoring equipment and readings.

In order to provide context to this complex data set for the public, the designed website should contain information regarding the species measured and the measurement techniques, discussion of levels of concern for each measured species, typical background levels, potential non-refinery sources that could contribute to measured concentrations, and definitions of data QC flags. This should be written at a public-friendly level with clarity and thoroughness and with links provided to additional sources of information. In addition, the air monitoring plan and the data website should include details of how the public can report experiences and provide comments and feedback for improvement of the website, the other data dissemination tools, and the monitoring activities in general. The website should also contain a weblink to the District's air monitoring website to promote the existence of the District's community air monitor.

6. Notification System

A. Reference Exposure Level (REL) Notifications

A Reference Exposure Level (REL) is an airborne concentration level of a chemical in which no adverse health effects are anticipated for a specified exposure duration. They are designed to protect the most sensitive individuals in the population by the inclusion of margins of safety. Therefore, an air concentration that exceeds the REL does not automatically indicate an adverse health impact. However, levels of exposure above the REL levels may have an increasing but undefined probability of resulting in an adverse health impact, particularly in sensitive individuals (e.g., children, the elderly, pregnant women, and those with acute or chronic illnesses).

The website should offer an opt-in notification system that is integrated with the data collected by the air monitoring network. The notification system should automatically generate and issue notifications to subscribers when any of the pollutant levels exceed the corresponding RELs or other lower thresholds pursuant to the approved air monitoring plan. Resources that should

inform the thresholds include the National Ambient Air Quality Standards (NAAQS), California Ambient Air Quality Standards (CAAQS), and the acute and chronic RELs as assessed by the Office of Environmental Hazard Assessment (OEHHA).⁷

OEHHA has developed acute RELs for assessing potential non-cancer health impacts for short-term, one-hour peak exposures to air pollutants and chronic RELs for assessing non-cancer impacts from long-term exposure. If the one-hour average concentration of any of the measured pollutants exceed its corresponding acute REL, notifications should be sent out to the subscribers. Whereas long-term exposures are typically assessed by their annual emissions. Therefore, chronic RELs and cancer risk must be compared to annual average concentrations of measured toxic pollutants and be reported in the periodic reports once one year of data is available.

B. Notification Methods & Emergency Response

The notification system should be designed to provide information to the public via email, text message or other communication venues with the ability to be notified regarding: (1) data availability and release of periodic reports; (2) exceedances of REL thresholds; and (3) monitoring system status. The timely notifications will inform the public when certain pollutants exceed those concentration thresholds or may pose a potential health concern, allowing the public to consider further actions to protect their health. The notifications would also provide information to refinery operators to rapidly identify and mitigate any undetected and/or accidental emissions. This can have a significant impact on the reduction of refinery fugitive emissions.

The air monitoring plan should also identify alternative methods of accessing periodic reports for those members of the community who may not have internet access (e.g., automated phone systems for dial-in information, public displays, hard copies of periodic reports in libraries or community centers, etc.). Based on the needs of the community, providing information in other languages should be strongly considered. Some examples of methods for communicating the data to the public include the following:

- Website data displays;
- Mobile application;
- Automated email/fax/text notification system;
- Social media feeds;
- Public data displays in community locations;
- Automated call-in phone system;
- Television and radio reports; and
- Published quarterly data summary reports.

⁷ www.oehha.ca.gov/air/allrels.html

As provided by state law, emergency response agencies, such as local fire agencies, have the primary responsibility for scene management during an accidental release of emissions or other emergency incidents. The refinery operator must identify the primary local agency that provides emergency preparedness and response services. The refinery must also coordinate with the first responders to integrate with and augment the existing public alert systems. Communication mechanisms are necessary to provide the public with access to public safety information during refinery upsets and accidental releases of pollutants and not to conflict or duplicate the first response alert systems in case of an accidental release of emissions.

The California Air Resources Board (CARB) Monitoring and Laboratory Division and the California Air Pollution Control Officers Association (CAPCOA) have completed the first two volumes of the Refinery Emergency Air Monitoring Assessment Report. The Objective 1: Delineation of Existing Capabilities report, released in May 2015, provides a comprehensive inventory of emergency air monitoring assets and capabilities located in and around California's major oil refineries. The Objective 2: Evaluation of Air Monitoring Capabilities, Gaps, and Potential Enhancements became available in March 2019. Also in March 2019, OEHHA released a related report: Analysis of Refinery Chemical Emissions and Health Effects. These are available from the CARB Refinery Air Monitoring website.⁸

⁸ www.arb.ca.gov/fuels/carefinery/crseam/crseam.htm