Draft Rule 1180 and Rule 1180.1 Fenceline Air Monitoring Plan Guidelines

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Diamond Bar, California

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1. Background

The South Coast Air Quality Management District (South Coast AQMD) Governing Board ~~adopted~~ amended Rule 1180 – Fenceline and Community Air Monitoring for Petroleum Refineries and Related Facilities (Rule 1180) and adopted Rule 1180.1 – Fenceline and Community Air Monitoring for Other Refineries (Rule 1180.1) on January 5, 2023. ~~(date of adoption).~~ The main purpose of Rule 1180 and Rule 1180.1 is to require real-time fenceline air monitoring systems and to establish a fee schedule to fund refinery-related community air monitoring systems that provide air quality information to the public and local response agencies about levels of various criteria air pollutants, volatile organic compounds, and other compounds at or near the property boundaries of ~~petroleum~~ refineries and related facilities. For the purpose of this guidance document, the term facility will be used to refer to petroleum refineries and related facilities subject to Rule 1180 and refineries subject to Rule 1180.1.

Rules 1180 and 1180.1 require~~s~~ that ~~refinery~~facility owner or operators submit a written ~~f~~Fenceline ~~a~~Air ~~m~~Monitoring ~~p~~Plan (~~air monitoring plan~~FAMP) for establishing and operating a real-time fenceline air monitoring system. ~~Therefore,~~ South Coast AQMD staff developed ~~the Rule 1180 – Refinery Fenceline Air Monitoring Plan Guidelines (Guidelines)~~ these Guidelines to serve as a written framework to be used by the Executive Officer to evaluate ~~air monitoring plans~~ FAMPs required by Rules 1180 and 1180.1. In addition, these Guidelines inform facility owners or operators about the elements necessary to complete a FAMP.

~~By design, these Guidelines will inform petroleum refinery operatorowners or operators subject to the Rules 1180 about the elements necessary to complete an air monitoring plan.~~ South Coast AQMD recognizes the need for flexibility when designing a~~n air monitoring plan~~FAMP, therefore, each plan will be evaluated on a case-by-case basis and should be tailored to each facility's size, operations, specific location, and ~~its~~ surrounding receptors. ~~Therefore, a~~A fenceline air monitoring system must be representative of the size of the affected facility and its emissions and must achieve adequate coverage along the entire facility fenceline. Rule 1180.1 is similar to Rule 1180 in its air monitoring requirements; therefore, staff revised existing Rule 1180 Guidelines to include guidelines for Rule 1180.1. The guidelines provide criteria that would be used to allow the exclusion of certain types of monitoring.

~~A fundamental requirement of~~ Rules 1180 and 1180.1 ~~is~~ require~~s~~ that ~~fenceline air monitoring plan~~FAMPs ~~must~~ and quality assurance project plans (QAPPs) provide detailed information about the installation, operation, ~~and~~ maintenance, and quality assurance and quality control (QA/QC) 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~~facility. An effective fenceline air monitoring system ~~should~~shall be capable of measuring routine emissions ~~from refineries~~ and detecting leaks, as well as unplanned releases from ~~refinery~~facility equipment and other sources of ~~refinery~~facility-related emissions. For this purpose, fenceline air monitoring system must cover the entire facility fenceline, whenever feasible. The fenceline air monitoring system would inform ~~refinery~~facility operators and the public about potential air pollution impacts to nearby communities from refinery operations. The following diagram (Figure 1) outlines the facility fenceline program. Each of the parts will be discussed in this guidance document.

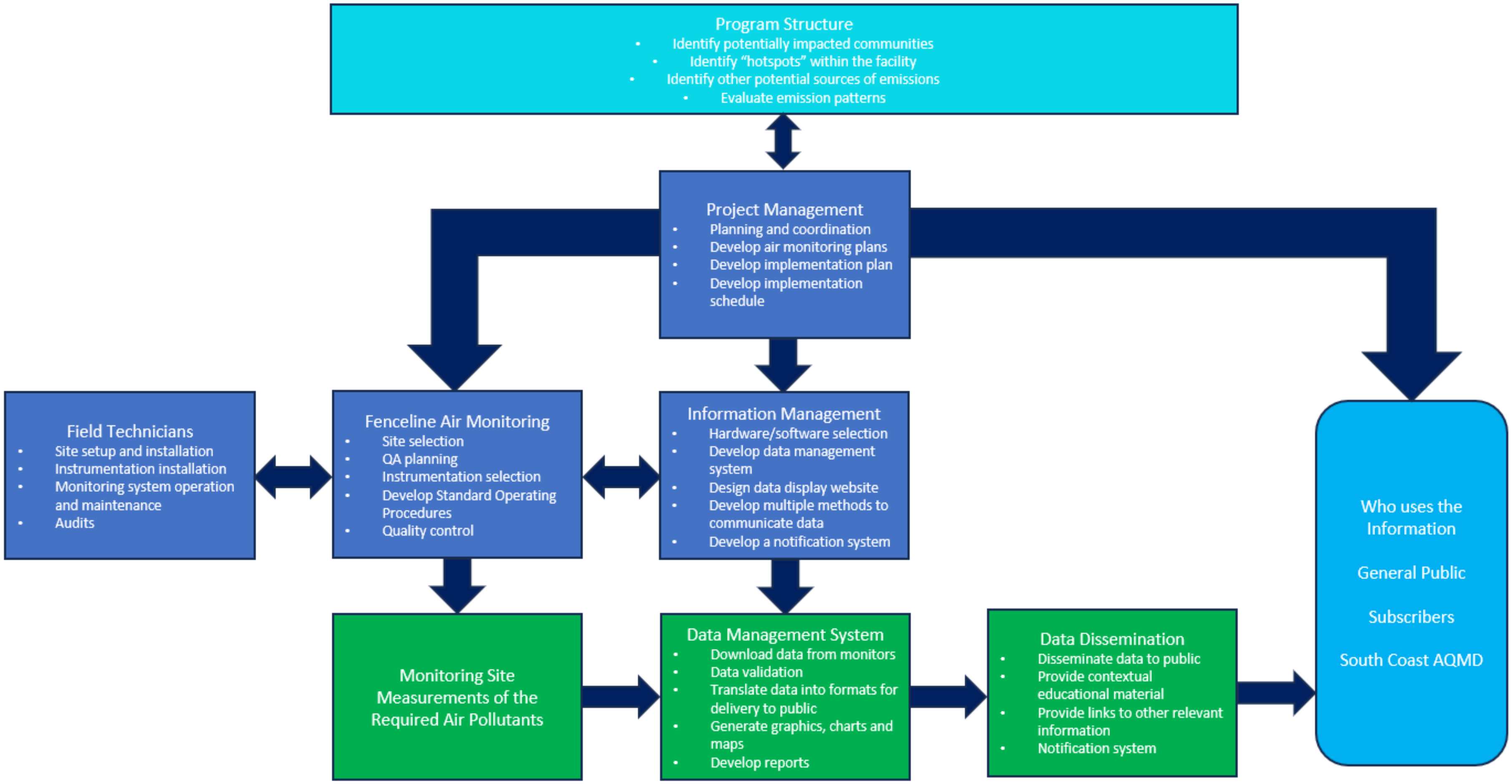
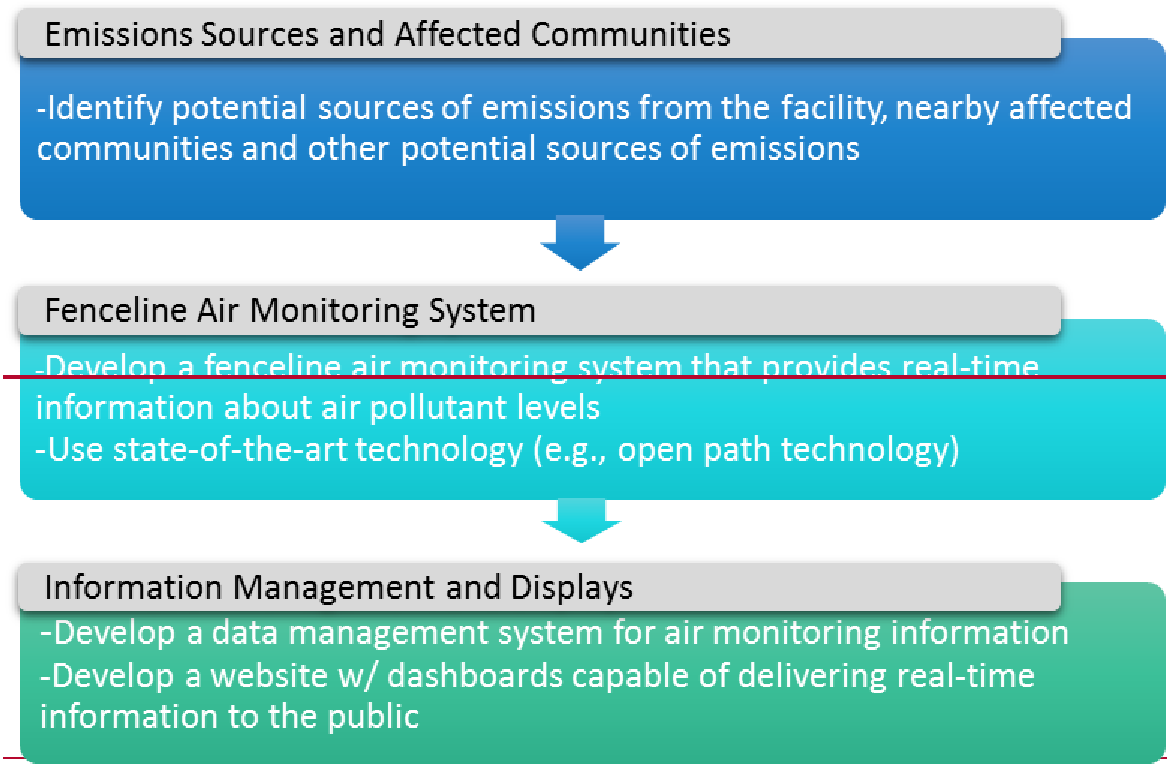


***Figure 1*: Overview of the Facility Fenceline Air Monitoring Programs**

2. Fenceline Air Monitoring Plan

~~Developing an air monitoring plan requires three important steps;~~There are three main steps in developing a FAMP: (1) identifying~~ication of~~ emissions sources and affected communities, (2) ~~deriving~~ developing 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. The below diagram (Figure ~~1~~2 - Overview of Key Steps to Developing a~~n~~ ~~Air Monitoring Plan~~FAMP)~~, below~~ outlines ~~important considerations for developing a fenceline air monitoring system~~these steps.



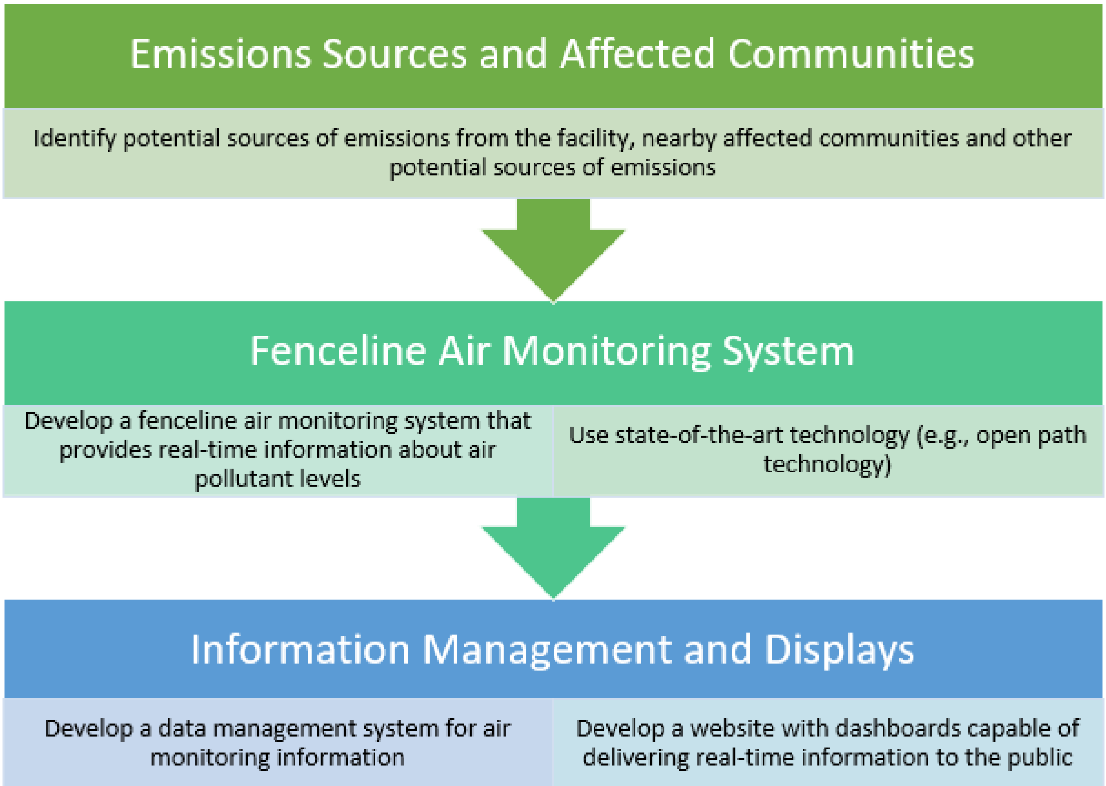


***Figure* 2: Overview of Key Steps to Developing a FAMP**

A~~n approvable~~ fenceline air monitoring plan shall meet the following key objectives:

- Provide ~~information about~~measurements of various air pollutant levels (i.e., ~~determined by~~ air pollutant concentration) ~~measured~~ in real-time (when feasible) ~~in durations~~and in short enough time resolutions to adequately address significant emissions changes from ~~refinery~~facility operations;
- Gather accurate ~~air quality and~~ meteorological data to identify ~~both the time(s) and location(s)~~ factors that may impact ~~of various~~ air pollutant levels near ~~refinery~~facility operations ~~and provide a comparison of these levels to other pollutant levels monitored in the Basin~~;
- Track long-term air pollutant levels, variations, and trends over time at or near the property boundaries of ~~petroleum~~ refineries ~~and in nearby communities~~;
- Provide context to the data so that local communities can ~~distinguish~~ understand differences (if any) in air quality in their location from other locations in the Basin and understand the potential health impacts associated with local air quality near ~~petroleum refinery~~facility operations;
- Notify subscribers ~~Provide a notification system for communities near refineries~~ when emissions exceed pre-determined thresholds (e.g., ~~reference exposure levels (RELs) or~~

~~other~~ the relevant health-based notification standards or information-based notification standards listed in the rules~~, whichever is lower~~); and

- Provide quarterly reports summarizing the measurements, data completeness, and quality assurance.

Thus, a FAMP shall address these objectives.

Rules 1180 and 1180.1 set~~s~~ ~~-~~forth requirements for ~~air monitoring plans~~FAMPs and QAPPs. Please see Appendix A for Fenceline Air Monitoring Plan Checklist. The ~~air monitoring plan~~FAMP shall include details of ~~detailed information for the following~~ the following:

- An evaluation of routine emission sources at the ~~refinery~~facility (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~~facility to determine potential emission sources and their location;
- 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, 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 Rules 1180 and 1180.1;
- 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~~Independent audit.

This information will ~~assist the Executive Officer in determining~~be used by the Executive Officer to determine ~~the approval status of an~~whether to approve the ~~air monitoring plan~~FAMP and QAPP during the plan review process ~~required by~~set forth in ~~paragraph (f) of~~ Rules 1180 and 1180.1.

3. Fenceline Air Monitoring Systems

~~Pursuant to the requirements of Rule 1180 discussed above, d~~Development of a fenceline air monitoring system shall ~~take into account~~ consider the geospatial layout of the ~~refinery~~facility 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 below. Fenceline air monitoring systems should achieve maximum possible fenceline coverage, whenever feasible.

Fenceline Air Monitoring Plan Checklist	
Fenceline Air Monitoring Coverage (or Spatial Coverage)	
R	Identify the facility's proximity to sensitive receptors affected by the refinery operation and provide the information below.
	o Distance from facility to closest sensitive receptor(s)
	o Location of downwind and upwind communities
	o Eminent sources of non-refinery emissions surrounding the facility (e.g. non-refinery industrial facilities)
	o Dispersion modeling‡
R	Describe historical facility emission patterns and pollutant hotspots based on the following:
	o On-site location of operations and processes within the facility's perimeter
	o On-site location of emissions sources and level of emissions
	o Facility plot plans and topography
	o Dispersion modeling‡
R	Select sampling locations along the perimeter of the facility based on the information above. Also, provide the following:
	o Locations where equipment will be sited (e.g., GIS coordinates) and measurement pathways
	o Elevations of equipment and pathways
	o A description of how the monitoring system will cover all nearby downwind communities
Fenceline Air Monitoring Equipment Description	
R	Select open-path air monitoring equipment that is capable of continuously measuring air pollutants in real-time and provide the following:
	o Specifications for the open-path instruments (e.g., detection limits, time resolution, etc.)

	~~o Explanation of the operation and maintenance requirements for selected equipment~~
	~~o Substantiate any request to use alternative technologies~~
~~R~~	~~Monitor for the pollutants listed in Table 1 of Rule 1180 and include the following:~~
	~~o Specify pollutant detection limits for all instruments and paths measured~~
	~~o Substantiate any exclusion of chemical compounds listed in Table 1 of Rule 1180 or the use of an alternative air monitoring technology~~
~~Quality Assurance~~	
~~R~~	~~Develop a Quality Assurance Project Plan (QAPP) that describes the following:~~
	~~o Quality assurance procedures for data generated by the fenceline air monitoring system (e.g. procedures for assessment, verification and validation data)~~
	~~o Standard operating procedures (SOP) for all measurement equipment~~
	~~o Routine equipment and data audits~~
~~Data Presentation to the Public~~	
~~R~~	~~Design a data display website that includes the following:~~
	~~o Educational material that describes the objectives and capabilities of the fenceline air monitoring system~~
	~~o A description of all pollutants measured and measurement techniques~~
	~~o A description of background levels for all pollutants measured and provide context to levels measured at the fenceline~~
	~~o Procedures to upload the data and ensure quality control~~
	~~o Definition of QC flags~~
	~~o Hyperlinks to relevant sources of information~~
	~~o A means for the public to provide comments and feedback; Procedures to respond~~
	~~o Archived data that with data quality flags, explains changes due to QA/QC and provides chain of custody information~~
	~~o Quarterly data summary reports, including relationship to health thresholds, data completeness, instrument issues, and quality control efforts~~

~~Notification System~~	
☑	~~Design a notification system for the public to voluntarily participate in that includes the following:~~
	~~o Notifications for activities that could affect the fenceline air monitoring system (e.g., planned maintenance activities or equipment failures)~~
	~~o Notifications for the availability of periodic reports that inform the community about the air and provide updates on the performance and maintenance of the fenceline air monitoring system~~
	~~o Triggers for exceedances in thresholds (e.g. Acute Reference Exposure Levels (RELs))~~
	~~o 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 (e.g., Health Risk Assessment)~~

Details about each of these key considerations are explained below.

Multi-Pollutant Monitoring

The purpose of Rules 1180 and 1180.1 is to provide air quality information to the public on levels of applicable air pollutants such as criteria air pollutants, volatile organic compounds, metals, and other air pollutants, at or near the facility property boundaries and in nearby communities. Multi-pollutant monitoring~~ is a means to~~ provides air quality information for multiple air pollutants and, therefore, can broaden the understanding of air quality conditions and pollutant interactions. This can~~,~~ furthering~~ing~~ the capabilities ~~to~~of evaluat~~e~~ing air quality models, develop emissions control strategies, and support research~~, including~~ (i.e., health studies). ~~Petroleum r~~Refineries and activities associated with them emit a wide range of air pollutants, including criteria pollutants (sulfur dioxide (SO_2), nitrogen dioxide ($NO_{~~x~~2}$), carbon monoxide (CO), and particulate matter (PM); volatile organic compounds (VOCs), including photochemically reactive VOCs that contribute to formation of tropospheric ozone (e.g., ethylbenzene, formaldehyde); carcinogenic hazardous air pollutants (e.g., benzene, 1,3-butadiene, naphthalene, polycyclic aromatic hydrocarbons, formaldehyde); non-carcinogenic air toxics (hydrogen fluoride, hydrogen cyanide); persistent bio-accumulative toxics (mercury), air toxic metals (e.g., at a minimum nickel, cadmium, manganese) and other air pollutants (e.g., hydrogen sulfide, ~~and~~ carbonyl sulfide, and particulate matter).

~~Chemical compounds associated with health risk and those measured at other ambient air monitoring locations~~All of the air pollutants list in Table 1 from the applicable rule, e.g., Rule 1180 or Rule 1180.1, ~~should~~shall be identified in the ~~air monitoring plans~~FAMPs. ~~Identification of the health risk drivers can be informed by the health risk assessment studies performed at the refineries, as well as other information regarding potential health risk near refineries.~~ Exclusion of any of these ~~chemical compounds~~air pollutants identified in Table 1 of the rules must be thoroughly explained and justified within in the facility'sthe air monitoring plan (FAMP). Other chemicals may also be detected by the fenceline air monitoring systems (e.g., ozone by the open path optical remote sensing analyzers) and may be included in the reporting for additional public information.

Additional chemicals may be of interest to monitor as a part of the fenceline air monitoring system, for example, if certain annual emissions exceed 10,000 lbs/year. Other chemicals may also be inherently monitored by the open-path systems and may be included in the reporting for additional public information.

Chemical Species of Interest

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. OEHHA and CalEPA published a the draft report in September 2017 report in March 2019. The report that presentsed 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[1]. The list prioritizes the chemicals according to their emissions levels and toxicity. Those at or near the top of the list would , 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.

The potential compounds emitted from refineries that pose the highest health risk in nearby communities shouldshall be identified along with the appropriate monitoring technologies selected to measure them. This assessmentThe identification of compounds and selection of monitoring technologies should be informed by the OEHHA report on Refinery Chemical Emissions and Health Effects Report. The chemical compounds of interest for Rules 1180 and 1180.1 are presented in Table 1 below, however, black carbon and the metal compounds are not required to be monitored by Rule 1180 related facilities and Rule 1180.1 refineries.

The petroleum refinery air monitoring plan must explain exclusion or replacement of monitoring for any of the compounds identified in Table 1 below. For example, in certain instances a petroleum refinery operator may propose to exclude monitoring for specific compounds that are not likely to be measured at or above the detection limits of the fenceline air monitoring equipment. In these instance, the petroleum refinery operator would be required to provide an

[1] OEHHA, "Analysis of Refinery Chemical Emissions and Health Effects," March 2019. [Online]. Available at https://oehha.ca.gov/media/downloads/faqs/refinerychemicalsreport032019.pdf.

alternative measurement methodology or evidence (e.g., historical air monitoring data or operational information) to support the proposed exclusion. A petroleum refinery may submit a revised fenceline air monitoring plan if changes to the fenceline air monitoring system are supported based on new information.

Table 1 - Refinery-Related Air Pollutants to be Addressed by Fenceline Air Monitoring PlanFAMPs

Air Pollutants
Criteria Air Pollutants
Sulfur Dioxide
Nitrogen Oxides
Particulate Matter
Volatile Organic Compounds
Total VOCs (Non-Methane Hydrocarbons)
Formaldehyde
Acetaldehyde
Acrolein
1,3-Butadiene
Naphthalene
Polycyclic aromatic hydrocarbons
Styrene
Benzene
Toluene
Ethylbenzene
BTEX Compounds (Benzene, Toluene, Ethylbenzene, Xylenes)
Metals *
Cadmium
Manganese
Nickel
Other Compounds
Hydrogen Sulfide
Carbonyl Sulfide
Ammonia
Black Carbon*
Hydrogen Cyanide
Hydrogen Fluoride+*

*Not required for Rule 1180 related facilities and Rule 1180.1 refineries

+ If the facility uses hydrogen fluoride.

Sulfur Dioxide (SO_2)

Heating and burning of fossil fuel releases the sulfur present in these materials and result in the formation of SO_2. SO_2 is the criteria pollutant that is the indicator of SOx concentrations in the ambient air and can have direct health impacts and can cause damage to the environment. As a result, SO_2 is routinely measured in ambient air monitoring networks. The major sources of SO_2 at refineries are fuel fired in furnaces and boilers, FCCFluid Catalytic Cracking units (FCCUs), Sulphur Recovery Units, flares, etc. As a result, measurement of this compound will help identify potential contribution of refineries to the ambient concentrations of SO_2x in nearby communities.

Oxides of Nitrogen Oxides (NoOx)

Both gasoline and diesel-powered vehicles are the main source of NOx emissions;, however, substantial emissions are also added by stationary sources such as petroleum refineries. Nitrogen oxides NOx is includes nitric oxide (NO) and NO_2, a group of highly reactive gases that contribute to the formation of secondary particlesparticulate matter, as well as tropospheric ozone. Scientific evidence links NO_2 exposures with adverse respiratory effects and is one of the criteria pollutants, making it a compound that is routinely measured in ambient air monitoring networks. NO_2 measurements also typically include measurement of NO and NO_x. Measurement of these constituents will help determine if refineries add significant concentrations of NOx to nearby urban environments.

Particulate Matter (PM_{10} and $PM_{2.5}$)

PM is a mixture of liquid droplets and solids such as dust, dirt, soot, and smoke in the air. These particles exist in a large variety of shapes, sizes, and chemical compositions. Fine particles commonly contain ionic species (e.g., sulfate, nitrate, and ammonium), acid (e.g., hydrogen ion, H+), organic and elemental carbon, and trace elements (e.g., aluminum, silicon, sulfur, chlorine, potassium, calcium, titanium, vanadium, chromium, manganese, nickel, copper, zinc, selenium, bromine, arsenic, cadmium, and lead). $PM_{2.5}$ can also contain larger amounts of polycyclic aromatic hydrocarbons (PAHs) such as naphthalene, chrysene, phenanthrene, and anthracene than PM_{10}.

Particulates have been detected at many emissions points in refineries (abrasive blasting, asbestos abatement, boilers, cooling towers, crude units, heaters, cokers, FCCUs, incinerators, and flares) and in non-routine emissions outdoors.

There are point monitors for particulate matter which employ methods such as beta attenuation, light scattering/absorption, and tapered element oscillating microbalance. These instruments range from hourly to minute averages and cover a range of PM types including $PM_{2.5}$, PM_{10}, and speciated particulate matter. Real-time PM monitoring instruments and methods are in use throughout regulatory air monitoring networks.

Volatile Organic Compounds **(VOCs)**

VOCs include non-methane hydrocarbons (NMHC) and oxygenated ~~NHMC~~ NMHC such as alcohols, aldehydes, and organic acids. ~~They~~ VOCs are emitted by a ~~large number~~variety of sources, but many hydrocarbons are associated with fuels and the production of fuels and ~~. VOCs, mainly hydrocarbons,~~ originate from production processes, storage tanks, transport pipelines and waste areas. As a result, measurement of these compounds is critical to determine the impacts that refineries have on nearby communities. Facilities are required to measure fenceline concentrations of total VOCs and specific VOCs listed in Table 1 of the respective rule using Open Path UV-DOAS and FTIR technologies~~,~~ unless other technologies have been approved in the facility's FAMPs.

~~While measurements of NMHC could provide valuable information about potential refinery emissions, for a refinery it is possible to distinguish a few and well-defined number of specified VOCs~~Table 1 of the respective rules, lists specific VOCs required for monitoring to represent ~~refinery~~ facility fugitive emissions and/or health risk drivers. ~~Measurement of these specified VOCs must be carried out continuously, using open-path technologies at the fenceline of the refineries.~~ In addition to individual VOC concentrations, total VOC measurements are also required at the facility fenceline. Total VOC~~'~~s in this guideline is described as Non-Methane Hydrocarbons, and CARB defines Non-Methane Hydrocarbons as the sum of all hydrocarbon air pollutants except methane[2]. Various hydrocarbon species absorb strongly around the 3000 cm-1 infrared spectral region. The absorption features of these hydrocarbons are similar, with the absorption strength scaling to the mass of the alkane species. As a result, Total VOCs can be readily quantified by open path FTIR technology by conducting spectral retrieval in the above-mentioned spectral region (the exact retrieval spectral window may vary slightly by vendor and retrieval approach).

~~Unless it is demonstrated in the fenceline air monitoring plan that an alternative measurement technique (e.g. point monitors) can be effectively utilized.~~ Automated gas chromatographs (~~A~~auto-GCs) ~~is the best point monitor option to measure~~ offer sub-ppb sensitivity for monitoring of select VOCs ~~pollutant concentrations~~ semi-continuously ~~at a monitoring site~~ (for example, hourly time resolution, with data for previous hour being available within 15-20 minutes past the hour). This technology has been developed by ~~a number of~~several manufacturers. The ~~and~~ U.S. EPA ~~have~~has evaluated the current state and availability of several commercially available auto-GCs in order to determine their suitability for use in air monitoring stations and ~~have~~has published the results in the Photochemical Air Monitoring Station (PAMS) Gas Chromatography Evaluation Study Report[3]. Other emerging methods for continuous measurement of ~~speciated~~selected VOCs include, but are not limited to, ~~in-situ~~ DOAS and FTIR optical analyzers.

[2] California Air Resources Board Glossary available at https://ww2.arb.ca.gov/about/glossary
[3] RTI International and EC/R Incorporated, "Gas Chromatograph (GC) Evaluation Study," 2014 available at https://www.epa.gov/sites/default/files/2019-11/documents/labevalreport.pdf

systems and quantum cascade laser These instruments that can effectively measure can reliably measure selected VOCs simultaneously with high time resolution (e.g., 1 minute or less), but with higher detection limits, compared to auto-GCs. The use of these measurement techniques can potentially provide real-time and continuous air quality data, hHowever, a substantial number of these auto-GCs units and/or(or other point monitors) would need to be deployed to achieve sufficient spatial coverage along the property boundary or fenceline of a petroleum refineryfacility. For this reason, open-path technologies used at the fenceline air monitoring of VOCs at the facility fenceline is preferred.

In some cases, more traditional measurement techniques could be utilized, if the air monitoring plan successfully demonstrates the effectiveness of the measurement technique. For example, VOCs could be measured by the collection of ambient air using evacuated canister sampling and subsequent analysis on a gas chromatograph (GC). This method relies on acquiring air samplethat often require a considerable amount of time depending on the measured concentrations (e.g., several hours with canisters to several days with adsorption cartridges) and subsequent chemical analysis in a certified laboratory. The sample collection time can vary from instantaneous grab samples to averaging times of 24 hours. If this sampling technique is selected, periodic 24-hour samples (e.g., 1 in 6 days) and instantaneous grab samples (e.g., 5- or 10-minute samples) that are triggered by elevated readings of continuous NMHC are required. The continuous NMHC measurement must achieve the temporal and spatial coverage requirements of the rule, while the periodic and triggered samples will provide information on the speciation of the measured VOCs.

Measurement of hydrocarbons will help determine if refineries add significant concentrations to nearby urban environments and can indicate leaks and emissions from refinery sources. The following are potential compounds of interest and are separated out based on their measurement and/or analytical techniques. techniques to measure and/or analyze them are described below.

Aldehydes

Aldehydes emitted into ambient air include, but are not limited to, formaldehyde, acetaldehyde, and acrolein that. These three aldehydes are identified as toxic air contaminants (TACs) and could be emitted from a refineryfacility. These compoundsaldehydes are the products of incomplete combustion of natural gas and are both precursors of atmospheric radicals that accelerate the formation of ozone and toxic air pollutants that may cause respiratory symptoms and cancer. These compoundsaldehydes could be measured continuously at the fenceline of the refineries using open-path technologies. A more detailed listing of aldehydes with potential health concerns is provided by OEHHA.

Aromatic Hydrocarbons

Benzene, toluene, ethylbenzene, and xylenes, referred to as BTEX, are Some of the aromatic hydrocarbons known as BTEX (referring to benzene, toluene, ethylbenzene, and xylenes) that occur naturally in crude oil and are associated with emissions from petroleum refineries. The

BTEX compounds are products of incomplete combustion of natural gas, and can also be emitted as fugitive emissions from petroleum storage and transfer. Emissions also occur from ~~different~~ other combustion sources, such as wood combustion, and stationery and motor vehicle fossil fuel combustion.~~, and e~~Elevated levels of BTEX compounds are expected in the vicinity of major roadways. Monitoring the concentrations of ~~T~~this group of aromatic VOCs ~~are~~is important because ~~not only~~ they pose a risk to human health~~, they also~~ and play a role in the formation of tropospheric ozone.

Analytical methods for BTEX compounds in air include absorption traps and subsequent separation by gas chromatography (GC) with detection by flame ionization optical absorption or mass chromatography, ~~as well as~~and automatic-GC monitors. Optical methods such as Open Path UV-DOAS and OP-FTIR monitors are more advanced techniques for real-time measurements~~,~~; ~~however,~~ UV-DOAS instruments are ~~particularly~~ more sensitive ~~in~~at detecting~~on of~~ BTEX compounds at low concentrations ~~and with good time resolution~~ compared to OP-FTIR instruments, and should be used for fenceline monitoring of BTEX.

Other Hazardous Air Pollutant VOCs

Other VOC air toxics of concern that are often reported in refineries' emission inventories include 1,3-butadiene and styrene that have been detected in routine and non-routine refinery emissions~~,~~, ~~and~~ therefore, these chemicals must be measured and reported. A more detailed list~~ing~~ of ~~potential~~ VOCs ~~of~~with potential health concerns is provided by the OEHHA. In addition, ~~and~~ the AB~~-~~ 2588 Health Risk Assessment reports could ~~that will help inform~~ assist in identifying other air toxics specifically ~~to~~emitted at each facility. Depending on emissions from each facility, measurement of other ~~VOC~~ volatile air toxics may be appropriate,~~. Such VOC compounds~~ includ~~e~~ing, but are not limited to, methanol, phenol, naphthalene, and hexane. ~~For example, the plan could include a requirement that these toxic gases shall be monitored and reported, if the emissions exceed 10,000 lbs/year and/or selected monitoring technologies are capable of detecting them.~~

Naphthalene

Naphthalene is a volatile white crystalline solid that exists in air in the form of vapor or adsorbed to particulates. It is released into the atmosphere from coal and oil combustion and from the use of mothballs. Naphthalene emissions have been detected at several refinery process units (separators, boilers, cooling towers, crude units, heaters, storage tanks, cokers, FCCUs, wastewater treatment, incinerators, and vents) and naphthalene has been detected in both routine and non-routine emissions. Open Path UV-DOAS instruments currently installed at the refineries for fenceline air monitoring would be capable of monitoring naphthalene.

Diethanolamine

Diethanolamine is a hydrocarbon found in air, water vapor, and particulate phases and has been detected at multiple refinery process units. Diethanolamine can be detected in air by drawing the air sample through sampling tubes for analysis with gas chromatography. However, diethanolamine has tendencies to absorb water and to supercool. Supercooling is a process of lowering the temperature of a liquid below its freezing point without it becoming a solid. As a result, diethanolamine has a short-lived gaseous phase. -Due to the nature of the compound, it would not remain in the vapor state long enough to be transported to the fenceline. For this reason, refineries will not be required to measure diethanolamine at the fenceline.

Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs are a group of over 100 different chemicals that are formed during incomplete combustion of organic matter at high temperature. Examples of incomplete combustion include fossil fuel burning, combustion in motor vehicle engines, waste incineration, oil refining, and coke and asphalt production. Due to their carcinogenic/mutagenic effects, 16 PAHs are currently listed as priority air pollutants in the Office of Environmental Health Hazard Assessment report, "Analysis of Refinery Chemical Emissions and Health Effects," finalized in March 2019 (OEHHA report)-. Typical analytical methods used to monitor PAHs require multistep sampling preparations and are not suited for continuous monitoring. There are studies for developing continuous monitoring of PAHs[4]. However, at the time of this writing, staff is not aware of any real-time technology for fenceline monitoring. Staff will report to the -Stationary Source Committee when Polycyclic Aromatic Hydrocarbons (PAHs) real-time monitoring is deemed feasible and provide guidance on the installation, operation, and maintenance of the real-time monitoring system before the Executive Officer provides a facility written notice for revising the FAMP to include PAHs real-time fenceline monitoring.

Metals: Cadmium, Manganese, and Nickel

Cadmium, manganese, and nickel are identified in the OEHHA report as candidates for air monitoring. Their toxicity-weighted emission scores make them among the highest priority air pollutants to be monitored at the refineries. Exposure to and bioaccumulation of metals have been shown to lead to numerous health problems. Those metals are associated with many facility process units. For example, manganese emissions could be associated with boilers, cooling towers, crude units, heaters, storage tanks, cokers, FCCUs, incinerators, etc. However, the FCCU is the only source that could have a large-scale release of metals as part of spent catalyst. The Electrostatic Precipitator (ESP) is a control equipment to remove PM from the FCCU flue gas. There were incidents of a refinery ESP failure or explosion that resulted in a large amount of spent FCCU catalyst with high PM and metal emissions being released to the nearby community. A speciated metals analyzer is commonly utilized for real-time monitoring of multiple metals in air samples, including cadmium, manganese, and nickel.

Hydrogen Sulfide (H_2S)

Hydrogen sulfide is a colorless, flammable, extremely hazardous gas with a "rotten egg" smell. It can result from the breakdown of organic matter in the absence of oxygen such as in swamps and sewers. It can also, occurs naturally in crude petroleum and natural gas, and is produced at

[4] M. R. a. D. B. Franck Amiet, "Continuous Monitoring of Polycyclic Aromatic Hydrocarbons Using Automatic Thermal Desorption-Gas Chromatography," 2016

oil refineries as a by-product of refining crude oil. -As a result, low-level concentrations can occur continuously at petroleum refineries and its measurement will help identify potential leaks at refineries and address community odor concerns.

Carbonyl Sulfide (COS)

Carbonyl sulfide (COS) is naturally found in crude oil and is a chemical intermediate and a byproduct of oil refining with a distinct sulfide odor. It is classified as a California Toxic Air Contaminant (TAC) and a federal hazardous air pollutant (HAP). COS can be released into atmosphere as fugitive emissions from refineries and at high concentration levels may cause narcotic effects in humans. COS can be measured using open-path technologies and shouldshall be measured and reported at the fenceline. if the selected open-path monitors can detect it at desirable levels.

Ammonia (NH_3)

While the main sources of ammonia are natural, primarily from the decay of organic matter, petroleum refineries can also emit considerable amounts, particularly from catalyst regenerator vent releases. It is colorless, pungent-smelling, and corrosive and even though it is unlikely to have adverse effect on health at background levels, exposure to high concentrations following an accidental release or in occupational settings may induce adverse health impacts. Ammonia can be measured using open-path technologies and shall be measured and reported at the fenceline.

Black Carbon (BC)

Black carbon (BC) is a product of incomplete combustion of fossil fuels, biofuels, and biomass, and it is emitted directly into atmosphere in form of particles, mostly in the PM2.5 $PM_{2.5}$ -size range. BC is a major component of ""soot"", a complex mixture that also contains some organic carbon (OC). It is emitted in high quantities by diesel engines and biomass burning. Although BC is often associated with emissions from heavy-duty diesel engines, a portion of all combustion emissions contains these constituentsBC. BC has been routinely used to estimate the contribution of diesel particulate matter (DPM) to total PM. DPM is the major contributor to air toxic health risk in the South Coast Air Basin,; however, it cannot be directly measured through atmospheric measurements and has to be estimated, usually based on BC measurements. In order to help determine if refineries add significant BC concentrations to nearby urban environments and discern the contribution of refineries to observed BC levels in the community,. BC is measured using point sensor technologies so full fenceline coverage is not achievable. For this reason, the petroleum refinery owner or operators are advised required to determine potential BC hotspots on the facility fenceline (or within the facility), and perform BC measurements.

Hydrogen Cyanide (HCN)

Hydrogen cyanide is colorless, highly flammable and can be explosive when exposed to air in high concentrations. It is released from various industrial activities, including refining. At high concentrations, such as from accidental releases, it is highly toxic. HCN can be effectively measured using open-path technologies and should be measured and reported at the fenceline ~~if the selected open-path monitors can detect it at desirable levels~~.

Hydrogen Fluoride (HF)

Hydrogen fluoride (HF) is a pungent, highly corrosive acid used at some oil refineries in a process called alkylation that boosts gasoline octane. HF also is used at chemical plants to manufacture compounds including refrigerants. The chemical poses a health risk to nearby residents and businesses because in the event of an accidental release, it can form a dense, fuming cloud capable of etching glass and causing severe damage to human skin and lung tissue. The facilities with alkylation units ~~may~~ already have monitors in place for detecting HF, such as could be associated with an accidental release~~s~~. Such monitors should ideally be placed near the alkylation unit, to ensure a rapid detection of accidental leaks to subsequently provide warning and real-time alerts ~~to inform health concerns~~ for the protection of ~~refinery~~facility workers and the nearby communities in the vicinity of the ~~refinery~~facility. All facilities that use hydrogen fluoride must monitor the ambient concentrations of HF ~~or demonstrate in the air monitoring plan that HF concentrations are adequately monitored and reported at the alkylation unit to be exempt from HF measurements~~ at the fenceline.

Sulfuric Acid

Sulfuric acid is a colorless, oily liquid that exists in air, water vapor, and particulates. It is corrosive to metals and organic materials and emits toxic sulfur trioxide-containing fumes or vapors when heated. In refineries, sulfuric acid is used as a catalyst during alkylation and in various treatment processes. Sulfuric acid has a very high boiling point, around 356°C; therefore, it is not very volatile. If sulfuric acid is released into the atmosphere, it would quickly fall to the ground as a liquid. Due to the nature of the compound, it would not remain in the vapor state long enough to be transported to the fenceline. For this reason, refineries will not be required to measure sulfuric acid at the fenceline.

Criteria for Exclusion

In certain cases, the facility owner or operator can request to exclude a compound identified in Table 1 if:

- The compounds are not associated with the processes at the facility:
  - A facility that does not store or use hydrogen fluoride;
  - A facility that does not have a FCCU, which is considered the only source of high concentrations of cadmium, manganese, and nickel which could be emitted as part of spent catalyst; or
  - A facility, such as a tank terminal, which does not have combustion equipment; or
- Technologies are not yet developed to perform real-time monitoring for the compound (e.g., PAHs). At the time of writing this Guidance Document, staff is not aware of any real-

time technology for fenceline monitoring PAHs. That would serve as technical justification to not include real-time monitoring for PAHs in the FAMP.

Continuous and Real-Time Measurement of Air Pollutants

Continuous air monitoring at or near the property boundaries of petroleum refineries can significantly improve rapid detection and communication of potential hazardous releases to refineryfacility owner or operators, responders, and the public in addition to providing long-term data, which would be used to determine trends in emissionsair quality near refinery fenceline (e.g., diurnal, seasonal routine emissions variations), and provide additional insight into facility emissions. Therefore, the fenceline monitoring equipment shall be operated continuously with a required time resolution of five-minute averaging when feasible. High time resolution monitoring reduces the chance of pollutant hot spots being undetected over the measured area and can provide real-time emissions information to refineryfacility personnel and the nearby communities. Due to the configuration of some open-path systems, e.g., an optical tent monitoring system or open path fenceline air monitor on a panning head, the measurements cycle for each fenceline path might take longer. The optical tent is a novel remote sensing system employing dual scanning Long-Path Differential Optical Absorption Spectroscopy (LP-DOAS), currently operational at a refinery in South Coast AQMD. Comprising of two open-path instruments, each scanning five light paths, this system continuously measures concentrations of selected VOCs along the refinery fenceline and inside the refinery. Such set-up provides benefits of early detection of pollution plumes, in certain instances before they reach the refinery fenceline; and augmented ability to pin-point the source(s) of unwanted emissions within the refinery. If achieving the desired time-resolution is not feasible, refineryfacility owner or operators shall provide rationale in the air monitoring plan FAMP for any proposed time resolutionsaveraging time greater than five minutes averaging (e.g., based on the equipment employed; the reasons for selecting such equipment; the number of paths covered by each open-path system; other potential benefits of the proposed measurement set-up; or other operational limitationsjustifications).

Selection of Fenceline Air Monitoring Technologies

A petroleum refineryfacility fenceline air monitoring system is a combination of equipment that measures and records air pollutant concentrations at or near the property boundary of a petroleum refineryfacility. Multiple technologies may need to be employed to ensure adequate compound identification and fenceline spatial coverage. 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 emissions hotspots or emissions plumes. Therefore, eEven after collecting data from multiple points in the survey area, the point sampling approaches may lack the spatial or temporal data necessary to obtain a complete picture of the emissions from large area sources. As a result, adequate number and spatial distribution of point monitors must be considered for fenceline air monitoring. Open path monitoring systems require a clear line of sight along the fenceline in order to provide accurate measurements. If facility demonstrates that such line of sight is not available, a facility may request approval to install point sensors instead open path monitoring systems at selected portions of the fenceline.

Open-path technology is a well-established method to measure path-integrated trace gas absorptions and concentrations in the open atmosphere making it ideal for long-term fenceline monitoring of pollutant concentration levels emitted from refineries or other large area sources. Open-path technology is a type of Optical Remote Sensing (ORS) that measures air pollutant concentration levels along an open -path, significantly improving the spatial coverage. ORS instruments use a light signal to continuously detect and measure concentrations of several chemical compounds simultaneously along the distance covered by the light signal in real-time. As a result, open-path technologies can provide greater temporal and spatial resolution compared to conventional air monitoring techniques; for example e.g., narrow pollutant plumes can be detected by an open-path fenceline air monitoring system that might otherwise be missed by point monitors. The light source emits light towards a detector, either at the opposite end of the light path (bi-static configuration) or co-located with the light source (mono-static configuration) if the light is reflected back by a reflector, providing path-averaged concentrations of multiple pollutants, simultaneously. Although the open-path ORS techniques have been used for over 20 years and are well-established, they are constantly improving and gaining use for large area source monitoring applications that are not conductive conducive to traditional point source testing methods. Improvements often include changes to technologies that improve detection limits, or the type of compounds detected.

Path-averaged monitoring approach presents aAnother advantage of open-path measurements is the capability of monitoring pollutant concentrations due to point source and fugitive emissions at or near the property boundary of a petroleum refineryfacility operation. Fugitive emissions are emissions of gases or vapors from leaks and other unintended or accidental releases of emissionspollutants. Leaks from pressurized process equipment generally occur through valves, pipe connections, mechanical seals, or related equipment, usually originating from the process area and storage tanks. Fugitive emissions also occur from storage tanks. These tanks are used to store crude oil prior to refining, intermediates between refining processes, and refined product streams. Except for a few process storage tanks, the storage tanks are generally located together in what is referred to as the “tank farm.”. Due to the large number of potential leak sources that are scattered over a wide area at large refineries, and difficulties in detecting and repairing these leaks (which may become significant collectively), these emissions are best monitored over a large area or path, using the open--path systems. U.S. EPA has published a comprehensive assessment of various open-path ORS technologies, outlining the advantages and limitations of each measurement method. In addition, South Coast AQMD conducted a comprehensive ORS technology demonstrations study to assess open-path capabilities for fenceline air monitoring[5].

[5] South Coast Air Quality Management District, "Optical Remote Sensing Studies," 2015. [Online]. available at http://www.aqmd.gov/ors-study.

In summary, open-path technologies through ORS, offer more advantages for fenceline air monitoring over traditional point monitors. They provide continuous, real-time measurements of multiple pollutants along an open path, thus enhancing its temporal and spatial coverage that might evade conventional point monitors. With the ability to monitor fugitive emissions across a wider area, open-path systems showcase a greater efficacy in identifying and addressing potential leak sources, therefore, making open-path technologies a more feasible long-term solution for facility fenceline air monitoring. Based on the advantages that open-path technologies provide over conventional air monitoring techniques, South Coast AQMD staff recommends the use of open-path technology, when applicableavailable, and appropriate for implementing a fenceline air monitoring system required by Rules 1180 and 1180.1. For open path monitoring systems, if the fenceline does not provide a clear line of sight, it may pose an infeasible condition for optimal open path measurements. In this case, the facility may request approval to install point sensors instead of open path monitoring systems.

The air monitoring plan FAMP must provide specifications for the fenceline instruments selected for a fenceline air monitoring system, such as detection limits of the equipment for each chemical and time-resolution capabilities. Prior to the installation of open path systems, expected detection limits for open-path instrumentation (described by different manufacturers as Method Detection Limits (MDLs) or Method Quantification Limits (MQLs)) for Rule 1180 or Rule 1180.1 compounds should be listed in facility's FAMP. These predicted MDLs are mainly the result of theoretical estimates based on spectroscopic specifications of the fenceline air monitoring equipment and estimated light path length. In real-life, actual MDLs of an open path system are dynamic quantities that are also depended on atmospheric conditions (e.g., MDL will increase as atmospheric visibility decreases), the presence of interfering or unknown compounds, the unique characteristics of each spectroscopic system, the atmospheric path length, and equipment performance. Real-life MDLs can be higher or lower than projected and can also change with time. Therefore, it is necessary to periodically re-evaluate and update open path MDLs for all measured compounds. Ideally, MDLs should be calculated for each open-path measurement. For open-path analyzers that do not provide this capability, MDL re-evaluation should be conducted for each Rule 1180 compound for each open path system every two weeks (at a minimum) or more frequently. Also, the air monitoring plan FAMP must demonstrate that the instruments can adequately measure the pollutants identified in Table 1. The selected open-path instruments should be able to record and store the measured spectral absorption, background and reference spectra and any other data used for concentration retrievals, and associated average concentrations of measured pollutants for retrospective investigations. Where open-path monitors are being operated, aAll factors that could affect air pollutant measurements where open-path monitors are being operated, such as the maximum path length the instruments are capable of measuring and potential interferences, must be discussed in the air monitoring plan FAMP. In certain instances, a refinery facility 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 thefor certain pollutant(s) that are monitored.

Alternative Fenceline Air Monitoring Technologies

In certain instances, alternative monitoring technologies may be appropriate to cover areas along the perimeter of a ~~refinery~~facility (for example, along the portions of the fenceline where open-path monitoring is not feasible, or for pollutants that cannot be reliably measured by open-path technologies). In these instances, the ~~refinery~~facility owner or operator may propose an alternative air monitoring technology~~(s)~~. The ~~refinery~~facility owner or operator must demonstrate the proposed alternative air monitoring technology~~(s)~~ will meet the requirements of Rules 1180 and 1180.1 and provide adequate sensitivity and ~~adequate~~ temporal and spatial coverage for the compounds identified in Table 1.

Fenceline Sampling Location(s) and Coverage

~~Air monitoring plans must specify~~The FAMP must achieve the complete fenceline spatial coverage, whenever feasible, and provide the following information related to the locations selected for the fenceline air monitoring equipment:

1. Areas along the perimeter that are likely to detect compounds associated with ~~petroleum refinery~~facility operations;
2. Locations of facility equipment or operations that may be emitting these compounds;
~~2.~~3. Proximity of proposed fenceline monitoring equipment to residences in the community and other sensitive receptors, such as schools, day~~ta~~ care centers, hospitals, clinics, nursing homes, and recreation areas;
~~3.~~4. Where equipment will be sited (e.g., GIS coordinates);
~~4.~~5. Elevations at which equipment will be placed; ~~and~~
6. Length of each path that will be monitored with fenceline instruments; and
~~5.~~7. A map of the facility indicating where the proposed monitors will be located.

The ~~air monitoring plan~~ FAMP must provide ~~a discussion that explains~~ the rationale for ~~choosing these~~the siting of the ~~refinery~~facility fenceline monitoring equipment~~ equipment siting specifications~~. ~~When considering a suitable fenceline technology for sites along the refinery perimeter, t~~The ~~refinery~~ facility owner or operator must address key considerations when siting the monitoring equipment, such as, the ~~distance necessary to accurately measure emissions~~ spatial coverage of monitors needed to detect emissions and critical transport areas around the perimeter of the ~~petroleum refinery~~facility. These considerations are further discussed below.

To ensure the highest level of accuracy when measuring emissions levels at or near the property boundary of a ~~petroleum refinery~~facility, the fenceline air monitoring system ~~should~~shall be designed considering the following key factors: local meteorological conditions, topography, pollutant hotspots, spatial coverage of monitors, and emerging technologies.

Local Meteorological Conditions

Meteorological conditions can significantly affect the concentration of air pollutants in a region~~.~~, ~~T~~therefore, it is important that the ~~petroleum refinery~~facility owner or operators consider the typical meteorological conditions (e.g., wind patterns, temperature, rainfall, cloud cover, etc.) of a site. For example, if a facility is in an area that is prone to fog, the facility owner or operator should ensure the equipment for the fenceline air monitoring system is not sensitive or easily impeded by low-lying cloud cover, and that visibility is being monitored produced by fog.

Evaluating historical meteorological data is imperative in air monitoring equipment site selection and 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 refineryfacility emissions to the surrounding communities. Often, peak concentrations occur during stable, low wind speed conditions when pollutants can build up and meanderdrift in any direction, highlighting the importance of complete or near-complete fenceline coverage. To the extent feasible, both long- and short-term wind measurements shouldshall be assessed in the air monitoring planFAMP. 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.

Topography

Concentrations of pollutants can be greater in valleys than for areas of higher ground. This is because, under certain weather conditions, pollutants can become trapped in low lying areas under certain weather conditions. Therefore, the topography of the refineryfacility can affect the distribution and dispersion of pollutants from refineryfacility operations. The petroleum refinery operator should design the fenceline air monitoring system to ensure fenceline air monitoring equipment is sited such that it captures at the most critical transport and dispersion areas along the perimeter of the facility would increase the likelihood for detection of fugitive emissions. The facility owner or operator should consider the topography of the facility when siting the fenceline air monitoring equipment such that the monitors are placed at locations and altitudes to maximize the likelihood of detecting pollution plumes crossing the facility fenceline.

Pollutant Hotspots

Facility owners or operators must identify potential pollutant hotspots within the facility to ensure fenceline monitoring of these emissions. This process ensures effective information dissemination to neighboring communities with adequate spatial coverage. It is essential for the refinery operators to identify potential pollutant hotspots within the facility to ensure fenceline monitoring of these emissions and to provide effective information to the neighboring communities with sufficient spatial coverage. Therefore, iIn developing the air monitoring plan FAMP, the refineryfacility owner or operator should survey the facility with special attention to areas where emissions are most likely, such as, tank storage, 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 geographical and topographical parameters, as well as the elevation of potential pollutant hotspots.

Spatial Coverage of Monitors

The fenceline monitoring system shouldshall be designed to ensure adequate coverage of the area along the facility perimeter, to the extent feasible. Considerations, such as, the proximity of refineryfacility emissions sources to sensitive receptors (i.e., residents, schools, hospitals, etc.)

and type of pollutants to be measured could require additional ~~open-path~~ monitors for a facility. In addition, an existing fenceline monitoring system installed and maintained by another Rule 1180 or 1180.1 facility along a shared fenceline may be considered when evaluating adequate coverage. ~~Also, i~~Information available from dispersion modeling, gradient sampling, and mobile measurements, should also be ~~taken into~~ considered~~ation~~ when assessing adequate coverage of a facility perimeter with a fenceline air monitoring system.

For metal monitors, since the only source of significant metal emissions are FCCU and ESP, the facility owner or operators could propose in their FAMP, with sufficient technical justification, that adequate coverage may be achieved with a limited number of air monitors located near those units.

Sampling locations should be away from certain ~~supporting~~ structures and have an open, unobstructed path. ~~Ideally, e~~Each air monitoring path should have an unobstructed line of sight ~~be at least 1 meter vertically and horizontally from any supporting structure~~, and be away from dusty or dirty areas, whenever possible. Additionally, locations and heights of monitoring paths should be selected to maximize the potential of capturing unwanted emissions, which may require positioning of analyzer shelters and/or reflectors at elevations of 15 feet or higher, depending on facility layout.

~~-~~Moreover, the ~~air monitoring plan~~FAMPs must identify potential disruption of airflow and the potential effect on measured concentrations caused by obstacles or traffic. Also, potential interferences caused by meteorological (e.g., fog or rain) or process issues (e.g., process steam) associated with the selected location(s) must be addressed. The air monitoring plan ~~should~~shall describe how the proposed fenceline air monitoring system will effectively provide relevant information for all nearby communities, especially downwind communities, given the expected meteorological conditions. Due to the high prevalence of marine fog in the areas where the ~~Basin~~ South Coast AQMD refineries are located, heaters and fans may be required to keep the instrument optics and reflector mirrors free of moisture to maximize data recovery.

Emerging Technologies

Some emerging next~~-~~ generation monitoring technologies ~~could possibly~~might meet the requirements for ~~this rule~~Rules 1180 or 1180.1. For example, it is possible that $PM_{2.5}$ low-cost sensors could ~~potentially~~one day allow cost-effective, real-time monitoring at numerous fixed locations along the perimeter (i.e., the fenceline) of a ~~petroleum refinery~~facility. Despite substantial progress, at this time, none of these methods can provide the level of sensitivity and accuracy ~~required~~ necessary to measure the air pollutants ~~required~~ listed ~~by~~ in Table 1 at the levels at or below ~~expected during normal refineryoperations~~ the health-standard based notification thresholds. However, gaseous sensors ~~are expected to~~may improve in the ~~near~~ future, at which point ~~and fenceline air monitoring plans~~ the FAMPs ~~could~~would be ~~augmented~~ revised to ~~employ~~ include the potential use of these sensors. ~~, therefore,~~ South Coast AQMD ~~may~~ would consider approving emerging technologies in the future. ~~for future compliance with Rules 1180.~~

~~SCAQMD has established an Air Quality Sensor Performance Evaluation Center (AQ-SPEC) to inform the public about commercially available low-cost sensors. Under this program, the performance of these sensors is compared against Federal Reference Method (FRM), Federal Equivalent Method (FEM), and Best Available Technology (BAT) instruments to determine their performance relative to more established measurement techniques. Some of these commercially available low-cost sensors can provide measurements for criteria pollutants (e.g., $_5$PM2.5, PM$_{10}$PM10, ozone, NO$_2$, and CO) which correlate well with FRM, FEM, and BAT methods, however, the situation is different for gaseous air toxics, where sensors with sufficiently low detection limits for specific compounds (e.g., benzene) are generally not available at this time. Total VOC concentrations can be measured using sensors based on Photon Ionization Detection (PID) at parts-per-billion (ppb) levels, although they do not provide VOC speciation and are not considered "low-cost" sensors. These sensors can serve as a temporary measurement technique in the event of an equipment failure or during extended maintenance activities until the fenceline air monitoring system is restored to normal operating conditions. However, as a substitute for the ORS-based approach, the refinery operators would have to deploy a network of traditional point monitors simultaneously at the fenceline of a facility. This would likely result in substantially increased sampling and analysis costs in order to achieve same level of temporal and spatial resolution and speciation of the target pollutants achieved with the ORS methods. 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.~~

4. Meteorological Measurements

Exposure~~s~~ to air contaminants within an urban area can vary greatly due to proximity to emission sources~~,~~; the magnitude and specific mix of emissions~~,~~; structures and terrain influences~~,~~; and meteorological conditions. Variability in wind speed and direction ~~in particular,~~ pose significant challenges for the analysis of data from air quality monitoring programs and exposure assessments ~~that rely on the ability to determine upwind and downwind locations in relation to emissions sources at any time~~. ~~Therefore, a~~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~~and when interpreting the measurement results, including the transport and dispersion of air pollutants from the ~~refinery~~facility to the community. Open-path measurements can also be affected by atmospheric visibility. Therefore, visibility monitors should also be included in fenceline air monitoring installations.~~Therefore, the sub-paragraph (d)(2)(D) of Rule 1180 requires fenceline monitoring locations to continuously record wind speed and wind direction data.~~

The ~~Air Monitoring Plan~~ FAMP must provide information on siting considerations and equipment to be employed for real-time meteorological data collection at high time resolution (at minimum, matching the time resolution of the air ~~quality~~ pollutant monitors), in order to provide high quality data. ~~-~~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[6].

5. 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.~~ Facilities must ensure that the data is high quality. The ~~air monitoring plan~~ FAMP shall address:

- ~~q~~Quality assurance, including training of personnel~~,~~; development and maintenance of proper documentation [i.e., instrument manuals, Standard Operating Procedures (SOP), and ~~a Quality Assurance Project Plan (~~QAPP~~)~~];~~,~~
- ~~r~~Routine maintenance and calibration checks~~,~~;
- ~~t~~Technical audits~~,~~;
- ~~d~~Data verification and validation~~,~~; and
- data quality assessment.

A QAPP for each ~~refinery~~facility fenceline monitoring project must~~t~~ ~~be developed that~~ outline~~s~~ the QA/QC plan, following U.S. EPA guidelines[7]. The QAPP provides a blueprint for conducting and documenting a study or program that produces quality results and must outline the specific goals of the monitoring networks and instrumentation, the data quality that is required and how that relates to when data generated by the instrumentation is accepted, and how the data will be reviewed and managed by the refineries. The QAPP ~~should~~shall provide clear definitions and procedures ~~for QA/QC that are necessary to indicate why some data may be missing, suspect, or invalid.~~ in the QA/QC plan for facilities to determine when data is missing, suspect, or invalid.

The critical functions to be addressed in the QAPP are summarized below. These functions were based on U.S. EPA guidelines.~~:~~

- **Project ~~b~~Background and ~~m~~Management:** The QAPP ~~should~~ shall provide background information and ~~define the problem(s) to be addressed and~~ the general goals of the fenceline ~~and community~~ monitoring system, ~~and describe~~including:
  - ~~project organization~~Organization tree that provides all personnel working on the project~~,~~;
  - ~~q~~Quality objectives and acceptance criteria for measurement data~~,~~; and
  - Plans for documentation, record keeping, and data dissemination.
- **Technical Approach:** The QAPP ~~should~~shall demonstrate that the appropriate approaches and methodologies are employed for~~performing~~ data measurements~~,~~ and data handling~~, and quality control are selected and address the design and implementation of the measurement systems~~.

[6] U.S. EPA, "Quality Assurance Handbook for Air Pollution Measurement Systems," 2008. [Online]. Available at https://www.epa.gov/sites/default/files/2021-04/documents/volume_iv_meteorological_measurements.pdf.
[7] U.S. EPA, "Guidance for Quality Assurance Project Plans," December 2002. [Online]. Available at: https://www.epa.gov/sites/default/files/2015-06/documents/g5-final.pdf.

- **Assessment/Oversight:** The QAPP should offershall provide appropriate QA/QC steps for ensuring the effectiveness of the monitoring plan. It shall cover 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 shouldshall describe what steps willshall 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 as approved by the Executive Officer 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, but not limited to:

- Automatically retrieving data from the fenceline monitors containing the measured levels of each air pollutant along with meteorological parametersdata from the meteorological stations and data from visibility monitors;
- 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 data display and dissemination program;
- Generating and recording logs to monitor system operation;
- NotificationsNotifying the public when measured concentrations are above pre-defined concentrations limitsthe notification thresholds.

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. To achieve the appropriate level of detail and standardization, and to consequently ensure that the monitoring equipment provides high quality data, Standard Operating Procedures (SOPs) must be prepared for each specific measurement method. The SOPs should shall be informed by general operating instructions that are typically provided by the manufacturers of 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 shall address specific topics such as calibration procedures and quality control procedures; including (indicating standards and checks, acceptance criteria, and schedule),; as well asand data reduction (indicating procedures; including validation procedures, reporting, and schedule).

Rule 1180 requires that the measurements from the fenceline monitoring system be available to the public on a real-time basis with Quality Assurance/Quality Control (QA/QC) measures implemented to provide confidence in the data collected. Rules 1180 and 1180.1 require that measurements from the fenceline monitoring system be available to the public in real-time, with implemented QA/QC measures to ensure confidence in the data. Publicly available quarterly measurement reports ~~should~~shall 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~~downtimes or malfunctions are detected quickly, with automated screening where feasible, 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.

6. Independent Audit

South Coast AQMD staff has been working with each facility to assure appropriate instrumentation, standardization of data acquisition and reporting, and appropriate procedure implementation to produce high-quality data. However, there is a need to have an independent party conduct a systematic review of the entire fenceline air monitoring network and ensure that the collected facility data meets the stringent quality assurance criteria of QAPP.

Based on the results of a Request for Proposals (RFP), South Coast AQMD selected a qualified contractor to develop an auditing protocol and implement the first independent audit of all fenceline air monitoring systems subject to Rule 1180. Staff anticipates the audit methodology will be developed in the second quarter of 2024, followed by audits initiated later in 2024. The audit protocol, or some portions of the protocol, developed through this process will also be used as the basis for conducting independent audit for facilities subject to Rule 1180.1, and for periodic ongoing independent audits of facilities subject to Rule 1180 and 1180.1.

Rules 1180 and 1180.1 require recurring audits to ensure the systems provide accurate data. The independent audit shall be performed by a qualified independent party according to the independent audit protocol to identify any deficiencies in the fenceline air monitoring system and quality assurance procedures.

Audit reports shall be signed by the qualified independent party, submitted to the South Coast AQMD, and made available to the public via the web-based fenceline notification system by the facility within 90 days after the audit has been performed. The qualified independent party shall certify under the penalty of law, based on information and belief formed after reasonable inquiry, that the statements and information in audit report and in all attachments and other materials are true, accurate, and complete.

~~6.~~7. Data Display and Dissemination

The primary goal of Rules 1180 and 1180.1 is to collect real-time emissions data and share that data with the community, local responders, and industry, to the extent feasible and as quickly as possible, so that ~~it can be used~~ they can use the data to evaluate and adaptively manage the impacts of refineries' emissions on the community. ~~Therefore, i~~It is essential that the collected data ~~must be~~is made available and displayed online in a relevant, useful, and understandable manner to the public in real-time or near-real-time and clearly identified as preliminary data. To provide context to this complex data set for the public, the designed website shall contain information regarding the species measured and the measurement techniques and corresponding MDLs, a 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 with clarity and thoroughness and with links provided to additional sources of information. In addition, the FAMP and the data website should include details of how the public can report experiences and provide comments and feedback for improvement of the website and other data dissemination tools, and the monitoring activities in general.

The air monitoring data must be provided in a manner that the public can readily access and understand. Websites for all facilities shall be designed in a user-friendly format. In order to make the data provided as accessible as possible, the project websites should use data visualization tools to graphically depict information using maps and time series plots of measured pollutants and wind data. In order to provide context to this complex data set for the public, the designed website shall 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.

The facility owner or operator must maintain a web-based data display to display, store, and make, at a minimum, the following information publicly available:.

a. Real-Time or Near-Real-Time Data

The real-time or near-real-time data must be submitted to SCAQMDmade publicly available on the facility's fenceline monitoring data display webpage, in a real-time or near-real-time manner, in an approved format. The refineryfacility owner or operators must also publish quarterly reports, root cause analysis, and other information specified by Rules 1180 and 1180.1 subdivision (g) written at a public-friendly level on the data dissemination website. The air monitoring plan FAMP 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 FAMP shall address means for providing automated, reliable, useful, and understandable information, including, the intent and any limitations of in the data collected and an explanation of how background concentrations and/or contributions from other sources may affect measured concentrations.

b. Historical Data

The facility owner or operators must make historical data publicly available on facility's fenceline monitoring data display webpage, including a graphical data display, with the ability to download electronic data that includes all historical measurements for the five most recent calendar years from each monitor for all air pollutants measured as one-hour averages, including time, date, and windspeed data. The data must be made available to the public in a timely and accessible manner that is easy to find on the website and can be understood by the general public. In addition, the facility owner or operators must make electronic real-near time and historical data available to the Executive Officer in an approved format.

bc. Quarterly Report

The refinery facility owner or operators must provide make quarterly data reports publicly available on facility's fenceline monitoring data display webpage. The quarterly report should include:

- after rigorous review of cCalibration data,; data processing calculations (such as conversion calculations of instrument signal to pollutant concentration),
- dData consistency,;
- fField data sheets and logbooks,;
- iInstrument performance checks,; and
- eEquipment maintenance documentation; and
- cCalibration 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 emissions levels detected by the fenceline air monitoring system and informs decision related to reducing community exposure;
- Identifying designated personnel to address SCAQMD's and public questions about monitoring equipment and readings.

The air monitoring data must be provided in a manner that the public can readily access and understand. Websites for all refineries should be designed in a user-friendly format. In order to make the data provided in this outreach as accessible as possible, the project websites should use data visualization tools to graphically depict information using maps and time series plots of measured pollutants and wind data. 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 definition 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 and other data dissemination tools, and the monitoring activities in general.

cd. Root Cause Analysis

When an air pollutant exceeds the notification threshold, Rules 1180 and 1180.1 require the facility owner or operator to conduct a root cause analysis. The root cause analysis is the process of discovering the root cause of the emissions exceeding the thresholds. The rules provides specifications on the analysis, which primarily include:

- Timeline for:
  - Initiating the analysis;
  - Conducting corrective action, if applicable, and
  - Making the root cause analysis report available on the online platform;
- Key elements to include in the analysis; and
- Corrective action.

7.8. Notification System

The website shouldshall offer an opt-in notification system that is integrated with the data collected by the air monitoring network. that The notification system shall automatically generates and issues notifications to subscribers when the concentration of anyeach of the pollutant levels exceeds the corresponding thresholds pursuant to the approved air monitoring planFAMP.

For text message notifications, the subscriber shall be able to opt-in to receive notifications via a short message service (SMS) or multimedia message service (MMS). A disclaimer must be provided, indicating that the subscriber may be subject to fees based on their phone service provider. The disclaimer must also indicate that messages may be delayed or not received based on their phone coverage. A mechanism to opt-out of the text message notifications is also required. The subscriber is responsible to opt-out of the text message notifications if they desire to do so.

a. Notification Thresholds

Resources that should inform the thresholds include In establishing health-standard based notification thresholds, South Coast AQMD reviewed the National Ambient Air Quality Standards (NAAQS), California Ambient Air Quality Standards (CAAQS), and the acute, chronic or carcinogenic Reference Exposure Levels (RELs) as assessed by California Office of Environmental Hazard Assessment[8] (OEHHA[9]). Except for six pollutants, air pollutants identified in Table 1 of Rules 1180 and 1180.1 have health standards available for establishing a health--standard-based notification threshold. The six air pollutants without health standards are total VOCs,

[8] OEHHA, "OEHHA Acute, 8-hour and Chronic Reference Exposure Level (REL) Summary," August 2020. [Online]. Available at: http://www.oehha.ca.gov/air/allrels.html

[9] OEHHA, 2008; http://www.oehha.ca.gov/air/allrels.html

ethylbenzene, black carbon, naphthalene, PAHs, and cadmium. Informational notification thresholds based on fenceline air monitoring data collected since the beginning of Rule 1180 fenceline air monitoring in 2020 have been established for total VOC. This notification threshold will indicate when air pollutant measurements are well above the levels typically detected at the fenceline. No informational notification thresholds have been established for ethylbenzene as its historical fenceline air monitoring data were mostly below the air monitoring systems' method detection limits. South Coast AQMD was not able to develop informational based thresholds for naphthalene, PAHs, and cadmium as there is no historical data available. Regarding Black Carbon, given its inclusion as part of the $PM_{2.5}$ measurements with established notification thresholds based on health standards, the staff is not currently considering proposing an informational-based notification threshold specifically for Black Carbon

The table below lists the health standard-based or informational-based notification threshold for each required air pollutant. One-hour rolling average data are utilized to determine if the notification thresholds would be exceeded, except that eight-hour rolling averages are used for manganese and 24-hour rolling averages are used for $PM_{2.5}$ and PM_{10}. South Coast AQMD will revise these thresholds and amend Rules 1180 and 1180.1 if the applicable standards and RELs are updated, or when sufficient historical data become available.

Table 2 Air Pollutants and Notification Thresholds*

Air Pollutants	Health Standard-Based Notification Threshold (ppb)	Information-Based Notification Threshold (ppb)
Criteria Air Pollutants		
Sulfur Dioxide	75	N/A
Nitrogen Oxides	100	N/A
Particulate Matter	35 μg/m³ ($PM_{2.5}$) and 50 μg/m³ (PM_{10}) (24-hr)	
Volatile Organic Compounds		
Total VOCs (Non-Methane Hydrocarbons)	N/A	730
Formaldehyde	44	N/A
Acetaldehyde	260	N/A
Acrolein	1.1	N/A
1,3 Butadiene	297	
Naphthalene	N/A	N/A
Polycyclic aromatic hydrocarbons (PAHs)	N/A	N/A
Styrene	5,000	N/A
Benzene	8	N/A
Toluene	1,300	N/A
Ethylbenzene	N/A	N/A
Xylenes	5,000	N/A
Metals		
Cadmium	N/A	N/A
Manganese	0.17 μg/m³ (8-hr)	N/A
Nickel	0.2 μg/m³	N/A
Other Compounds		
Hydrogen Sulfide	30	N/A
Carbonyl Sulfide	270	N/A
Ammonia	4,507	N/A
Black Carbon	N/A	N/A
Hydrogen Cyanide	309	N/A
Hydrogen Fluoride	289	N/A

*One-hour rolling average data are utilized to determine notification thresholds exceedances, except that eight-hour rolling averages are used for manganese and 24-hour rolling averages are used for $PM_{2.5}$ and PM_{10}.

~~An REL is an airborne concentration level of a chemical at or below which no adverse health effects are anticipated for a specified exposure duration as developed by RELs are based on the most sensitive, relevant, adverse health effect reported in the medical and toxicological literature. RELs are designed to protect the most sensitive individuals in the population by the inclusion of margins of safety. Therefore, exceeding the REL does not automatically indicate an adverse health impact. The REL is not the threshold where population health effects would first be seen. 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., the very young, the elderly, pregnant women, and those with acute or chronic illnesses). OEHHA has developed acute RELs for assessing potential non-cancer health impacts for short-term, one-hour peak exposures to air pollutants including facility emissions., therefore For example, 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. By definition, an acute REL is an exposure that is not likely to cause adverse health effects in a human population, including sensitive subgroups, exposed to that concentration for the specified exposure duration on an intermittent basis. Chronic RELs are developed for assessing non-cancer impacts from long-term exposure, at or below which no adverse health impacts are anticipated following long-term exposure. Long-term exposure for these purposes has been defined by U.S. EPA as at least 12 percent% of a lifetime, or about eight years for humans. However, for assessment and reporting programs, such as those required by AB 2588, 1-year emissions assessments are typically used for modeling ambient conditions in nearby communities for long-term exposures. Therefore, chronic RELs 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 System Design

The notification system ~~should~~ shall be designed to provide information to the public, ~~-~~via email, text message, or other approved communication ~~venues with, at minimum, the ability to be notified regarding:~~ methods, with a mechanism for the public to opt-in or opt-out. 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; and
- Automated call-in phone system

At a minimum, the notification system shall notify the public of the following:

- ~~(1) data availability and release of periodic reports~~ The maximum concentration of the air pollutant detected during the period of an exceedance;
- ~~(2) exceedances of thresholds established in approved fenceline air monitoring plans~~The notification thresholds of the air pollutant;

(3) monitoring system status Duration of the exceedance.

For each exceedance, an initial notification -shall be generated and issued within 15 minutes of the exceedance occurrence and a follow up notification is required within 15 minutes of the conclusion of the exceedance to inform the public the required information. 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 facility owners or operators to so they can rapidly identify and mitigatereduce any previously undetected and/or accidental emissions. The notification system shall also send a notification if a fenceline notification was sent in error with an explanation as to the cause of the false fenceline notification. This can have a significant impact reduce on the reduction of refinery fugitive emissions.

Websites should not simply provide graphical information about current conditions. Air monitoring plans should include a plan for how residents can 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. The data must also be made available to SCAQMD in an approved format.

The air monitoring plan should also identify alternative methods of accessing without a computer for those members of the community who may not have internet access (e.g., automated phone systems for dial-in information, or public displays, hard copies of periodic reports in libraries or community centers, etc.). Based on the needs of the communities, 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 data summary reports.

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 operators must identify the primary local agency that provide emergency preparedness and response services for each refinery, and coordinate with the first responders to integrate with and augment the existing public alert systems and communication mechanisms to provide the public with access to timely alerts and 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 volume and a draft a second volume 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 draft report for Objective 2: Evaluation of Air Monitoring Capabilities, Gaps, and Potential Enhancements became available in September 2017. Also in September 2017 OEHHA released a related draft report: Analysis of Refinery Chemical Emissions and Health Effects. These are available from the CARB Refinery Air Monitoring website.

Text message notification system

Refineries are required to offer options for interested parties to opt in or opt out of receiving text notifications when they exceed a notification threshold. Depending on the availability of smartphones at the end user's location, the type of messaging can vary. It could range from receiving simple text messages with up to 160 characters (commonly known as SMS) to receiving longer messages containing links to other websites (e.g., OEHHA Air Chemical Database website) to provide more information in the form of MMS. Therefore, the system shall allow subscribers opt-in to receive text messages in the form of either SMS or MMS. Interested parties are responsible for re-opting in if their phone numbers change; this is not the responsibility of the notification-issuing facility. The text message notification system should, at a minimum, provide this information:

- For SMS notifications:
  - Facility name, location, site, date, and time of the exceedance.
  - Air pollutant name, concentration measured, and the notification threshold.
- For MMS notifications:
  - Include all of the information in the SMS notification.
  - Add a link to the OEHHA Air Chemical Database website for the specific air pollutant detected above the threshold.
  - Add a link to the facility's website that contains additional information about the event.
- Include a disclaimer that text messages are handled by individual cell phone carriers, which is outside the control of the facilities.

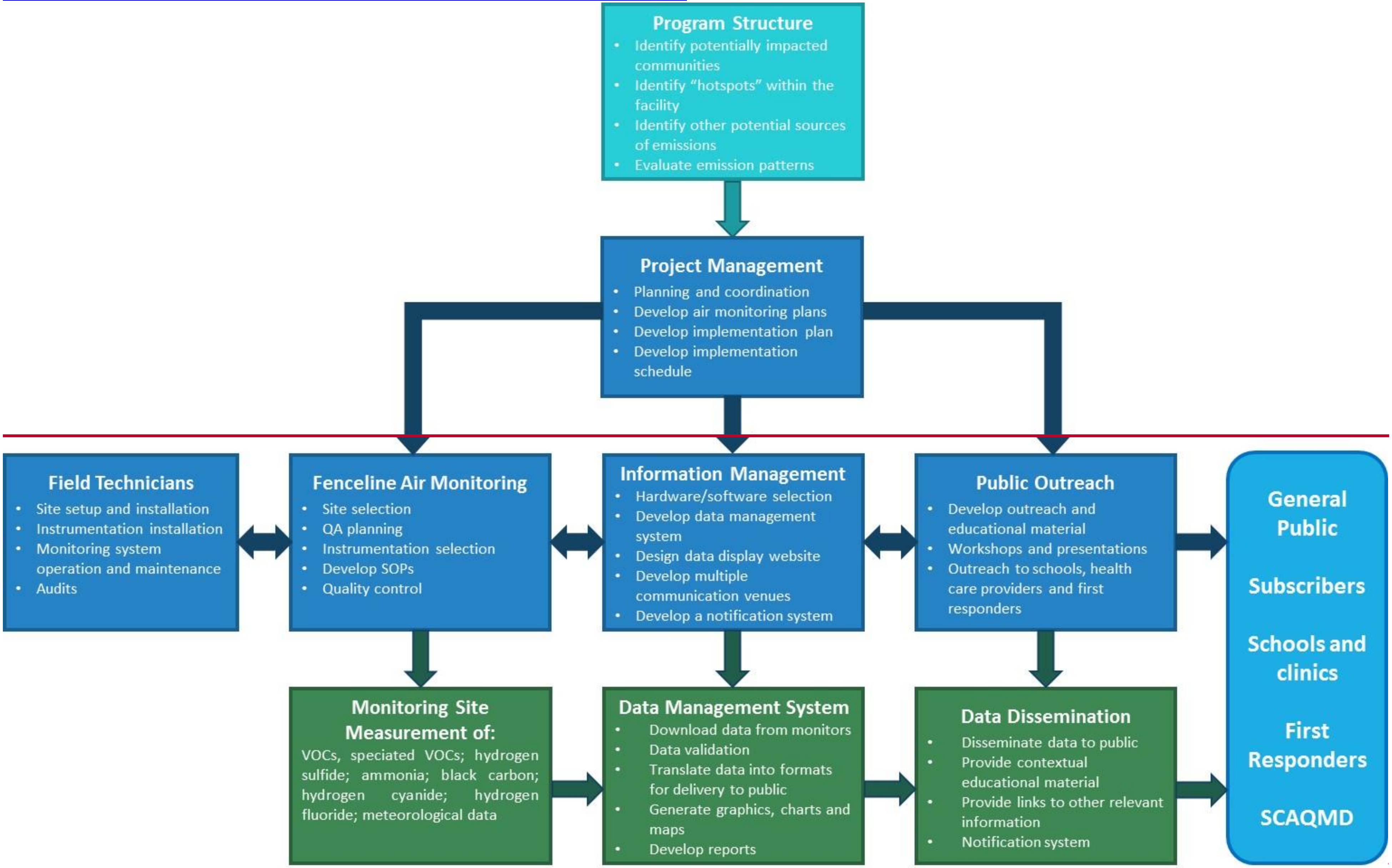
8. Other Regulatory Programs

The U.S. EPA adopted a rule in December 2015 (40 CFR §63.658) with fenceline monitoring provisions that require sampling for benzene at refinery property boundaries. Considering that open-path technologies are currently the best available and the most accurate method for fenceline monitoring of benzene and other pollutants, SCAQMD will assist the refineries in seeking U.S. EPA approval for monitoring systems proposed as part of Rule 1180 through the

~~refinery's fenceline air monitoring plan to also meet U.S. EPA requirements for monitoring of benzene.~~

9. Future Updates to Rules 1180 and 1180.1 Fenceline Air Monitoring Plan Guidelines

Revisions and updates to this guidance are expected ~~and will be required~~ as new instrumentation, methodologies and monitoring strategies are developed. The resolution for the 2023 Rule 1180 amendment and Rule 1180.1 adoption included a commitment to technology assessment. Staff will assess real-time monitoring technologies for any air pollutant listed in Table 1 of the rules by January 1, 2029, and every five years thereafter, and report the results of the assessment to the South Coast AQMD Stationary Source Committee.



~~Figure 22 - Overview of the Refinery Fenceline Air Monitoring Programs~~

Appendix A - FAMP Checklist

FAMP Checklist	
Fenceline Air Monitoring Coverage (or Spatial Coverage)	
þ	Identify the facility's proximity to sensitive receptors affected by the facility operation and provide the information below.
	○ Distance from facility to closest sensitive receptor(s)
	○ Location of downwind and upwind communities
	○ Significant sources of non-refinery emissions surrounding the facility (e.g. non-refinery industrial facilities)
	○ Dispersion modeling†
þ	Describe historical facility emission patterns and pollutant hotspots based on the following:
	○ On-site location of operations and processes within the facility's perimeter
	○ On-site location of emissions sources and level of emissions
	○ Facility plot plans and topography
	○ Dispersion modeling†
þ	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 provide adequate coverage, especially for all nearby downwind communities
Fenceline Air Monitoring Equipment Description	
þ	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
	○ Justification to use alternative technologies

þ	Monitor for the pollutants listed in Table 1 of Rule 1180 or Rule 1180.1 and include the following:
	○ Pollutant detection limits for all instruments and the defining factors, such as paths measured for open path systems
	○ Justification of any exclusion of chemical compounds listed in Table 1 of Rules 1180 and 1180.1 or measurement of a surrogate compound
Quality Assurance	
þ	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 data)
	○ ~~Standard operating procedures (~~SOP~~)~~ for all measurement equipment
	○ Routine equipment and data audits
Data Presentation to the Public	
þ	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
	○ The most recently approved, or partially approved, FAMP and QAPP
	○ Definition of each data quality flag
	○ Report(s) generated from independent audit(s), including corrective action plan(s) or revised corrective action plan(s) if applicable
	○ Root cause analysis
	○ Hyperlinks to relevant sources of information
	○ A means for the public to provide comments and feedback; Procedures to respond
	○ Real-time and at least five years of historic concentration data of all air pollutants measured on the fenceline air monitoring system including data quality flags, quarterly reports, audits, etc.

	○ Real-time and at least five years of historic concentration wind speed and wind direction data
	○ Quarterly data summary reports, including relationship to notification thresholds, data completeness, instrument issues, and quality control efforts
Notification System	
þ	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 downtime)
	○ Notifications for the availability of periodic reports that inform the community about air quality
	○ TriggersNotifications for exceedances inof thresholds (e.g. Acute Reference Exposure Levels (RELs))
	○ Communication methods for notifications, such as, automated emails, text messages, and other approved communication methods

† Dispersion modeling shall be conducted using U.S. EPA's Preferred and Recommended Air Quality Dispersion Model (e.g., Health Risk Assessment)

Appendix B - Other Resources

Bay Area Air Quality Management District, 2016. Air Monitoring Guidelines for Petroleum Refineries.

http://www.baaqmd.gov/~/media/files/planning-and-research/public-hearings/2016/9-14-and-12-15/042016-hearing/1215-amg-041416-pdf.pdf?la=en

Bay Area Air Quality Management District, 2016. Regulation 12, Rule 15: Petroleum Refining Emissions Tracking.
[http://www.baaqmd.gov/~/media/files/planning-and-research/rules-and-regs/reg-12/rg1215-pdf.pdf?la=en]

U.S. EPA, 2015. AP-42: Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Chapter 5: Petroleum Industry.
[https://www3.epa.gov/ttn/chief/ap42/ch05/index.html]

U.S. EPA, 2015. 40 CFR §63.658, Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, Final Rule.
[https://www.gpo.gov/fdsys/pkg/FR-2015-12-01/pdf/2015-26486.pdf]

U.S. EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5, EPA/240/B-01/003)
[https://www.epa.gov/sites/production/files/2016-06/documents/r5-final_0.pdf]

U.S. EPA Guidance for the Data Quality Objectives Process (EPA QA/G-4, EPA/600/R-96/055)
[https://archive.epa.gov/epawaste/hazard/web/pdf/epaqag4.pdf]

U.S. EPA Guidance on Technical Audits and Related Assessments for Environmental Data Operations (EPA QA/G-7, EPA/600R-99/080)
[https://www.epa.gov/sites/production/files/2015-07/documents/g7-final.pdf]

Network Design for State and Local Monitoring Stations (SLAMS), National Air Monitoring Stations (NAMS), and Photochemical Assessment Monitoring Stations (PAMS).
Code of Federal Regulations. Title 40, Part 58, Subpart E, Appendix D.

Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Part 1 (EPA-454/R-98-004)
[https://goo.gl/HGCNrR]

Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (EPA/625/R-96/010b)
[https://www3.epa.gov/ttn/amtic/airtox.html]

Guidance for Preparing ~~Standard Operating Procedures (~~SOPs~~)~~ (EPA QA/G-6, EPA/240/B-01/004)
[https://www.epa.gov/sites/production/files/2015-06/documents/g6-final.pdf]

Draft Rule 1180 and Rule 1180.1 Fenceline Air Monitoring Plan Guidelines

U.S. EPA Handbook: Optical Remote Sensing for Measurement and Monitoring of Emissions Flux
[https://www3.epa.gov/ttnemc01/guidlnd/gd-052.pdf]

Draft CARB/CAPCOA Refinery Air Monitoring Assessment Reports
[https://www.arb.ca.gov/fuels/carefinery/crseam/crseam.htm]

Draft OEHHA Report: Analysis of Refinery Chemical Emissions and Health Effects
[https://oehha.ca.gov/air/analysis-refinery-chemical-emissions-and-health-effects]