Quality Assurance Project Plan
for
Ultramar Wilmington Refinery
SCAQMD Rule 1180 Refinery Fenceline Monitoring

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A PROJECT MANAGEMENT ELEMENTS

A.1 Title and Approval Sheet

Quality Assurance Project Plan
for
Ultramar Wilmington Refinery
SCAQMD Rule 1180 Refinery Fenceline Monitoring

Approvals

Ultramar Inc.

Atmosfir Optics Ltd.

SCAQMD Rule 1180 Staff – for approval

A.2 Table Of Contents

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A.3 Distribution List

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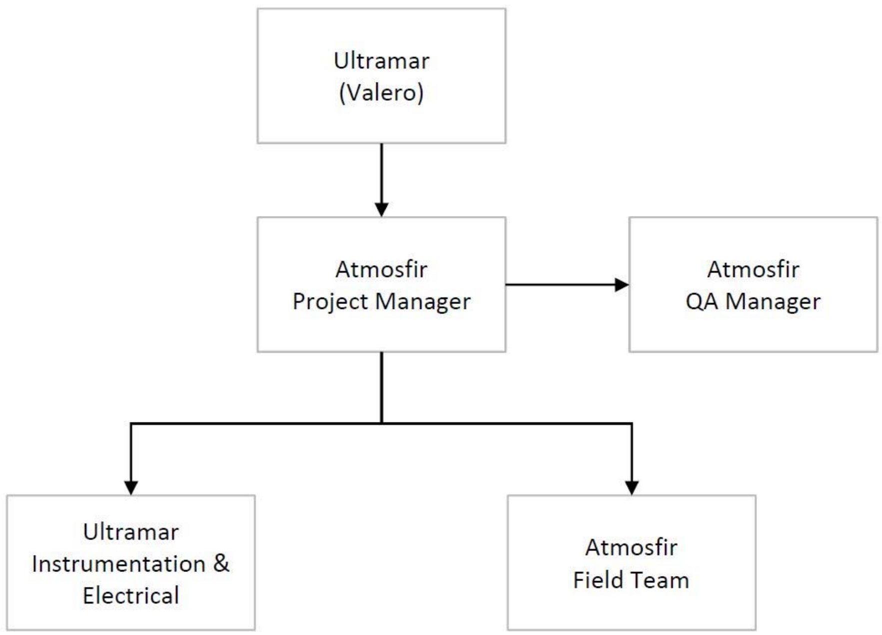
A.4 Project/Task Organization

The organization of the project team is as shown in Figure A-1.

Figure A-1 Organization Chart



Ultramar has overall responsibility for maintaining and updating the QAPP. Other aspects of the monitoring project are managed by support staff and Atmosfir, under the supervision of Ultramar.

A.5 Problem Definition and Background

On December 1, 2017 the South Coast Air Quality Management District (SCAQMD) adopted Rule 1180 Refinery Fenceline and Community Air Monitoring. The purpose of Rule 1180 is to require petroleum refineries to establish a real-time fenceline air monitoring systems that provide air quality information to the public and local air district about levels of various criteria air pollutants, volatile organic compounds and other compounds at or near the property boundaries of petroleum refineries.

The focus of this Quality Assurance Project Plan (QAPP) is the monitoring of pollutant concentrations that exist at or near the property boundary of petroleum refineries.

Ultramar, Inc., dba Valero Wilmington Refinery (Ultramar) is committed to quality and the implementation of the procedures and practices found in this QAPP. Quality Assurance (QA) is an integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed, and expected. Quality Control (QC) is the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer. The QC system includes the operational techniques and activities that are used to fulfill requirements for quality.

Quality Control is largely implemented through the QAPP. Each monitoring program has unique requirements, statutory guidelines, rules, and policies that must be followed. The QAPP incorporates the unique qualities that are specific to each monitoring program.

Ultramar and its contractors are committed to the principles and practices of its QA Program at the highest level. The QA Program developed for this program focuses on preventing quality problems.

A.6 Project/Task Description

Ultramar's Fenceline Air Monitoring Plan specifies the project goals to be fulfilled. In summary, the project involves establishing a network of monitoring stations to continuously monitor air quality at the fenceline surrounding the Ultramar refinery in Wilmington, California. The monitoring stations will continuously monitor a variety of pollutants using a combination of open path and point-extractive monitoring technologies, as required by SCAQMD Rule 1180.

Wind speed and direction monitoring will be included in order to address upwind versus downwind pollutant concentrations. The collected data will be used to better understand emissions and potential impacts at the fenceline and surrounding community. Monitoring will be posted to a publicly accessible via web portal in near-real time to enhance public awareness of current air quality conditions in the vicinity , and will notify public information subscribers when concentrations exceed pre-defined health thresholds .Further analysis of the results and monitoring system performance will be posted quarterly. The monitoring will be conducted under the supervision of SCAQMD.

The pollutants to be monitored at the facility are summarized below in Table A-1 with the defined acute health thresholds.

Table A-1 Monitored Pollutants and Notification Thresholds

Pollutant	Published Acute 1-hour Threshold (ppb)[1]	Air Quality Standards 1-hour
Criteria Pollutants		
Sulfur Dioxide	75	NAAQS
Nitrogen Dioxide	100	NAAQS
Volatile Organic Compounds		
Total VOCs	N/A	N/A
Formaldehyde	45.5	OEHHA
Acetaldehyde	265	OEHHA
Acrolein	TBD[2]	TBD[2]
1,3-Butadiene	303	OEHHA
Styrene	5,000	OEHHA
Benzene	8.6	OEHHA
Toluene	9,964	OEHHA
Ethyl Benzene	TBD[2]	TBD[2]
Total Xylenes	5,142	OEHHA
Other Compounds		
Hydrogen Sulfide	30	OEHHA
Carbonyl Sulfide	273	OEHHA
Ammonia	4,662	OEHHA
Black Carbon	TBD[2]	TBD[2]
Hydrogen Cyanide	312	OEHHA
Hydrogen Fluoride	298	OEHHA

Notes.
[1] Published acute standard from EPA and OEHHA thresholds
[2] TBD – To be determined with consultation with the AQMD

A.6.1 Meteorological Monitoring Station

Ultramar will install a meteorological station on the facility property that measures wind direction and wind speed. The meteorological station will provide high time resolution at least matching the time resolution of the air quality monitors and will be located at Cabinet 2 (see Figure A-2). Meteorological stations installed on the other cabinets will serve as a backup system if the station in Cabinet 2 is down. Refer to Section 3.5 Routine Maintenance and Failure Management in the fenceline air monitoring plan for more details.

A.6.2 Fenceline Monitoring Systems

A.6.2.1 Sampling Techniques

The techniques for the monitored pollutants are detailed in Table A-2 and are according to the SCAQMD requirements. The detection limits that will be reported to the public and maximum range for these techniques, based on the specific vendor specification, are also detailed in Table A-2.

Table A-2 Monitoring Technologies and Reporting Detection Limits

Pollutant	Monitoring Technique	Estimated Detection Limit (ppb)	Maximum Detection Limit (ppb)[2]
Sulfur Dioxide	UV-DOAS	0.4	1,900
Nitrogen Dioxide	OP-FTIR	10	52,000
Total VOCs (as Total Alkanes)[1]	OP-FTIR	1	114,000
Formaldehyde	OP-FTIR	2	80,000
Acetaldehyde	OP-FTIR	0.5	114,000
Acrolein	OP-FTIR	0.3	44,000
1,3-Butadiene	OP-FTIR	0.3	4,000
Styrene	OP-FTIR	1	57,000
Benzene	UV-DOAS	0.3	626
Toluene	UV-DOAS	0.3	531
Ethyl Benzene	UV-DOAS	1.2	461
m-Xylene	UV-DOAS	0.2	461
o-Xylene	UV-DOAS	0.7	461
p-Xylene	UV-DOAS	0.2	461
Hydrogen Sulfide	UV Fluorescence	0.4	10,000
Carbonyl Sulfide	OP-FTIR	0.1	7,000
Ammonia	OP-FTIR	0.1	66,000
Black Carbon	Aethalometer	0.0005	10 $\mu g/m^3$
Hydrogen Cyanide	OP-FTIR	3	>1,000,000
Hydrogen Fluoride	OP-FTIR	1	16,000

Notes.
1 As there is no open path technology capable of measuring all NMHC, it is proposed to use open path FTIR technology to monitor at least C2-C5 alkanes as an indicator of NMHC concentrations. The range may be extended up to C2-C12 alkanes.

[2] Unit is expressed in parts per billion (ppb) by volume except for Black Carbon (particulate matter) of which unit is expressed as microgram per cubic meter ($\mu g/m^3$)

Special consideration in fulfilling Rule 1180 measurement tasks:

- Measurements of Total VOCs (NMHC) - Rule 1180 asks for measurements of Total VOC (non-methane) for fenceline monitoring. There is no open path measurement for Total VOC, and point monitoring is not a preferred solution for Rule 1180. Atmosfir D-fenceline™ solution for total alkanes is the most suitable to measure Total VOC (which, by definition, excludes methane).
  The total alkanes measurement is defined and explained by the method used in the approved EPA study.[1] The spectral analysis is designed to quantify a bimodal mixture of total alkane, using a predefined surrogate pair of a low order alkane and a high order alkane. The analysis in the D-fencline™ system includes the equivalent molecular weight of the alkanes mixture. This feature enables the user to define the content of the mixture (heavy versus light alkanes).

- System Detection Limits - The acute 1-hour thresholds, that will trigger a notification to the public, according to Rule 1180 and SCAQMD requirements, are detailed in Table A-1. All the pollutant has reporting detection limits that is lower than the needed threshold; that is, the sensitivity is good enough for detecting the pollutant below the threshold, see also the full D-fencline™ System detections capabilities In Table A-3.
  The detections limits for the OP-FTIR with the D-fenceline™ system are all below the Acute Thresholds and can serve as a backup system for the pollutants that are monitored primarily using UV-DOAS, see Table A-3.

- System Maximum Detections - The maximum measurement range for toluene and xylenes with the UV-DOAS is below the high REL concentrations for these compounds; the instrument can be saturated "blinded" by high concentrations. This can cause a problem if a concentration is above the instrument's maximum range – there is no way of knowing if the value exceeds the notification threshold if relying on UV-DOAS alone. A solution for these situations is using the FTIR, which has a much higher maximum measurement range, for such high-concentration measurements (see Table A-3). Therefore, UV-DOAS will be used for trace-level monitoring of these pollutants, and OP-FTIR for higher-concentration monitoring and notification triggering.

[1] THOMA, E. D., M. MODRAK, AND D. J. Williams. Investigation of fugitive emissions from petrochemical transport barges using optical remote sensing. U.S. Environmental Protection Agency, Washington, DC, 2009. EPA Document ID EPA-600/R-09-136.

Table A-3 Full D-Fencline™ System Detections Capabilities

List of targeted compounds relevant for Rule 1180	Detection limits [a,b]	Maximum range [c]	units	Technology	1hr threshold level for public notification [d]	Atmosfir D-fenceline system OP-FTIR (for 250m)	
						Estimated Minimum detection limits (MDL) [a] [ppb]	Maximum range [ppb] [c]
Sulfur Dioxide	**0.4**	**1900**	ppb	OPSIS UV-DOAS	**75**	**2**	**>1,000,000**
Nitrogen Oxides	**10**	**52,000**	ppb	OP-FTIR - D-fenceline™	**100**	**10**	**52,000**
Total VOCs (as Total Alkanes)	**1.0**	**114,000**	ppb	OP-FTIR - D-fenceline™	**---**	**1**	**114,000**
Formaldehyde	**2.0**	**80,000**	ppb	OP-FTIR - D-fenceline™	**45.5**	**2**	**80,000**
Acetaldehyde	**0.5**	**114,000**	ppb	OP-FTIR - D-fenceline™	**265**	**0.5**	**114,000**
Acrolein	**0.3**	**44,000**	ppb	OP-FTIR - D-fenceline™	**1.1**	**0.25**	**44,000**
1,3-Butadiene	**0.3**	**4,000**	ppb	OP-FTIR - D-fenceline™	**303**	**0.25**	**4,000**
Styrene	**1.0**	**57,000**	ppb	OP-FTIR - D-fenceline™	**5,000**	**1**	**57,000**
Benzene	**0.3**	**626**	ppb	OPSIS UV-DOAS	**8.6**	**1**	**333,000**
Toluene	**0.3**	**531**	ppb	OPSIS UV-DOAS	**9,964**	**2**	**15,000**
Ethylbenzene	**1.2**	**461**	ppb	OPSIS UV-DOAS	**---**	**10**	**28,000**
m-Xylene	**0.2**	**461**	ppb	OPSIS UV-DOAS	**5,142**	**1**	**25,000**
o-Xylene	**0.7**	**461**	ppb	OPSIS UV-DOAS	**5,142**	**1**	**10,000**
p-Xylene	**0.2**	**461**	ppb	OPSIS UV-DOAS	**5,142**	**1**	**16,000**
Hydrogen Sulfide	**0.4**	**10000**	ppb	Fluorescence	**30**	**500**	**>100,000**
Carbonyl Sulfide	**0.1**	**7,000**	ppb	OP-FTIR - D-fenceline™	**273**	**0.1**	**7,000**
Ammonia	**0.1**	**66,000**	ppb	OP-FTIR - D-fenceline™	**4,662**	**0.1**	**66,000**
Black Carbon	**0.0005**	**10**	microgram/m^3	Aethalometer AE33	**---**	not measure in FTIR	**---**
Hydrogen Cyanide	**3.0**	**>1,000,000**	ppb	OP-FTIR - D-fenceline™	**312**	**3**	**>1,000,000**
Hydrogen Fluoride	**1.0**	**16,000**	ppb	OP-FTIR - D-fenceline™	**298**	**1**	**16,000**

(a) OP-FTIR detection limit is dynamic, Atmosfir Estimated MDL for OP-FTIR is based on real site measurements (250m path) for the Minimum Detection Limit (above background level). The real detection limit will change according to the specific location and atmospheric conditions, for more insights please contact Atmosfir.

(b) UV-DOAS detection limit is dynamic, Opsis UV-DOAS Estimated MDL is for monitoring path 500 m (measurement time 1 min), the real detection limit will change according to the specific location and atmospheric conditions.

(c) OP-FTIR and UV-DOAS maximum range is path dependent since the measurements are in ppb*m.

(d) Thresholds are according to SCAQMD requirements (table 8 draft), based on NAAQS 1-hr ppb for NO2 & SO2 and REL - OEHHA2017 Table 3.

A.6.2.2 Sampling Locations

Sampling locations have been selected with a variety of goals and constraints in mind. The air monitoring systems primary purpose is to inform the public and Ultramar about air pollution impacts to surrounding areas. The SCAQMD approval locations were chosen to help facilitate locating fugitive emission sources at the Refinery (such as leaks) so that they can be more promptly be corrected. Additionally, given the heavy concentration of major emission sources in the surrounding neighborhood (ports, chemical industries, other refineries) and heavy traffic (road/rail) in the area, monitoring locations have been selected to help identify and differentiate emissions coming from the Refinery versus those coming from other nearby sources. Given concerns that point-extractive monitoring techniques may not always be impacted by localized pollutant plumes, open path monitoring technologies are used the maximum extent feasible to enhance the representativeness of the data. The SCAQMD approved monitoring equipment locations are shown in Figure A-2.

Figure A-2 Monitoring Equipment Locations

A.6.3 Sampling Frequency

Meteorological and air quality data are sampled at least every five minutes, and recorded as five-minute averages on data loggers located at each monitoring station. For one-hour averages, compounds measured by open path-FTIR; a unique algorithm in the D-fencline™ system will allow 1-hour sampling that will be updated every 10 min, For further explanation on the 1-hour sampling for the OP-FTIR see Section B.2.

A.7 Quality Objectives and Criteria for Measurement of Data

This QAPP has been prepared to detail the methodologies to establish continuous fenceline measurements around the Refinery. This monitoring will be conducted to satisfy the requirements of Rule 1180. The procedures outlined in this QAPP have been developed to meet the goals and objectives of the monitoring project. Revisions to the QAPP are made, as necessary, to reflect changes to the regulations or goals of the monitoring project. As a minimum, the QAPP is reviewed annually and revisions are made as necessary.

The monitoring program will carefully consider the guidance found in the following documents:

- EPA's Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV, Meteorological Measurements, EPA March 2008;
- EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II: Ambient Air Quality Monitoring Program, EPA-454/B-08-003, May 2013.

This is intended to ensure that data and technical information that are measured are documented and of appropriate quality and usability.

Data Quality Indicators (DQIs) are selected to design the measurement system and ensure that it meets the data quality objectives of the project, as defined by Rule 1180 and District guidance. For typical chemistry data, DQI's can be defined in terms of the following data quality indicators:

- Precision is a measure of agreement among repeated measurements of the same property under identical, or substantially similar, conditions. This is the random component of error. Precision is estimated by various statistical techniques typically using some derivation of the standard deviation.
- Bias is the systematic or persistent distortion of a measurement process which causes error in one direction. Bias will be determined by estimating the positive and negative deviation from the true value as a percentage of the true value.
- Accuracy is a measure of the overall agreement of a measurement to a known value and includes a combination of random error (precision) and systematic error (bias) components of both sampling and analytical operations.
- Representativeness refers to the degree to which data accurately and precisely represent a characteristic of a population, a parameter variation at a sampling point, a process condition, or a condition.
- Comparability expresses the degree of confidence that one data set can be compared to another and can be combined for the decision(s) to be made.
- Completeness describes the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct, normal conditions.
- Sensitivity is the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability.

The acceptance criteria used for the DQIs are the Measurement Quality Objectives (MQOs) for the meteorological and air quality measurements. MQOs are designed to evaluate and control various phases of the measurement process to ensure that total measurement uncertainty is within the range prescribed by the data quality objectives.

Project MQO's are presented in Table A-4 for key criteria such as precision, accuracy, and completeness. These enable the project team to measure progress and success in attaining the quality goals for the monitoring effort. Other quality objectives are described in Section B.5 as part of the quality control tests for each technique; some of them are automatic and some periodic manual tests. Periodic tests that do not meets the MQOs will immediately trigger an investigation to the reason of the failure and a corrective action. According to the investigation, ambient measurement data may be invalidated back to the last good check or calibration of the equipment after an MQO is not met. Some of the automatic quality objective that are described in Section B.5 can automatically exclude invalid ambient measurement.

Table A-4 General Data Quality Indicators (DQIs)

Instrument	DQI	Frequency	MQO	Reference	Complete-ness
Fourier Transform Infrared Spectroscopy (FTIR)	Accuracy: Bump Test	Annually or after major maintenance	±20%	Manufacturer Recommendation & SCAQMD Request	90%
	Precision: Bump Test	Annually or after major maintenance	±20%		
	N_2O accuracy – periodic check	Monthly	±20%	EPA Compendium Method TO-16 & GD-52 - EPA Handbook: Optical Remote Sensing for Measurement and Monitoring of Emissions Flux & Manufacturer Recommendation	
	N_2O precision – periodic check	Monthly	±10%		
Ultraviolet Differential Optical Absorption Spectroscopy (UV-DOAS)	Accuracy: Bump Test	Annually or after major maintenance	±25%	EPA QA Handbook (EPA-454/B-17-001)	90%
	Precision: Bump Test	Annually or after major maintenance	±25%	EPA QA Handbook (EPA-454/B-17-001)	
Black Carbon Aethalometer	Bias: Flow Rate	Semi-annually (every 6 months)	±10%	ARB SOP #407 & Manufacturer Recommendations	90%
	Bias: Neutral Density (ND) Optical Filter test	Annual	±10% Test Value	Manufacturer Recommendations	
Hydrogen Sulfide (H_2S) Ultraviolet (UV) Fluorescence	Accuracy: IZS test	Monthly	±15%	Proposed based on EPA QA Handbook (EPA-454/B-17-001), Appendix D criteria for SO_2, allowing for additional uncertainty due to differences between H_2S and SO_2 analyzers	90%
	Precision: IZS test	Monthly	±15%		
Wind Speed	Calibration/ Accuracy	Annually or after major maintenance	≤5 m/s: ±0.25 m/s >2 m/s: ±5% not to exceed 2.5 m/s	EPA SLAMS Program MQO	90%

Instrument	DQI	Frequency	MQO	Reference	Complete-ness
	Starting Threshold[2]	Annually or after major maintenance	0.5 m/s	EPA SLAMS Program MQO	
Wind Direction	Calibration/ Accuracy	Annually or after major maintenance	±5 degrees; includes orientation error	EPA SLAMS Program MQO	90%

[2] Determined to be satisfied when the starting torque is within the manufacturer's specifications.

The sensitivity criteria for this project are detailed in Table A-3 above under the MDL (Minimum Detection Limit). Most of the parameters being monitored are subject to dynamic detection limits in that they will vary significantly depending on co-pollutants, atmospheric interferents present in the sample and the sampling configuration. For the open-path instruments that are subjected to dynamic detection limits, the actual detection limits achieved are determined for every measurement and part of the automatic QCs screening. The typical detection limit values in Table A-3 will not be used as blanket MQOs to serve as an acceptance or rejection criteria for acceptance or rejection of data produced by the open path monitoring instruments. Evaluation of the monitoring data's ability to meet project goals will be discussed in each quarterly report.

Representativeness and comparability of the data to be produced have largely been addressed through the Fenceline Monitoring Plan review and approval process.

A.8 Special Training/Certifications

No special training of field personnel is required for this project other than refinery-specific safety training and Refinery Safety Overview (RSO) training that are necessary for site access. Field personnel conducting all the field activities are experienced staff member(s) who has been gone through hands-on field training and/or has been supporting similar activities.

Analysis of open path measurement data will be conducted using a combination of specialized software and personnel with appropriate experience in ambient air quality data analysis, and where necessary, spectral analysis. Ongoing training is offered as needed or required to maintain and improve the skills and knowledge of staff. All training is tracked and documented.

Facility personnel will get a full training by Atmosfir on use of the client user interface, examination of results, first level of maintenance and first level of the spectral validation feature.

A.9 Documents and Records

The refinery will document all activities related to data collection, analysis, validation, and reporting. Table A-5 contains a list of the records maintained by the air monitoring program. These records can be electronic, bound in notebooks, and/or forms that are used for specific applications.

Table A-5 Documentation and Reports

Documentation Type	Frequency	Archive	Retention Period
Monitoring Data	Online Upload	Google cloud server	> 5 years
Raw Spectral Data	Online upload	Google cloud server	> 5 years
QAPP	Reviewed annually or modification/upgrade to FLM system as needed	Ultramar and Atmosfir archives	> 5 years
Copies of Field Logbooks	After each site visit	Ultramar and Atmosfir archives	> 5 years
Equipment Calibration Records	Per calibration	Ultramar and Atmosfir archives	> 5 years
Quarterly Reports	Quarterly	Ultramar/Atmosfir archives, website	> 5 years

Data flow and backups are as follows:

- Sensors in the site generate the raw data.
- The fenceline instruments are connected to a front-end PC in each cabinet. The computer gets the raw data from the instrument and stores it locally in files. The copy files than sent to the cloud system for storage and analysis.

- The cloud system resides in Google infrastructure. Datacenter disks have built-in redundancy to protect data against equipment failure.
- Once the raw data reaches the cloud, it is stored in a database.
- The database has daily backups up to 60 days and monthly backups up to a year.
- The data is retained on the server for 5 years.
- The backend runs algorithms to identify pollutant concentrations, perform real-time data analysis, automatic QC, reports, etc. The results are also stored in the database.
- The system includes web users' interfaces (UI) for Client UI and Admin UI. Client users and Admin users can each use the system with separate interfaces. Both interfaces are secured and allow controlled access according to user permissions. The UIs query the backend system and get results to display to the users in the web interface. The Admin UI includes system management capabilities.
- The public website has its one database that synchronized on-line in real time with system data base.
- The public website data base also resides on Google server and will retain data for 5 years.
- All the data will be protected with a WAF (Web Application Firewall) with a second layer of protection between the website and the database.

The public website will contain current near real-time meteorological and air quality chart trends, data values, timestamps, and quality assurance notes. Historical raw data will also be available for review and download from the public website. All near-real time data records will be clearly identified as **preliminary data**. A validated dataset will be posted to the public website with the quarterly reports. Once the approved data set is published with the quarterly report this will be the only set available to the public.

The quarterly reports will be submitted to SCAQMD and uploaded to the website for public review in electronic format no later than sixty (60) days after the end of each quarter.

The QAPP is a key component of the quality system developed for a project. The QAPP is intended to ensure that the data used in its decision-making process has known and documented quality. The QAPP and standard operating procedures are reviewed and updated when significant changes are made to the monitoring equipment or methodologies utilized. The Refinery is responsible for distributing the approved QAPP to the distribution list in Section A.3, both initially and when revisions are approved.

B DATA ACQUISITION AND GENERATION

This section describes the project design and implementation of the monitoring program, including sampling methods, sample collection, data handling and analysis, quality control requirements, equipment testing, inspection, calibration, and maintenance, and managing and validating the data.

B.1 Sampling Process Design

The fenceline air monitoring system was designed to measure routine emissions from the refinery and detect leaks, as well as unplanned releases from refinery equipment and other sources of refinery-related emissions. The fenceline air monitoring system will inform the refinery and the public about air pollution impacts at the fenceline and nearby communities.

The monitoring methods and equipment implemented provide quality meteorological and air quality data that can be used to meet the requirements of Rule 1180. A local PC gets the raw data from the instruments, store it locally in files until it is sent to the cloud system for storage and analysis, both are saved in the database. The public data base synchronized to the system on line, the public website sends query to the cloud data base to view the data (See Section A.9 for full description).

The extractive probes siting (for the point measurements) and site configuration for the monitoring are, to the extent practical, based upon 40 CFR Part 58 Appendix E as well as manufacturer recommendations.

The monitoring equipment will continuously monitor pollutant concentrations in near real time at the approved fenceline locations, which minimizes the potential that an air quality event may go undetected by occurring between periodic sampling events.

B.2 Sampling / Monitoring Methods

Sampling and monitoring for this project will use a combination of extractive point monitoring and open path monitoring. In both cases, pollutant concentrations are monitored continuously using equipment located at each fenceline.

Data integrity is maintained by the data flow and backups described in Section A.9.

The monitoring to be used is intended to satisfy SCAQMD Rule 1180 requirements and related agency guidance. The appropriateness of the measurement equipment and techniques have previously been reviewed and approved by SCAQMD. Therefore, their appropriateness need not be discussed further here with the exception of the high-concentration monitoring strategy for toluene and xylenes discussed in Section 0.

To fulfill Rule 1180 requirements reporting of the concentration will in 5-minute, 1-hour, 8-hour, and 24-hour durations. The base interval of the reporting will be 5-minute intervals, where all available data points will be averaged to produce a 5-minute average. For the other intervals, new rolling averages will be calculated every 10 minutes. Raw data will continue to be stored after averaging in order to allow for subsequent detailed evaluation.

When readings are collected that fall below the corresponding instrument's minimum detection limit (a.k.a., method detection limit, MDL), the MDL will replace the readings below the detection limit for calculating averages. This decision implies that all average calculation is potentially regarded as an upper limit for the actual concentration. For the OP-FTIR 1-hour data, Atmosfir D-fenclineTM system averages the single beams, and not the concentrations, in that period. This technique reduces the potential over-estimation from reporting MDLs for those readings that fall below the detection limit, and it reports one reading of the actual measurement for the entire sampling duration in question. Using a 10-minute update time is superior over a 5-minute update time as it enables reaching the extremely low detection limits required to meet Rule 1180 goals.

Concentration below the detection limit will be marked as "below detection" for the pubic website. The detection limit will be set at the values presented in Table A-2.

B.3 Sample Handling and Custody

Continuous sampling instruments analyze and record sample results in near real time and require no additional sample handling or custody forms.

Point sensors extractive samples are collected through tubing which extends from the outside of the cabinet to the hydrogen sulfide and black carbon analyzer.

The extractive sample probes materials meet manufacture recommended. For the H_2S sample, Teflon-type polymers such as PTFE and PFA are considered acceptable by the EPA for use as intake sampling material for all reactive gaseous pollutants. These will not react with hydrogen sulfide, which helps ensure that no hydrogen sulfide will be lost from the ambient air sample while it is being conveyed into the hydrogen sulfide analyzer. The particulate sample for the aethalometer will be conveyed to the instrument using the manufacturer-recommended carbon conductive tubing, which is designed to prevent particle loss to electrostatic and/or impaction mechanisms during sample transport.

Open path technologies do not collect samples using extractive means, and therefore do not use conventional sample handling and custody methods.

B.4 Analytical Methods

Four different pollutant concentration monitoring technologies will be used as part of the fenceline monitoring system, in addition to monitoring of meteorological conditions. The equipment will be operated and maintained in accordance with Standard Operating Procedure (SOP) documents. SOPs are living documents that will be developed and updated as needed as operational experience on the project using this specific equipment is developed. The analytical methods are briefly summarized below.

B.4.1 Aethalometer

The Aethalometer is selected for black carbon measurement as a mature technology specialized for this single purpose. The unit continuously samples ambient particulate matter at 5 liters per minute on a Teflon-coated glass fiber filter tape. The collected particles are analyzed based on light transmission through the filter; the light is attenuated by the accumulating particles on the filter. The Aethalometer divides the sampled air into separate streams that flow through the filter. Another separate stream of filtered air is also passed through a designated location on the filter. Measuring the attenuation of light through three cross sections on the filter is used to compensate for blank filter, particulate overload effects and non-linearities. Rate of change in the light absorbance between samples is used to calculate the mass concentration of latest sample. The Aethalometer measures absorbance at seven wavelengths channels simultaneously. The data obtained from measurement at 880 nm (channel 6) corresponds to black carbon concentration. The filter tape advances automatically when a loading threshold is achieved so that sampling can begin on new filter spots and maintain sensitivity.

B.4.2 Ultraviolet (UV) Fluorescence Hydrogen Sulfide (H_2S) Monitor

The hydrogen sulfide analyzer continuously samples air flow at 0.6 liter per minute, converts H_2S to SO_2 and analyze concentration by measuring sulfur dioxide (SO_2) fluorescence in response to UV light. First, the sample flows through, particulate matter filter to avoid optics contamination, a hydrocarbon scrubber to remove other species such as naphthalene and meta-xylene that interfere with the ultraviolet measurement, and a chemical scrubber to remove any sulfur dioxide residues in the sample. Then the filtered sample flows through a molybdenum converter heated to 315 ºC to catalytically oxidize hydrogen sulfide in the sample to sulfur dioxide. The sample proceeds to an optical chamber where it is radiated by a monochromatic ultraviolet light (214 nm) that selectively excites SO_2 molecules. While returning to ground state each molecule emits a photon at 330 nm, going through a photomultiplier to provide a measurable signal by a UV detector. The Model T101 prevents ozone absorbance and bias by applying a very short light path between the area where the excited SO_2 fluorescence occurs and the detector. That way the amount of O_3 reasonably expected has negligible effect.

B.4.3 Open Path Fourier Transform Infrared Spectroscopy (FTIR)

The FTIR includes an infrared (IR) source, interferometer, and detector. The interferometer takes the IR radiation and splits it in two. One part is reflected to a fixed mirror, and the other proceeds to a moving mirror. The two beams of IR are then recombined and interfere in a destructive or constructive mode, depending on the path distance between them. The change in path distance produce a modulated IR radiation called an interferogram. The moving mirror and radiation sampling are controlled by pulses of a dedicated laser. Applying Fourier transform to the modulated intensity results in an IR spectrum, (radiation vs its frequency). Use of IR modulation instead of grating enables to preserve most of signal intensity and still obtain thousands of frequencies. In open path measurements the IR beam is aligned to travel through an open path, typically 100-500m length, hits a reflecting mirror and travel back to the detector. The IR radiation is thus partially absorbed by chemical species in the open path, linear to the present compound's concentration and the path length. The measured absorbance is the sum of all the present compounds contributions. The high frequency resolution enables to differentiate between unique spectral absorbance signatures of multiple species, and retrieve the concentration of dozens of compounds from each measurement. The multiple concentration retrieval is based on a CLS algorithm using standard reference spectra (absorbance coefficients per compound measured in standard laboratory conditions).

B.4.4 Open Path Ultraviolet (UV) - Differential Optical Absorption Spectroscopy (DOAS)

The UV-DOAS instrument applies Xenon lamp to emit UV light through an open path to a receiver at the end of the path (typically, 400-600 m long). An auto-alignment system keeps the UV beam focused on the receiver. From the receiver the light is directed by fiber optic cable through a grating wheel to fall on a detector to collect a spectrum. The UV light is partially absorbed by several organic compounds, ozone, nitrogen dioxide and sulfur dioxide. The analyzer software controls the grating wheel to scan a set of spectral regions where the monitored compounds have specific absorbance patterns in UV light. Each spectrum is automatically normalized to the instrument line shape (a fixed spectrum, measured and saved per specific UV-DOAS unit at the manufacturer). The analyzer algorithm mathematically fits a background spectrum to the normalized spectrum and use it to calculate the differential absorbance spectrum. Then, a best-fit analysis, using the reference spectrum of each compound to retrieve their respective concentrations, based on Beer-Lambert Law. The reference spectra are measured at the manufacturer's laboratory for calibrated concentrations.

B.4.5 Meteorological Equipment

The wind speed sensor chosen is a high-resolution wind sensor designed specifically for air quality applications. The unit is equipped with precision grade, stainless steel ball bearings. The wind speed measurements are made with a four-blade helicoid propeller which produces a signal directly proportional to wind speed with a starting threshold is 0.5 meters per seconds (m/s). The wind speed on the public website will be reported in miles per hours.

The wind direction sensor consists of a counter-balanced, lightweight vane and precision low torque, highly reliable potentiometer that yields a voltage output proportional to the wind direction. Once properly oriented on the cross-arm, the wind direction sensor can be removed without requiring reorientation. The vane starting threshold is 0.5 m/s at 10-degree deflection and has an accuracy of ±2 degrees.

B.5 Quality Control

This section describes the routine quality control (QC) procedures used for the fenceline monitoring program. All procedures have been specifically designed to provide the appropriate quality control and ensure that valid data recovery is maximized.

The meteorological monitoring program will follow the quality control guidelines stated in the following documents:

- Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements, March 2008; and
- Meteorological Monitoring Guidance for Regulatory Modeling Applications, 2000.

The air quality monitoring program will follow the quality control guidelines stated in the following documents:

- EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I: Principles,
- EPA's Quality Assurance Handbook for Air Pollution Measurement Systems Volume II: Ambient Air Specific Methods, December 2008,
- EPA's Compendium Method TO-16 Long-Path Open-Path Fourier Transform Infrared Monitoring of Atmospheric Gases, January 1999, EPA/625/R-96/010b
- Equipment Manuals.

Specific quality control checks, their frequencies, and associated data invalidation practices are discussed in Section 0 and below.

B.5.1 Black Carbon Aethalometer Quality Control

- **Automatic QC Flagging**

The system and aethalometer instrument software continuously monitor a couple of status parameters in order to flag them for subsequent review:

  - Monitor Sample Inlet Flow – will be conducted automatically online.
  - Internal Flow monitoring – Internal mass flow meter checks the flow in the calibration range in all flow sections.

- **Leak Check**

Leakage is the difference between the flow entering the inlet port and the flow passing through the system downstream of the filter. The difference is due to tangential leakage through the edges of the filter tape. The acceptable leakage limit is <10%.

- **Clean Air Test**

The Clean Air test is conducted using the built-in filter to determine the stability and performance of the Aethalometer under the air flow conditions. Acceptable limit: mass concentration lower than 550 ng/m^3.

- **Stability Check**

The Stability Test determines the performance of the light source and detector, without air flow through the system. Acceptable limit: mass concentration lower than 450 ng/m^3.

- **Flow Check (flow verification, flow calibration)**

The flow is initially checked by the Flow Verification routine that allows the operator to check if the internal flow sensors are responding accurately using an external flow meter. The test is satisfactory if the difference of flow readings is less than +/-10%. If the test is failed than the flow should be re-calibration using the manual calibration routine; see Section B.7.2.1.

- **ND Filter Test**

The Neutral Density (ND) Optical Filter test routine is used to verify the response of the optical detectors to varying intensities of light from the optical sources. The ND Test uses 4 optical elements, each fitted with inserts of Neutral Density glass which have stable and standards-traceable optical absorbance. The routine compares the measured attenuation values for each glass element at each wavelength, versus the calibrations at the time of manufacture. The data is analyzed as a linear fit: if the slope differs more than 10% from unity, the test fails.

B.5.2 H_2S UV Fluorescence Analyzer Quality Control

- **Automatic QC Screening and flags**

The System and UV Fluorescence instrument software automatically screens several status parameters in order to validate its measurements for accuracy or potentially flag them for subsequent review:

  - UV Fluorescence instrument software invalid data.
  - Check range of operation and flag accordingly.
  - In addition to the invalid status from the sensor the software monitors the sampling condition (such as temperature, pressure and light intensity), if exceeding the manufacturer set value the sample is invalid.
  - A second level in the system monitors the critical conditions. A sample that exceeds the working range gets a flag for further review.

- **Internal Zero and Span Test (IZS)**

The IZS check evaluates but does not alter the analyzer's calibration curve. The test uses a zero air and permeation tube for a high-level concentration for two-point verification check. The acceptable limits are stated in Table A-4.

- **Perform Zero/Span Calibration**

See Section B.7.2.2.

B.5.3 Open Path FTIR Quality Control

Open path monitoring requires the use of specialized quality control check procedures.

- **Automatic QC Screening**

Atmosfir software runs automatic QC screening in real time in two data levels- the raw single beams and the absorbance signals. This screening evaluates the following:

- Intensity: The open path system parameter of the entire IR beam. A minimum threshold is defined to reject bad single beam(s), such as might occur if the beam were blocked momentarily by passing traffic or equipment. The parameter is tunable per mirror and is applied.
- Nitrous Oxide (N_2O) background concentration: This N_2O is monitored due to its global prevalence at uniform concentrations. A maximum delta is allowed between sequential measurements (as a default ±15% from the atmospheric background level). The maximum allowed delta is a tunable parameter per mirror.
- Spectral validation: The detected signal is validated by calculating correlation between the measured signature and the reference signature. The spectral validation correlation threshold filters detections that won't pass the spectral validation. This ensures that unrecognized pollutants are not falsely pattern-matched and labeled as pollutants being monitored for this project.
- Concentration error calculation: Real time QC tests per every absorbance spectrum, and every compound (method) analysis. The error is calculated for the spectral analysis range and sets the method detection limit, MDL, as the three times the measurement error according to the EPA's Method TO-16, Section 5.3. Calculating the measurement quantification limit, MQL, as a function of the MDL (compound specific factor) as a minimum threshold to confirm a detection.

- **Gas Cell Verification**

A bump test with a gas cell will be conducted with one gas from the required pollutant gases measured by the OP-FTIR for the project. To effectively test instrument response using a gas cell of practical size, the gas cell must use a very high concentration of the pollutant gas. Ammonia was chosen as the least harmful and available compound (REL of 4662 ppb) to use for the FTIR test for the MQOs of accuracy and precision. See Table A-4 for the MQOs. If the test fails to meet the MQOs, a thorough examination is needed to understand the reason and execute a corrective action plan accordingly.

- **Stray Radiation**

Stray radiation is regarded as a source of uncertainty that should be controlled and minimized. In a monostatic FTIR configuration the radiation is modulated before passing the open path, and therefore any internal stray radiation is a constant for the instrument that results from scattering within the instrument, bypassing the intended beam path and the actual monitoring path. It does not change with the monitoring path or the meteorology. The internal stray radiation can be determined simply by measurement without a reflector and pose a problem for measurements only at low detected intensities. When amplitude on the detector goes down to 0+0.2 V, the instrument needs to be checked.

- **Periodic Atmospheric N_2O**

A check for N_2O concentration against the atmospheric constant background levels can be used as a QC check for the system. Two parameters will be periodically checked in addition to the real time automatic QC check for N_2O (see above section), the N_2O precision and the N_2O accuracy. The N_2O precision will be calculated for each month from the standard deviation of the N_2O measurements of this month. The N_2O accuracy will be calculated for one day on each month against the current N_2O background levels[3] . For the DQO of the N_2O accuracy and precision see Table A-4. These checks will be performed on each path. In case of failure in these checks then the relevant system needs to be checked and a corrective action is required.

B.5.4 Open Path UV-DOAS Quality Control

Open path monitoring requires the use of specialized quality control check procedures.

- **Automatic QC Screening and flagging**

The System and UV-DOAS instrument software automatically screens a number of status parameters in order to validate its measurements for accuracy or potentially flag them for subsequent review.

  - Intensity: The receiver is expected to receive between 30% and 90% of the source's light level.
  - Measurement Quantification Level (MQL): This the concentration threshold below which measurements are considered to be below the detectable level. The MQL is two times the standard deviation of the measurement data.
  - Signal to Noise Ratio (SNR): The ratio between the concentration to the calculated measurement error. The instrument's internal SNR threshold is 10. Below that level, the level of noise is considered too large relative to the measured concentration, and the value is either rejected or flagged for subsequent review.

- **Gas Cell Verification**

A bump test with a gas cell will be conducted with one gas from the required pollutant gases measured by the UV-DOAS for the project, Benzene has been chosen from the UV-DOAS compounds for this test due it's high

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[3] From the NOAA/ESRL halocarbons in situ program, https://www.n2olevels.org/

concern as a BTEX to the SCAQMD. This serves as a precision and accuracy test; see Table A-4 for the MQOs. If the test fails to meet the MQOs, a thorough examination is needed to understand the reason and execute a corrective action plan accordingly.

- **Multipoint Span/Offset Calibration**

Calibration requirements are discussed in Section B.7.2.

- **Reference Check**

The reference spectrum is the raw lamp spectrum and needs to be updated to compensate for changes in the analyzer spectrometer and electronics, to minimize the measurement noise.

- **Light Attenuation Test**

Estimate analyzer sensitivity to change in light intensity.

- **Wavelength Precision**

Verify that the wavelength range seen by the analyzer is identical to the range for which it was manufactured.

B.6 Instrument/Equipment Testing, Inspection and Maintenance

Various types of ambient air monitoring instruments are used in support of air monitoring activities for this project. To ensure data collected by the fenceline monitoring instrumentation is valid, credible and defensible, it is critical to properly test, inspect, and maintain the fenceline equipment.

Fenceline monitoring equipment used in this monitoring program is generally designed to operate without major maintenance or repair for long periods of time. However, routine service checks and preventative maintenance are critical areas of quality control that help to prevent extended period of downtime, costly errors, and data loss. Table B-1 through Table B-5 present the maintenance checks for each piece of equipment.

Trained field technicians are responsible for testing, inspection, and maintenance.

Table B-1 Maintenance and QC Procedures - Aethalometer

Task	On-Line	Monthly	Semi-Annually	Annually	As Needed
Check Sample Inlet Flow, Internal Flow monitoring	X				
Inspect Sample Line Tubing		X			
Inspect and clean size selective inlet & insect screen		X			
Inspect Optical Chamber (Clean if Necessary)			X		X
Perform Leak Test			X		
Perform Clean Air Test			X		
Flow check (flow verification & flow calibration)			X		
Stability check			X		
ND filter test				X	
Lubricate Optical Chamber Sliders				X	
Change Bypass Cartridge Filter				X	
Install a New Filter Tape Roll					X

Table B-2 Maintenance and QC Procedures - UV Fluorescence H_2S Analyzer

Task	On-Line	Monthly	Quarterly	Semi-Annually	Annually	As Needed
Operating working range	X					
Replace SO_2 Scrubber						X
Replace H_2S to SO_2 Converter Catalyst						X
Replace Particulate Filter		X				X
Perform IZS Zero and Span Test (Perm Tube)		X				
Perform Zero/Span Calibration					X	
Verify Test Functions		X				
Replace Zero Air Scrubber			X			
Perform Flow Check				X		
Replace Critical Flow Orifice and Sintered Filters					X	
Replace Internal IZS Permeation Tube						X
Perform Pneumatic Leak Check					X	
Replace Pump Diaphragm					X (2 years)	X

Table B-3 Maintenance and QC Procedures – Open Path FTIR

Task	On-Line	3 Weeks	Quarterly	Semi-Annually	Annually	As Needed
Light intensity; N_2O background concentration; spectral validation correlation; and concentration error	X					
Retroreflectors cleaning		X				X
Telescope mirror cleaning & alignment check, re-align if necessary			X			X
Silica gel dry check, replace if necessary			X			X
Stray light check					X	
Gas cell verification - Ammonia					X	
Laser replacement						X
Cooler replacement						X
Instrument Log examination (remote)				X		
Atmospheric N_2O periodic check (remote)			X (monthly basis)			

Table B-4 Maintenance and QC Procedures – Open Path UV-DOAS

Task	On-Line	Quarterly	Semi-Annually	Annually	3 Years	As Needed
Light level; MQL threshold; and SNR threshold	X					
UV DOAS – Lamp replacement			X			
Cleaning windows			X			X
Mirror replacement					X	X
Gas cell verification - Benzene				X		X
Span / Offset calibration				X		X
Reference check				X		
Light attenuation test				X		
Wavelength precision				X		
Instrument Log examination (remote)			X			

Table B-5 Maintenance and QC Procedures – Wind Sensor

Task	Monthly	Semi-Annually	Annually	As Needed
Visual inspection for prop/tail damage, normal movement	X			
Check starting torques			X	X
Replace bearings			X	X
Check calibration			X	X

Prior to installation, all equipment will be visually inspected to ensure there is no physical damage. Sensors and analyzers that fail to meet specifications will be returned to the manufacturer. Installation will perform according to the procedures presented in each respective operating manual. Preventive maintenance and quality assurance procedures will be conducted on a routine basis. Acceptance testing procedures will be documented on the appropriate forms.

At least monthly or as needed, the field technician will visit the monitoring station to inspect the monitoring shelter, heating and cooling system, meteorological tower and sensors, and air quality equipment. The field technician will conduct any maintenance that is required according to the maintenance schedules.

Some of the checks can be performed remotely, like checking time and date, verification of data streaming, etc. The system is designed to send operations alerts that are monitored by the field operator to ensure proper operation of the equipment and data acquisition system.

Entries, either on-site or remote, will be record in electronic logbook (E-log) documenting all site activities conducted. These entries will include the date of the visit, reason for the visit, and the maintenance or QC activities performed. Entries will be made any time there is a change or modification in the way a sample is obtained, or the station configuration altered. If the field technician encounters a problem which cannot be rectified, a corrective action plan will be used to resolve the issue.

Personnel operating the meteorological and air quality monitoring program are thoroughly trained in the proper operation, calibration, and maintenance of the equipment to ensure continued collection of valid, representative data.

B.7 Instrument/Equipment Calibration and Frequency

Detailed calibration procedures for each instrument are provided in the SOPs for the instruments. Calibration records will be retained on file for at least five years.

B.7.1 Meteorological Equipment Calibration

Meteorological equipment calibrations will be performed annually with equipment that is in current calibration and is traceable to National Institute of Standards and Technology (NIST) or A2LA standards. Sensors which do not meet calibration specifications or fail performance audits will be repaired and re-calibrated. Calibration procedures for the meteorological sensors are presented below.

B.7.1.1 Wind Direction

The cross arm orientation will be checked using a professional compass. The wind vane will be aligned with the cross arm and set to true north. True north is distinguished from magnetic north by reading a magnetic compass and applying a correction factor for the magnetic declination. The declination will be determined from a declination calculation computer program. If the overall wind direction error (orientation plus linearity) exceeds ±5 degrees from true North, the sensor will be re-calibrated.

The wind direction linearity will be checked using a direction template. The sensor response will be checked at a minimum at 30-degree increments in both clockwise and counterclockwise rotations and compared with the data acquisition readings. If the indicated wind direction linearity plus orientation error exceeds ±5 degrees, the sensor will be repaired and re-calibrated.

B.7.1.2 Wind Speed

Horizontal wind speed response checks will be performed using a synchronous motor. Sensor readings taken from the data acquisition will be compared to calibration values obtained from transfer functions provided in the sensor manufacturer's specifications. If the wind speed error exceeds ±0.2 m/s when ≤5 m/s or ±5% when >5 m/s not to exceed ±2.5 m/s, then the instrument will be recalibrated.

B.7.2 Air Quality Equipment Calibration

Calibration will be performed as scheduled and if one or more of tests show the sampling equipment are outside defined criteria or exhibit abnormal characteristics. Air quality monitoring equipment will be calibrated as summarized in this section.

B.7.2.1 Aethalometer Flow Calibration

The aethalometer's internal flow meter is calibrated against an NIST-traceable primary standard and adjusted as needed to ensure that the instrument is sampling black carbon at the correct flow rate. It is intended that the flow be checked semi-annually or if the online internal flow monitoring alert is triggered, but the sensor calibration only be adjusted on an as-needed basis when the measured flow deviates more than 10% from the primary standard.

B.7.2.2 UV Fluorescence Hydrogen Sulfide Analyzer Calibration

Calibration is conducted annually by flowing known H_2S concentrations within the measurement range (minimum of two: zero and span concentration), while setting the H_2S analyzer in calibration mode. The software controls the valves of the air sampling and calibration gas flows, therefore no physical adjustments of the instrument is required. In calibration mode, the operator feeds a known concentration then starts measurement. The software assigns the detector response to each concentration and fits a linear regression curve. If the calibration curve slope and offset parameters are similar to the already set parameters (within defined margins in the manual) there is no need to update the instrument parameters Otherwise, the device is first examined for possible failures that could cause the change of parameters. Once the test and maintenance operations are exhausted a new calibration is conducted, and the new calibration parameters are saved in the device software.

B.7.2.3 FTIR Calibration

As part of the FTIR measurement principle, in order to get the concentration for each compound from the spectrum, a references library is used. The references are in a library of calibrated spectra with high spectral resolution using the same spectrometer used in the system, following the high-quality standard (such as NIST and PNNL). According to the methods, when using such calibrated library there is no need for further calibration as part of the maintenance of the instrument.

In addition, per SCAQMD, a gas cell measurement for one gas will be used for bump test verification of the system. See Section ? for details.

B.7.2.4 UV-DOAS Calibration

For the UV-DOAS the concentration retrieval is based on the factory calibrated spectral coefficients, per UV-DOAS unit. During the annual multipoint calibration, factors for offset and span can be used for fine-tuning of the instrument in the last step of the calculated results evaluation.

In addition, per SCAQMD, a gas cell measurement for one gas will be used for bump test verification of the system. See Section ? for details.

B.8 Inspection/Acceptance for Supplies and Consumables

Procurement of items and services is performed through approved vendor such as the instrument manufacturer or reputable suppliers, sole source non-competitive bid process, or a competitive bid/contract process as necessary.

A qualified field personnel is responsible for ensuring the availability and quality of the critical consumables and supplies identified in Table B-6. Spare part as recommended by manufacturer will be available for 1-year operation. Any expired gas cylinder will be marked and send back to manufacturer. Calibration gas certificates used during calibrations will be retained and included in the quarterly reports. Materials will be stored in the maintenance warehouse or on the manufacturer's warehouse.

Table B-6 Critical Supplies

Item	Manufacturer
Aethalometer Filter Tape	Magee Scientific
Aethalometer Zero Filter	Magee Scientific
H_2S Analyzer Expendables Kit	Teledyne API (rep: Cal-Bay Controls)
H_2S Permeation Tube (NIST-traceable, 76 g/min permeation rate)	VICI
OP-FTIR Laser	Bruker
OP -FTIR MCT	Bruker
OP -FTIR IR source	Bruker
UV DOAS lamp	Opsis
H_2S - Certified Standard-SPEC (CGA 330)	Airgas
Benzene – Primary Standard (CGA 350)	Airgas
Ammonia - EPA Protocol Standard (CGA 705) EPA G2	Airgas

B.9 Non-Direct Measurements

There are no non-direct measurements.

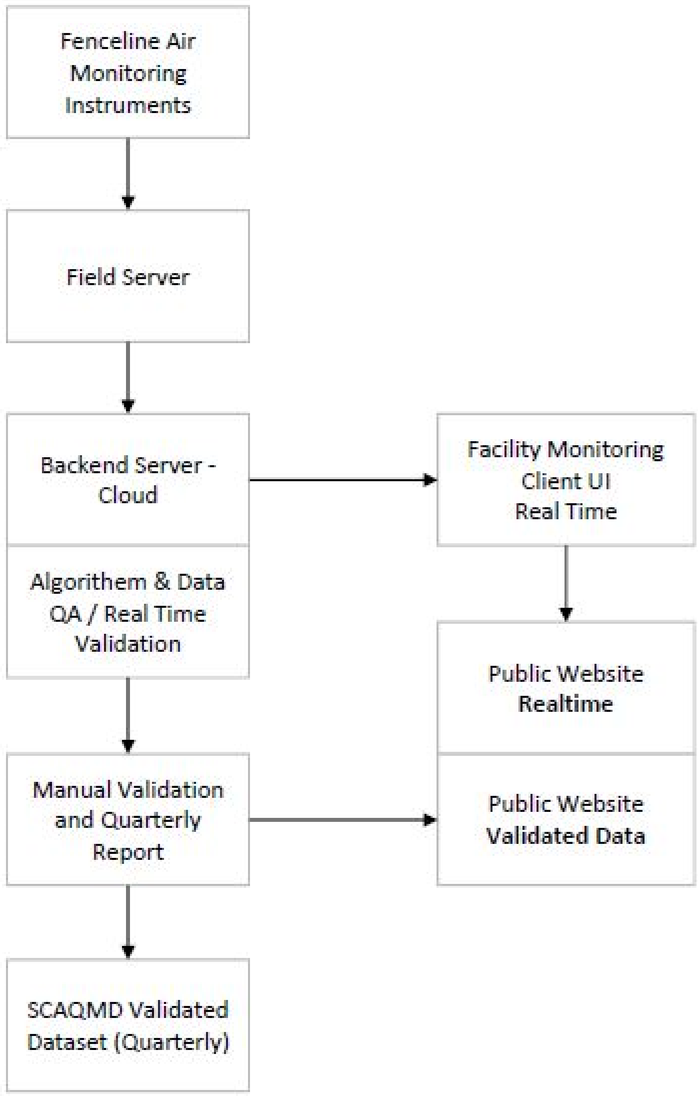
B.10 Data Management

The proper management of all data is critical to assuring the quality and usability of the monitoring results. As such, procedures have been implemented to ensure robust data acquisition, validation, reduction, reporting, and storage of electronic data. Continuous meteorological and air quality monitoring data will be recorded and stored on site using computer equipment and software. Data flow and storage is described in Section A.9.

Meteorological and air quality data will be reviewed and subjected to several levels of quality control, validation and quality assurance as discussed in Section D. The air quality final data will be reported quarterly as part of the quarterly report and will retain for 5 years.

The overall flow of data management is illustrated in Figure B-1.

Figure B-1 Data Management Flow Chart



B.10.1 Data Validation

Data validation ensures that data processing operations have been carried out correctly and that the quality of field operations has been performed properly in accordance with written procedures. Once data validation has identified problems, the data can be corrected, flagged or invalidated and corrective actions can be taken when necessary. In the event of a failed audit or out of range calibration or other QC test, the results will be review and checked for invalidity. Data validation procedures are described in detail in Section D.

B.10.2 Data Storage and Retrieval

Electronic copies of the data will be stored on Ultramar and Atmosfir servers. All validated data will also be available for AQMD and the public to view.

C ASSESSMENTS AND OVERSIGHT

Assessments or evaluations are designed to determine whether the QA Project Plan is being implemented as approved (conformance/nonconformance), to increase confidence in the information obtained, and ultimately to determine whether the information may be used for their intended purpose.

C.1 Assessments and Response Actions

Performance audits on the pollutant samplers and meteorological equipment will be conducted by an independent auditor and/or SCAQMD. Additional information regarding auditing will be released by SCAQMD at a later time. SCAQMD has yet to determine the most appropriate way to provide oversight for Rule 1180 fenceline systems, which may include a qualified independent contractor.

C.1.1 SCAQMD Notifications

This monitoring will be conducted under additional oversight by SCAQMD. In order to facilitate agency oversight, Ultramar will comply with notification requirements in Rule 1180 by:

- Calling 1-800-CUT-SMOG 48 hours prior to planned maintenance activities and provide the name of the refinery, the name of the monitor and the planned date(s) of the event(s).
- Calling 1-800-CUT-SMOG within 2 hours of discovering that equipment failed to accurately provide real time air monitoring information and provide the name of the refinery, name of the monitor, date of occurrence and the reason for the lapse in collecting and/or reporting the real time air monitoring information.
- Providing written notification to the SCAQMD for any equipment failure that results in failure to provide accurate, continuous, real time air monitoring information for 24-hours or longer. Written notification is required within 24-hours of discovering the equipment failure and shall include the following:
    - An explanation of activities currently being pursued to remedy the equipment failure;
    - Estimated time needed to restore the fenceline air monitoring equipment to normal operating conditions that comply with the approved fenceline community air monitoring plan; and
    - Temporary air monitoring measures to be implemented until the fenceline air monitoring system is restored to normal operating conditions.
- Submitting an updated fenceline monitoring plan to the SCAQMD if an equipment failure results in a failure to accurately provide continuous, real time air monitoring information for more than 30 days.

Routine maintenance and calibrations will not be trigger notification to SCAQMD. Maintenance and calibration flags will be present on the public website in near real time. Email notifications will be sent out during periods of routine maintenance and calibration via opt-in subscription.

C.1.2 Corrective Actions

All deficiencies identified during routine data surveillance, performance audits and/or site surveillances will be documented and reported by the refinery. Please refer to Table 3-3 Backup Monitoring Plan in the fenceline monitoring plan for additional information. Corrective actions to deficiencies will be addressed and documented in the monitoring station logbook. Follow-up action shall be taken to verify implementation of the corrective action.

C.1.3 QAPP Revisions

If revisions to the QAPP are needed, any modifications will be approved by Ultramar and submitted to SCAQMD for review and comment, and a revised edition will be distributed to all appropriate individuals on the distribution list.

C.2 Reports to Management

The previously mentioned quarterly reports will keep management and SCAQMD informed of the fenceline system assessment and findings.

D DATA VALIDATION AND USABILITY

D.1 Data Review, Validation, and Verification Requirements

The refinery is responsible for verifying proper operation of the fenceline monitoring equipment. The data will be reviewed by qualified personnel to ensure that the data are complete, accurate, and representative and that erroneous data have been removed in preparation for the final quarterly report.

The data validation criteria for this project are primarily driven by the DQIs and outcome of QC checks. If data are generated under conditions that result in failure to meet a DQI or QC check criterion, the collected data may need to be invalidated or flagged back to the prior passing DQI or QC check evaluation.

Calibration procedures for the continuous monitoring equipment are presented in Section B.7. For the fenceline equipment, precision, bias, accuracy and/or other QC tests will be determined using the protocols presented in Section 0 and the equipment SOPs. Data will be considered valid when the system response indicated MQOs are being achieved.

D.2 Data Validation and Verification Methods

The refinery is responsible for verifying the proper operation of the meteorological and air quality equipment by reviewing the QC checks, calibration records, audit results, and field notes form the site technicians prior to formal acceptance of these data. Precision and bias calculations will be also be reviewed.

D.2.1 Level 0 Data Validation

Level 0 data is raw data obtained directly from the data acquisition systems in the field. These data have not received any adjustments for known biases or problems that may have been identified during preventive maintenance checks or audits.

D.2.2 Level 1 Data Validation

Level 1 data validation consists of automatic verification using Atmosfir D-fencline™ software and equipment software.

- Operational alerts are sent to Atmosfir and the refinery.
- Automatic QC screening: The system, either directly from instrument manufacturer software or from Atmosfir software, screens automatically data that do not pass basic QC conditions. For details see Section 0.
- Automatic QC flagging: The system generates QC flags for the public and to the reviewers for later verification. See Table D-1.

Table D-1 QC Flags

QC Flags	Meaning	Description
N/A	Data is Not Available	Can generate from no readings, invalid data, or average that has small sample size (see section D.2.5)
Cal	The instrument is under Calibration	This flag appears in times of calibration. Value during calibration will not be shown in the public website, as it does not represent ambient concentration data.
Maint.	The instrument is under Maintenance	This flag appears in times of maintenance. Value during maintenance will not be shown in the public website, as it does not represent ambient concentration data.
BQL	Below Quantification Level	This flag appears when the value is below the quantification limit (see Table A-3).
To be reviewed	The Concentration value need further review	This flag appear next to a concentration value, it can be generate from data that has high rate of change, repeated value, concentration above the instrument range, or if an instrument status parameter indicates that the data should be reviewed (see Section 0).

The history of each data point being flagged will be auditable. Flags conditions will be reviewed as the project progress, to see if change is needed. Flags can also be changed according to any new SCAQMD requirements.

Data will be published to the near real-time web site after these automatic QC checks but will be marked as preliminary where presented to the public.

D.2.3 Level 2 Data Validation

Level 2 data validation will include the first level of manual data validation. During daily review, project staff will check that systems are working and check for system alerts. Staff will check for concentration alerts (exceeding thresholds) and forward them as needed to the Atmosfir QC department for in-depth review. Staff will write in the site logbook the daily check and the outcome. The reviewer of an exceeding concentration will write the outcome of the examination in a QC validation log.

Atmosfir D-fencline^{TM} system has a built-in validation process available to the project team. This feature enables the teams to send a suspected spectral validation to an experienced spectroscopist for validation at any time. The outcome from the spectroscopist validation will also be logged in the QC validation log.

D.2.4 Level 3 Data Validation

Quarterly, Atmosfir scientific specialist (or spectroscopist for FTIR and UV-DOAS), will review:

- Maintenance, calibration and other QC tests, logs, and systems alerts during the quarter.
- Reviewing any data exceeding calibration range.

- Ensuring the actual detection limit of the instruments are within specifications. For the dynamic DL of FTIR and UV-DOAS – review the 25% average (or the standard deviation at zero concentration) and any anomalies.
- Review concentration flags with "to be reviewed" and make a final decision on data validity.
- Review concentration for reasonableness by using time series graph and in relevant to the wind data.
- Spectroscopist manual validation for all suspected FTIR and UV-DOAS concentration above the threshold.
- Spectroscopist sampled review on the FTIR and UV-DOAS spectral methods for new interferences that can cause false positive/negative detections.
- Looking for trends with time and history reviews in all relevant checks that implement a change is needed.

Any change to the data will be reported in the QC validation log. The change data will be marked with the reason of the change, name of the authorized person for the change and the date. The new database after these validations will be generated quarterly. The preliminary database will be archived.

Published final data and any changes to the concentration will be published in the quarterly report.

D.2.5 Minimum Acceptable Data Recovery Percentage

To be considered valid, each hour of air quality data must consist of at least 45 minutes (75%) of valid data. This criterion for valid data will be implemented also for the 8-hour and 24-hour averages.

D.2.6 Data Report QA Checklist

As part of the data validation process to prepare data for reports, report table content versus data files, missing data, off-line periods, percent data recovery and mathematical calculations are routinely verified.

D.3 Reconciliation with User Requirements

The purpose of reconciliation is a final step in which the validated data is evaluated to determine if it answers the original questions asked, such as the data quality objectives and project tasks. Data will be evaluated for reasonableness, and an effort made to determine its suitability and power for decision makers. Limitations of the data should be considered. If issues are noted during reconciliation, revisions to the Plan or QAPP may be needed.