Quality Assurance Project Plan

Prepared by

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Prepared for

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May 30, 2025
Revision 9

STI-922008-7170

This document contains blank pages to accommodate double-sided printing.

A. Project Management

A.1 Title and Approval Page

Quality Assurance Project Plan
Fenceline Monitoring for the Chevron Products Company in Richmond, CA

Signature	Date
Name Chevron Products Company	Title
Signature	Date
Name Sonoma Technology, Inc.	Title

The attached Quality Assurance Project Plan (QAPP) is hereby recommended for approval and commits Chevron Products Company to follow the elements described within.

A.2 Table of Contents

Figures

Tables

Review and Revision History

Rev. No.	Date	Responsible Party	Description of Change
0	December 7, 2018	Chevron Richmond	Initial Submission to BAAQMD
1	August 23, 2019	Chevron Richmond	Submission to BAAQMD; Addressed comments on initial submission, including revised emergency maintenance procedures and description of key personnel.
2	January 8, 2020	Chevron Richmond	Submission to BAAQMD; addressed comments from BAAQMD on August 2019 submission including modifications to FTIR, data completeness, and other open-path-related items.
3	October 20, 2020	Chevron Richmond	Submission to BAAQMD; Modified descriptions of UV and FTIR systems. Added detail on visibility measurements. Added description of QC/OP Codes.
4	June 1, 2022	Chevron Richmond	Submission to BAAQMD; including addition of Tunable Diode Laser measurements of hydrogen sulfide.
5	February 15, 2023	Chevron Richmond	Submission to BAAQMD; addressed comments on June 1, 2022, submission
6	September 5, 2023	Chevron Richmond	Submission to BAAQMD; addressed comments from BAAQMD on February 15, 2023, submission
7	February 13, 2024	Chevron Richmond	Submission to BAAQMD; addressed comments from BAAQMD on September 5, 2023, submission
8	October 31, 2024	Chevron Richmond	Submission to BAAQMD; addressed comments from BAAQMD on February 13, 2024, submission
9	May 30, 2025	Chevron Richmond	Submission to BAAQMD; addressed comments from BAAQMD on October 31, 2024, submission

This Quality Assurance Project Plan (QAPP) is a living document, meaning it will undergo regular review to ensure that data quality assurance practices are robust and current. This QAPP will be reviewed at least annually and any proposed updates will be submitted for approval to Bay Area Air Quality Management District (BAAQMD). The official version of this QAPP is maintained by Chevron

in Richmond, CA. This QAPP contains all critical documents for this program, including Standard Operating Procedures (SOPs) and blank data entry forms.

A.3 Distribution List

Name	Organization	Role
Luke Honnen	Chevron Richmond	Refinery Contact
Director, Meteorology & Measurement Division	BAAQMD	BAAQMD Contact
Director, Compliance & Enforcement Division	BAAQMD	BAAQMD Contact
Neil Fernandez	Sonoma Technology	Project Manager
Hilary Hafner	Sonoma Technology	Quality Assurance Manager
All Project Personnel	Sonoma Technology	Various

Personnel included in above list will be provided with revisions of all critical documentation.

A.4 Project Organization

This QAPP details the specifications for operating the monitoring network. It outlines the operation and maintenance of all instrumentation and equipment, data management and quality control (QC) procedures, and public reporting via a publicly accessible website.

Refinery staff work with a designated contractor to achieve the goals of the fenceline monitoring network. An organization chart (**Figure 1**) and various project roles are detailed below. Contact information for key personnel is provided in **Table 1**.

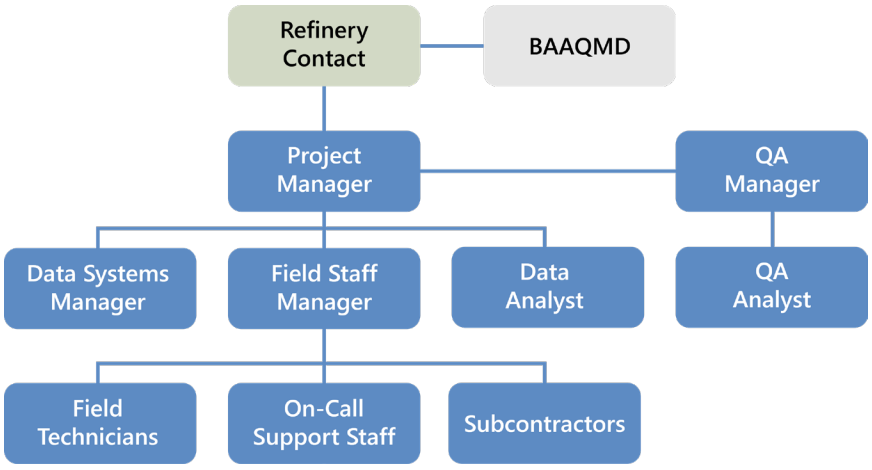

Figure 1. Organization chart for the refinery's fenceline monitoring project.

Refinery Contact. The Refinery Contact is responsible for project oversight and serves as the primary point of contact for the refinery. They facilitate communication between the refinery and BAAQMD.

Project Manager. The Project Manager is responsible for the successful execution of the fenceline monitoring project and serves as the primary point of contact for the contractor. The Project Manager oversees day-to-day monitoring operations, coordinates with all project personnel, and reports to the Refinery Contact. They also work closely with the Quality Assurance Manager to ensure that the QAPP and SOPs are followed, and oversee corrective action plans when needed.

Quality Assurance Manager. The Quality Assurance Manager (QA Manager) provides overall guidance for the evaluation of data. The QA Manager is responsible for evaluating data for adherence to project specifications and ensuring that QA activities remain independent from data collection. If deviations are discovered, the QA Manager coordinates with the Project Manager to determine and implement necessary corrective actions.

Field Staff Manager. The Field Staff Manager oversees the team responsible for operating and maintaining all instrumentation and equipment at the refinery fenceline monitoring sites. They work closely with Field Technicians and Subcontractors, coordinate staff coverage and additional science support as needed, and regularly provide updates to the Project Manager.

Field Technicians. Field Technicians are responsible for the successful operation of instrumentation and equipment, providing routine maintenance according to SOPs. They are qualified to work on refinery property and with all scientific instrumentation. They also perform required quality checks according to this QAPP and document work in site logs.

On-Call Support Staff. On-Call Support Staff are responsible for responding to automated system alerts outside of normal business hours, including remotely troubleshooting data flow outages and validating potential detection events. They are trained on the theory of operation for all field

instrumentation and equipment, and conduct abbreviated data checks to identify operational issues requiring field support.

Subcontractors. Subcontractors may be used to provide additional technical support for instrumentation and equipment. They are overseen by the Field Staff Manager and adhere to all project requirements.

Quality Assurance Analyst. The Quality Assurance Analyst (QA Analyst) conducts independent reviews of data products to confirm that data analysis activities have been conducted according to the QAPP. The QA Analyst works closely with the QA Manager and Data Analysts.

Data Analysts. Data Analysts conduct routine daily data checks to ensure accuracy of real-time reporting on the public website, and relay issues to the Field Staff Manager as needed. They also conduct an extended analysis every calendar quarter to generate data products for regulatory reporting efforts, including the assembly of final data sets.

Data System Manager. The Data System Manager is responsible for continuous real-time data flow, routine operation of the automated alerting system, and proper data display on the public website. They work closely with Field Technicians, Data Analysts, and the Project Manager to ensure that the system is operational and real-time data is reported to the public.

Table 1. Contact information for key project personnel.

Name	Organization	Role	Contact Information
Luke Honnen	Chevron Richmond	Refinery Contact	luke.honnen@chevron.com 510-242-5271
Neil Fernandez	Sonoma Technology	Project Manager	nfernandez@sonomatech.com 707-665-9900
Hilary Hafner	Sonoma Technology	QA Manager	hilary@sonomatech.com 707-665-9900

A.5 Problem Definition and Background

The Chevron Products Company (Chevron Richmond) conducts air quality monitoring at its refinery in Richmond, CA, in response to BAAQMD Regulation 12, Rule 15 (Rule 12-15).[1] Measurements are collected according to an Air Monitoring Plan (AMP) consistent with BAAQMD Air Monitoring

[1] Petroleum Refining Emission Tracking (Rule 12-15; approved by the BAAQMD on April 20, 2016).

Guidelines for Petroleum Refineries,[2] and data are reported in real time on a publicly accessible website.

Rule 12-15 Guidelines from BAAQMD require fenceline monitoring with "open path technology capable of measuring in the parts per billion range regardless of path length," or an alternative measurement technology.[2] The required compounds to be measured include benzene, toluene, ethylbenzene, xylenes (BTEX), and hydrogen sulfide (H_2S). As described in the facility's AMP, sulfur dioxide (SO_2), methane, and C2 through C5 alkanes (ethane, propane, butane, and pentane) were also included in the list of compounds to be measured. Detailed information regarding monitoring methods is provided in Section B of this document.

The California Environmental Protection Agency (EPA) Office of Environmental Health Hazard Assessment's (OEHHA) acute 1-hr reference exposure limits (RELs) are used as references for fenceline monitoring because they represent the concentration threshold above which compounds are considered hazardous to human health. Table 2 lists the RELs for the compounds included in this fenceline monitoring program, for which sampling methods capable of measuring below these values were selected. For clarity, the California Ambient Air Quality Standards (CAAQS; California EPA) and National Ambient Air Quality Standards (NAAQS; U.S. EPA) are also included. Detailed information regarding monitoring methods is provided in Section B of this document.

Table 2. Reference thresholds for fenceline monitoring.

Compound	1-Hr REL (ppb)	1-Hr CAAQS (ppb)	1-Hr NAAQS (ppb)
Benzene	8.5	--	--
Ethylbenzene	--	--	--
Hydrogen Sulfide	30	30	--
Sulfur Dioxide	252	250	75
Toluene	1,327	--	--
Xylenes	5,066	--	--

Sorbent tube analysis for benzene is discussed in Section B of this document and is subject to quality assurance/quality control (QA/QC) requirements in 40 CFR 63 Appendix A Methods 325A[3] and 325B.[4] Ground Level Monitors (GLMs) are subject to QA/QC requirements in BAAQMD Manual of Procedures Volume VI.[5]

[2] Bay Area Air Quality Management BAAQMD (2016) Air monitoring guidelines for petroleum refineries. April. Available at baaqmd.gov/~/media/files/planning-and-research/public-hearings/2016/9-14-and-12-15/042016-hearing/1215-amg-041416-pdf.pdf?la=en.
[3] https://www.epa.gov/sites/default/files/2019-08/documents/method_325a.pdf
[4] https://www.epa.gov/sites/default/files/2016-07/documents/m-325b.pdf
[5] https://www.baaqmd.gov/~/media/files/records/mop/vol-6/vol6.pdf

A.6 Project Description

Chevron Richmond currently conducts open-path monitoring of BTEX, H_2S, SO_2, methane, and alkanes along five fenceline paths in accordance with BAAQMD Rule 12-15 and the facility's AMP. Sampling sites were selected in consideration of dominant wind patterns, sources of potential air emissions on the property, nearby local receptors, and logistical feasibility. Details regarding fenceline monitoring sites are provided in Table 3.

Preliminary data from fenceline monitors is quality controlled and reported in real time to a publicly accessible website, and final quarterly data sets are provided to BAAQMD. Additional details are provided in the AMP and Section B of this document.

Table 3. Fenceline monitor geographical locations and coverage paths. Because intermediate paths (e.g. F1 and F2) are close to but not exactly the same as the overall path (e.g. path F), the distances may not be exactly the same.

<table>
<tr><th>Endpoint</th><th>Coordinate (Decimal Degrees)</th><th>UV-DOAS</th><th>FTIR and TDLAS</th></tr>
<tr><td>North end of North Richmond fenceline monitor</td><td>37.953652, -122.379626</td><td rowspan="2">Path D, 692 m</td><td rowspan="2">Path D, 692 m</td></tr>
<tr><td>South end of North Richmond fenceline monitor</td><td>37.948302, -122.375505</td></tr>
<tr><td>North end of Atchison fenceline monitor</td><td>37.940985, -122.381348</td><td rowspan="3">Path E, 791 m</td><td rowspan="2">Path E1, 415 m</td></tr>
<tr><td>Intermediate point of Atchison Fenceline Monitor</td><td>37.937706, -122.383615</td></tr>
<tr><td>South end of Atchison fenceline monitor</td><td>37.934659, -122.385536</td><td rowspan="3">Path E2, 376 m</td></tr>
<tr><td>North end of Point Richmond fenceline monitor</td><td>37.934345, -122.385961</td><td rowspan="3">Path F, 899 m</td><td rowspan="2">Path F1, 497 m</td></tr>
<tr><td>Intermediate point of Point Richmond fenceline Monitor</td><td>37.933810, -122.391573</td></tr>
<tr><td>South end of Point Richmond fenceline monitor</td><td>37.933217, -122.396070</td><td rowspan="2">Path F2, 400 m</td></tr>
</table>

A.7 Quality Objectives and Criteria

Data Quality Objectives

Data quality objectives (DQOs) outline the major question(s) to be answered by a monitoring project and ensure that collected data are of sufficient quality to support project goals. The U.S. EPA provides a seven-step process to establish DQOs:

1. **Problem Statement**: The goal of this monitoring program is to meet the requirements of BAAQMD Rule 12-15, which was established to provide the public with information regarding concentrations of target compounds at the fenceline of refining facilities.
2. **Decision**: The refinery provides information to the public regarding concentrations of target compounds consistent with BAAQMD Rule 12-15 and the facility's AMP.
3. **Information Inputs**: Concentration data from open-path monitors are provided as 5-min and 1-hr rolling average concentrations. Data are reviewed with respect to representativeness and comparability, and measurements from other available sources in similar geographic locations serve as a basis of comparison.
4. **Study Boundaries**: Concentration measurements are collected along the refinery fenceline, in accordance with BAAQMD Rule 12-15 and the facility's AMP.
5. **Decision Rule**: Measurements are collected and reported in real time, in accordance with BAAQMD Rule 12-15 and the facility's AMP.
6. **Acceptance Criteria**: Data will be considered acceptable for reporting, provided they meet the defined performance criteria for the project.
7. **Data Collection**: Raw data are collected at various frequencies (depending on the instrumentation and equipment), 24 hours a day, 7 days a week, and aggregated into 5-min averages. Automated quality control logic (AutoQC) and DMS-level screening checks are performed in real time before data are posted to a publicly accessible website.

Data Quality Indicators

Data quality indicators (DQIs) are the quantitative statistics and qualitative descriptors used to interpret the degree of data's acceptability or utility in consideration of the project's DQOs. The DQIs for the BAAQMD Rule 12-15 fenceline monitoring project are defined below. Accuracy and precision are quantitative metrics, representativeness and comparability are qualitative metrics, and completeness combines quantitative and qualitative metrics.

Accuracy is the metric of agreement between an observed value and an accepted reference value. Accuracy is calculated using some derivation of error or recovery from data sets collected during bump tests and calibration checks. Additional details are provided in Section B.7 of this document.

Precision is the metric of mutual agreement among individual measurements of the same parameter, otherwise known as the random component of error. Precision is calculated using some derivation of the standard deviation data sets collected during bump tests and calibration checks. Additional details are provided in Section B.7 of this document.

Representativeness refers to the degree to which data collected by the monitoring project broadly represent ambient conditions, variations between sampling sites, and potential detection events. Representativeness is primarily controlled by the sampling locations, which are detailed in the facility's AMP.

Concentrations of target compounds will be reported in parts per billion (ppb), consistent with the requirements of the Rule 12-15 Guidelines from BAAQMD. Routine bump tests and calibration checks with NIST-traceable reference gases ensure that concentrations reported by open-path analyzers are comparable to other available measurements.

Completeness is a measure of the amount of usable data obtained by the monitoring project compared to the potential amount expected to be obtained under normal operating conditions. The goal of the monitoring project is to maximize system uptime through robust analyzer maintenance, routine data review and short response times for addressing system issues. Quantitative metrics for calculating completeness are detailed further within this section, consistent with BAAQMD guidance.

Measurement Quality Objectives

Measurement quality objectives (MQOs) are individual performance or acceptance goals that directly translate each DQI into discrete analytical performance criteria. The MQOs for this fenceline monitoring project are detailed below.

Accuracy and Precision

Accuracy and precision are assessed for the Ultraviolet-Differential Optical Absorption Spectroscopy (UV-DOAS) and Fourier Transform Infrared (FTIR) open-path systems through routine bump tests with NIST-traceable reference gases. The acceptance criteria shown in **Table 4** are used for periodic testing (i.e., monthly, quarterly, annually), as well as for continuous, AutoQC of real-time data. Test gases were identified based on which compounds are required for monitoring by Rule 12-15, and concentrations were selected to be representative of potential detection events and near or below health thresholds of concern. Regarding accuracy and precision of open-path bump tests, warning levels are defined as 5% less than the acceptance criteria and are further discussed in the individual instrument SOPs (see Attachments 1-6). Bump tests and calibration checks are performed for information purposes only with the Tunable Diode Laser Absorption Spectroscopy (TDLAS) open-path system.

An appropriate manufacturer-specific calibration kit is used to assess accuracy of the visibility sensor and generally consists of a blocking plate (sensor zero) and scatter plate (span). The calibration

fixture is assigned a factory-traceable extinction coefficient, which is compared to the value reported by the sensor.

Additional details regarding instrument calibration and frequency are shown in Section B.7, and step-by-step procedures are provided in the relevant instrument SOPs (Attachments 1–6).

Table 4. Acceptance criteria for instrumentation and equipment.

QA/QC Checks	Frequency	Gas/Concentration	Acceptance Criteria
UV-DOAS			
Bump test (accuracy and precision)	Monthly (and after major service)	Benzene 1–20 ppb	±20%
Spectral match (r^2)	Continuous	--	0.8–1.0
Integration time	Continuous	--	≤250 ms
Signal intensity	Continuous	--	≥70% (if integration time >250 ms)
TDLAS			
Bump test (informational purposes)	Monthly (and after major service)	Not applicable – temporary informational monitoring	
3-point calibration (informational purposes)	Quarterly	Not applicable – temporary informational monitoring	
H_2S spectral match (r)	Continuous	--	0.72–1.0
Signal power	Continuous	--	≥0.1 mW (corresponds to <1% transmission)
H_2O spectral match (r)	Continuous	--	0.95–1.0
CO_2 spectral match (r) (in the presence of dry air masses)	Continuous	--	0.95–1.0
FTIR			
Bump test (accuracy and precision)	Monthly (and after major service)	Propane 50–200 ppb	±20%
Spectral match (r^2)	Continuous	--	0.7–1.0
Signal intensity	Continuous	--	≥2%

QA/QC Checks	Frequency	Gas/Concentration	Acceptance Criteria
AutoGC			
Zero	Monthly	--	<2 ppb
Span test (accuracy and precision)	Monthly	Benzene (10–20 ppb) and n-Hexane (10–20 ppb)	±15%
Multi-point calibration (linearity)	Quarterly (and after major service)	Benzene 10–20 ppb	±15% (each point) R^2 >0.96 y-intercept ±2 ppb
H_2S Point Monitor			
Zero/span verification (accuracy and precision)	Monthly	Zero air and H_2S (450 ppb) [a]	<3 ppb (zero) ±15% (span)
Zero/span calibration	Quarterly (and after failed Zero/Span Verification)	Zero air and H_2S (450 ppb) [a]	--
Multi-point verification (linearity)	After Zero/Span Calibration	H_2S 75 ppb, 200 ppb, 325 ppb	±15% (each point) R^2 >0.96 y-intercept ±3 ppb
Visibility Sensor			
Extinction coefficient (accuracy)	Annually	--	±25%

[a] This concentration, if detected during one 5-min period, would result in an hourly ambient concentration close to the OEHHA REL and CAAQS for H_2S (30 ppb).

Completeness

Data completeness is assessed after reviewing the data flags assigned for each 5-min average data point (see Section B.5). BAAQMD guidance for open-path measurement data recovery is that instrumentation must meet a minimum of 75% completeness on an hourly basis, 90% of the time based on annual quarters. Completeness is therefore calculated as follows:

$$Quarterly\ \%\ Completeness = \left(\frac{Count\ of\ hours\ in\ the\ calendar\ quarter\ where\ hourly\ completeness > 75\%}{Count\ of\ all\ hours\ in\ the\ calendar\ quarter}\right) x\ 100$$

Additional data completeness definitions are included below.

- **Possible**. Maximum number of 5-min average concentrations that can be measured in a given hour and logged in the data management system (DMS)
- **Captured.** Actual number of 5-min average concentrations that were measured in a given hour and logged in the DMS
- **Missing.** Number of 5-min average concentrations not measured or logged in the DMS in a given hour

  Missing = Possible – Captured
- **% Missing.** Percentage of missing 5-min average concentrations in a given hour relative to the possible number 5-min average concentrations

  % Missing = (Missing / Possible) x 100
- **Invalid Total.** Number of invalid 5-min average concentrations measured and logged in the DMS in a given hour
- **% Invalid Total**. Percentage of invalid 5-min average concentrations in a given hour relative to the possible number of 5-min average concentrations

  % Invalid Total = (Invalid Total / Possible) x 100
- **Invalid Environmental.** Number of invalid 5-min average concentrations in a given hour due to adverse atmospheric or environmental conditions
- **Invalid Other.** Number of invalid 5-min average concentrations in a given hour due to anything other than adverse atmospheric or environmental conditions
- **% Invalid Other.** Percentage of invalid 5-min average concentrations in a given hour due to anything other than adverse atmospheric or environmental conditions relative to the possible number of 5-min average concentrations

  % Invalid Other = (Invalid Other / Possible) x 100
- **Expected.** Number of possible 5-min average concentrations in a given hour, adjusted for periods of low visibility during adverse atmospheric or environmental conditions

  Expected = Possible – Invalid Environmental

- **Valid.** Number of valid 5-min average concentrations in a given hour
- **% Valid.** Percentage of valid 5-min average concentrations in a given hour relative to the possible number of 5-min average concentrations

  % Valid = (Valid / Possible) x 100

- **% Hourly Completeness.** Percentage of valid 5-min average concentrations in a given hour relative to the expected number of 5-min average concentrations

  % Hourly Completeness = (Valid / Expected) x 100

A.8 Special Training and Certifications

All project personnel are provided with necessary training and oversight, including:

1. Safety courses administered through the Occupational Safety Councils of America (OSCA)
2. Instrument-specific training from vendors
3. Data validation training from experienced analysts
4. Routine operations and maintenance training from experienced field technicians

Training is conducted by senior staff with at least one year of experience operating refinery fenceline monitoring systems, and analyzer manufacturers. Project personnel are provided copies of the QAPP and SOPs, and receive updated versions when available. Initial training is provided prior to personnel performing work on the system, and refresher trainings are conducted on an annual basis. The QA Manager will identify specific training requirements for all project personnel and will determine when trainees are qualified to work independently. Training records will be maintained by the Field Staff Manager. Additional details regarding training and certification are provided in the individual SOPs included as attachments (Attachments 1-6).

A.9 Documents and Records

Quality System documentation, including the AMP, QAPP, and SOPs, are frequently revised to reflect current best practices, improvements to available technology and data control practices, and fenceline monitoring program changes. Revisions (and new SOPs) are undertaken at the direction of the QA Manager. In addition to Quality System documentation, quarterly reports are produced that provide a summary of system performance over each calendar quarter, which may include data summaries, statistical analyses, and the results of QC tests. These reports are generated by relevant project staff, overseen by the QA Manager, and delivered to BAAQMD along with quarterly data deliveries.

The fenceline contractor (Sonoma Technology) achieves work product quality through a series of internal review-and-correction cycles and an external review by the client. Documents undergo at

least two internal reviews – the first by a senior technical staff member who is knowledgeable about the subject matter but is not the primary author of the work, and the second by a technical editor who is skilled in English mechanics and writing style. Before any document (draft or final) is delivered to the refinery, the lead author or Project Manager conducts a final quality review and approves it for delivery. Final approved versions in PDF format are distributed to the refinery and/or appropriate project personnel via email. Final approved versions in PDF format are distributed to the refinery and/or appropriate project personnel via email. The refinery reviews the report for accuracy and any changes are jointly discussed between the refinery and the fenceline contractor prior to finalization and submission.

Sonoma Technology employs a robust, systematic approach to version tracking and file maintenance. Each document is stored by project number on a shared fileserver. Only the most recent version is stored in the top-level folder, and each draft version is tracked by a timestamp as well as all reviewers' initials in a subfolder. A unique Master File Number is assigned to each document and all versions of that document retain that number.

Sonoma Technology's proprietary Deliverables Organizer and Tracking System (DOTS) is used to track progress and facilitate management of all quality documentation and work products. The web-based system retains information on document versions, including the dates and names of employees who edited, reviewed, and revised each document. DOTS also contains standard reports for tracking deliverables through the QA/QC and delivery process, and ensures that document information can be easily retrieved. A lead author or Project Manager creates a DOTS entry for each upcoming deliverable; the project Technical Editor maintains the DOTS record as each deliverable progresses through the update, review, delivery, and disposition process. Microsoft Word and PDF versions of all final approved documents are preserved on Sonoma Technology's fileserver in a secured Master File Library.

All staff involved in fenceline monitoring have been provided with electronic copies of all SOPs. Revised versions of the QAPP and SOPs will be distributed to both refinery and contractor staff via email, and will also be stored on a shared drive. Additionally, hard copies of the SOPs and analyzer user manuals are kept in the analyzer shelters and replaced when revisions are completed. By updating digital and hard copies of the QAPP, SOPs, and other QC documents, we ensure that staff only use the most recent version to meet measurement and data quality objectives.

The analyzer shelters also contain logbooks where all onsite activities related to the fenceline monitoring system are recorded. This includes planned maintenance activities and emergency site visits. The field logbooks are scanned monthly to generate electronic copies.

Any corrections that are made to hard-copy documents will be indicated by (1) a cross out of the previous entry, (2) the addition of a new entry, (3) the date of correction, and (4) the initials or name of the individual making the correction. Electronic documents (reports and data) are stored on a password-protected server at Sonoma Technology, with current and previous versions stored by project and document (Table 5). The document retention policy for the fenceline monitoring network is shown in Table 5.

Table 5. Document management procedures for the Chevron Richmond Refinery fenceline monitoring project.

Document	Retention Policy
AMP	Fenceline Project Manager to retain all versions for project duration
QAPP	Fenceline Project Manager to retain all versions for the duration of the air monitoring program
Maintenance Forms	QA Manager to retain all documents for 5 years
Audit Forms	QA Manager to retain all documents for 5 years
Corrective Action Report	QA Manager to retain all documents for 5 years
Calibration Standard Certifications	QA Manager to retain all documents for 5 years
Daily Data Check Logs	QA Manager to retain all documents for 5 years
Logbooks	Field Staff Manager to retain all versions for 5 years at Chevron Richmond (or electronically)
Training Documents	QA Manager to retain all documents for 5 years

B. Data Generation and Acquisition

B.1 Sampling Process Design

Open-path analyzers were selected after consideration of all Rule 12-15 requirements, including (1) spatial coverage necessary to monitor hundreds of meters of refinery fencelines, (2) 5-min resolution for real-time data, and (3) required detection limits, accuracy, and precision of target compounds. Additional details about open-path analyzers are provided in Section B.2.

Heavy fog, rain, or smoke may block the signal from an open-path instrument and prevent data collection, but even light fog can partially absorb the signal and interfere with measurements. Visibility measurements are made at one representative location to confirm when low-visibility conditions result in invalid data from open-path instruments. Three sampling paths, composed of five segments in total, are shown in Figure 2.

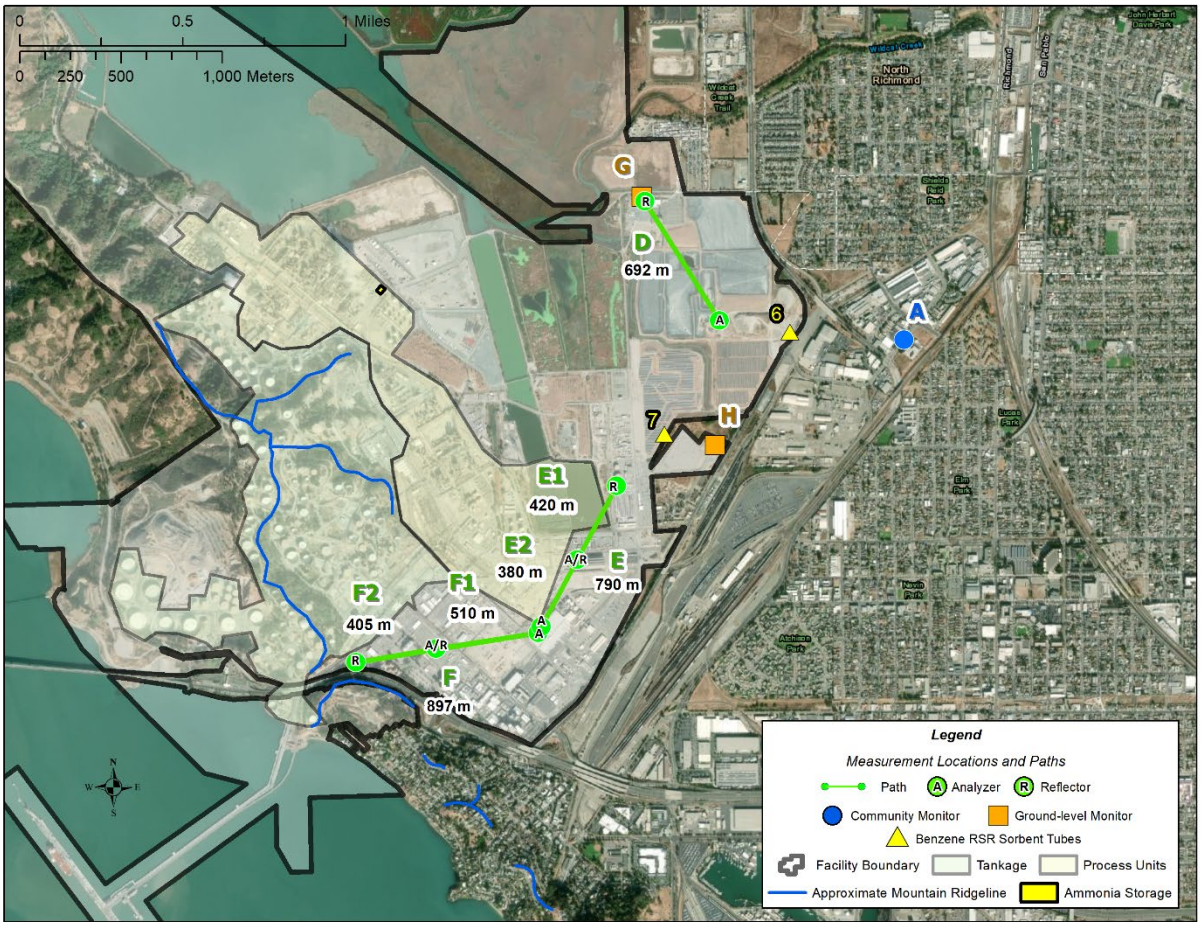

Figure 2. Location of sensors and measurement paths. Bistatic UV-DOAS instruments are used at paths D, E, and F. Monostatic FTIR and TDLAS instruments are used at paths D, E1, E2, F1, and F2.

Separate community monitors near the open-path monitoring sites include UV-fluorescence analyzers to measure H_2S, cavity ring-down spectroscopy analyzer for ammonia (NH_3), aethalometers for black carbon (BC), beta attenuation monitors (BAMs) for particulate matter ($PM_{2.5}$), and automated gas chromatography analyzers (AutoGCs) for volatile organic compounds (VOCs). GLMs provide additional measurements of H_2S and SO_2, and passive sorbent-tube samplers provide additional measurements of benzene. Real-time data from these additional community monitors are shown on the public website.

Meteorological stations contain visibility sensors and provide measurements of wind speed, wind direction, temperature, and relative humidity.

B.2 Sampling Methods

BTEX and SO_2 are measured by bistatic UV-DOAS (source and detector on opposite ends of the sampling path) with a xenon light source. The xenon light source is required to achieve sufficient detection limits for target compounds over the approximately 800-m sampling paths. Each target ultraviolet- (UV) absorbing compound has a unique absorbance spectrum, meaning they absorb different amounts of light at discrete wavelengths. This is measured by the analyzer, which then compares regions of a sample absorbance spectra to the same regions of a reference absorbance spectra.

Methane and alkanes are measured by monostatic (source and detector collocated, with a retroreflector on the opposite end of the path) FTIR, which operates similarly to the UV-DOAS. A combination of industry standard and proprietary methods are used to mitigate interference from water vapor and interference gases.

For both UV-DOAS and FTIR, a classic least squares regression analysis provides a spectral match parameter (r^2) which is used to identify potential interferences present in the sample path. The primary means of avoiding absorbance due to interfering gases is to select regions of the absorbance spectrum that are specific to the target compounds and free of absorbance due to other gases. Spectral subtraction is used in cases with overlapping absorbance features, and the subtraction technique is proprietary to the instrument manufacturer. Spectral matching is used to identify the target compounds and Beer's Law is used to report the concentration. This approach is comparable to U.S. EPA's TO-16 Methodology,[6] though TO-16 was not written specifically for UV-DOAS applications.

H_2S will temporarily be measured for informational purposes only by monostatic TDLAS pending deployment of more precise point monitors. A tunable diode laser emits light at a very small range of wavelengths, which allows spectral measurement of an H_2S absorption peak. The Unisearch TDLAS

[6] U.S. Environmental Protection Agency (1999) Compendium of methods for the determination of toxic organic compounds in ambient air: compendium method TO-16. Second edition, prepared by the U.S. Environmental Protection Agency, Office of Research and Development, Cincinnati, OH, EPA/625/R-96/010b, January. Available at https://www3.epa.gov/ttnamti1/files/ambient/airtox/tocomp99.pdf.

operates in a wavelength range that also contains an absorbance feature for water vapor and carbon dioxide (CO_2), both of which are present in Earth's atmosphere, so the spectral match of those gases can be used as additional performance metrics. If the water vapor spectral match drops below a threshold value, the CO_2 spectral match is examined. If that also drops below a threshold value, data are flagged as invalid. The signal strength of the light transmitted through the atmosphere is recorded using a photodiode detector and recorded in the data file. Together with an independent visibility measurement, the signal strength can be used to evaluate the impact of atmospheric conditions or misalignment on data quality. The TDLAS detection limit for H_2S is variable and also depends on atmospheric conditions.

The North Richmond community monitor uses an AutoGC with a photoionization detector (PID) to measure BTEX in ambient air. Sample gas flows through the gas chromatograph column and separates at different rates depending on the various chemical and physical properties. The photoionization detector causes ionization of the sample using UV light. The ionization chamber exposed to the light source contains a pair of electrodes. When a positive potential is applied to one electrode, an electro-magnetic field is created in the chamber. Ions formed by the adsorption of photons are driven to a collector electrode. The current produced correlates with concentration.

The North Richmond community monitor and Castro Street GLM use UV pulse analyzers to measure H_2S and SO_2 in ambient air. The H_2S analyzer draws sample gas through an H_2S-to-SO_2 converter coupled to a pulsed-fluorescence SO_2 analyzer. Continuous H_2S monitoring is accomplished by conversion of H_2S in the sample to SO_2 and its subsequent detection by the SO_2 analyzer. The SO_2 fluorescence analyzer has a similar principle of measurement as the H_2S analyzer: sample flows into the fluorescence chamber, where pulsating UV light excites the SO_2 molecules. The condensing lens focuses the pulsating UV light into the mirror assembly, which contains four selective mirrors that reflect only the wavelengths that excite SO_2 molecules. As the excited SO_2 molecules decay to lower energy states, they emit UV light that is proportional to the SO_2 concentration.

Table 6 summarizes the estimated MDLs and upper detection limits (UDLs), which are the lowest and highest concentrations of each species that can be measured by each instrument and sampling path, as reported by instrument manufacturers. Values are presented as the average concentration along the sampling path, meaning a higher concentration is needed for detection when a narrow plume covers only a portion of the path. The MDL may be higher than those listed in Table 6 if there is poor atmospheric visibility (e.g., fog, rain, smoke, or dust), misalignment of the light source with the retroreflectors, hardware problems, or interfering gases. MDLs at the lower end of the specified range are expected under the opposite conditions.

Additional information regarding instrument operations and maintenance, emergency site visits, and corrective actions are detailed in Section B.6.

Table 6. Open-path instruments and approximate detection limits by pollutant and path. Actual detection limits will differ and depend on ambient conditions. H_2S MDLs will be evaluated in real-time and used for informational purposes only.

Path	Compound	Path Integrated Values		North Richmond (D)		Atchison (E)		Atchison (E1)		Atchison (E2)		Point Richmond (F)		Point Richmond (F1)		Point Richmond (F2)	
Distance (m)		N/A		692 m		791 m		415 m		376 m		899 m		497 m		400 m	
Technology		MDL (ppb)	UDL (ppb)	MDL (ppb)	UDL (ppb)	MDL (ppb)	UDL (ppb)	MDL (ppb)	UDL (ppb)	MDL (ppb)	UDL (ppb)	MDL (ppb)	UDL (ppb)	MDL (ppb)	UDL (ppb)	MDL (ppb)	UDL (ppb)
UV-DOAS	Benzene	0.27	16,000	0.19	23,000	0.17	20,000	-	-	-	-	0.15	18,000	-	-	-	-
	Toluene	0.84	22,000	0.61	32,000	0.53	28,000	-	-	-	-	0.47	25,000	-	-	-	-
	Ethylbenzene	0.3	11,000	0.22	16,000	0.19	14,000	-	-	-	-	0.17	12,000	-	-	-	-
	o-xylene	3.8	2,100	2.7	3,100	2.4	2,700	-	-	-	-	2.1	2,400	-	-	-	-
	m-xylene	0.35	920	0.25	1,300	0.22	1,200	-	-	-	-	0.2	1,000	-	-	-	-
	p-xylene	0.24	360	0.17	510	0.15	450	-	-	-	-	0.13	400	-	-	-	-
	Sulfur Dioxide	0.68	21,000	0.49	30,000	0.43	26,000	-	-	-	-	0.38	23,000	-	-	-	-
TDLAS	H_2S	N/A[a]	7,500	N/A[a]	5,400	-	-	N/A[a]	8,900	N/A[a]	9,900	-	-	N/A[a]	7,500	N/A[a]	9,300
FTIR	Methane	7	4,200	5.1	3,000	-	-	8.4	5,000	9.2	5,500	-	-	7.1	4,200	8.8	5,200
	Ethane	3.2	1,100	2.3	810	-	-	3.8	1,300	4.2	1,500	-	-	3.2	1,100	4	1,400
	Propane	3.8	1,100	2.7	810	-	-	4.5	1,300	5	1,500	-	-	3.8	1,100	4.7	1,400
	Butane	4.2	1,100	3	810	-	-	5	1,300	5.5	1,500	-	-	4.2	1,100	5.2	1,400
	Pentane	1.6	1,100	1.2	810	-	-	1.9	1,300	2.1	1,500	-	-	1.6	1,100	2	1,400

[a] The TDLAS detection limit for H_2S is variable and also depends on atmospheric conditions. H_2S will temporarily be detected and quantified for informational purposes only using an open-path TDL air monitoring system pending deployment of more precise point monitors.

B.3 Sample Handling and Custody

Analyzers are located in secured sites to prohibit tampering or handling by anyone other than authorized personnel. Technicians keep sampling shelters clean and routinely check analyzers for any debris or residue during site visits. Real-time data are transmitted to the DMS by cellular modem and can only be accessed by authorized personnel. All changes to data within the DMS are tracked through chain-of-custody logs.

As discussed in the AMP, benzene concentrations are measured at select sites through the use of an absorbent tube deployed inside a sampling shelter. Sampling and analysis are performed following EPA 325 A/B methodology. Sample tubes are conditioned, blank checked, assigned to sample sites, and recorded in an electronic chain-of-custody file in the lab. A colored loom band is placed on each conditioned tube prior to deployment in the field, which differentiates deployed tubes from retrieved tubes. Tubes are deployed and retrieved every 14 days using separate “retrieval” and “deployment” carriers, and chain-of-custody logs are updated at each deployment and retrieval.

B.4 Analytical Methods

Refer to Section B.2 for information regarding real-time sampling methods.

Sampling and analysis for the benzene sorbent tubes are performed following EPA 325 A/B methodology. Sorbent tube samples received in the laboratory for analysis are thermally desorbed and analyzed by gas chromatography/mass spectrometry (GC/MS) for trace-level benzene. Critical steps included in the process of thermal desorption are described below and performed automatically by the thermal desorption system.

- Leak testing under stop flow
- Recording ambient conditions
- Internal standard addition
- Tube purging
- Thermal desorption of the sample tube
- Refocusing on a cold trap
- Secondary desorption of the cold trap with transfer/injection of the sample to the capillary GC column for analysis of the analytes of interest

B.5 Quality Control Requirements

Real-time data from open-path analyzers and point monitors undergo several rounds of QC, including a review by AutoQC logic, which flags data before they are posted on the public website. Additional details on analysis and quality control of real-time and final data are described in Section D.2.

Field blanks for the benzene sorbent tubes are deployed in the same manner as samples, except that the long-term storage caps remain on both ends of the tube and are placed in the sample shelter alongside the field sample. One field blank is required per sampling event and is chosen randomly in different quadrants. Two co-located duplicates are collected for every sampling event following the normal deployment procedure.

B.6 Instrument/Equipment Testing, Inspection, and Maintenance

Routine Maintenance

The UV-DOAS, TDLAS, and FTIR open-path analyzers are designed to require only modest service and maintenance. **Tables 7 through 9** summarize the routine maintenance activities for open-path analyzers as recommended by instrument manufacturers, and additional details are provided in the instrument SOPs (Attachments 1–3). Preventive maintenance frequency depends on the operating environment and may need to be adjusted depending on field conditions. Any potential changes will be reflected in an updated version of this QAPP, which will be sent to BAAQMD for approval.

Table 7. Schedule of routine maintenance activities for UV-DOAS open-path analyzers.

Activity	Monthly	Quarterly	Annually
Visually inspect the system	✓		
Inspect detector and retroreflector optics; clean if necessary	✓		
Inspect and clean system filters	✓		
Inspect all electrical cables for wear; replace as needed	✓		
Confirm the alignment of the light source and detector	✓		
Ensure that there are no obstructions between the light source and detector (e.g., refinery equipment, vegetation, or vehicles)	✓		
Document signal levels to establish a baseline for light source replacement frequency	✓		
Archive historical data and remove from analyzer computer	✓		
Perform bump test	✓		
Replace light source if diagnostics are outside the acceptable range		✓	
Replace ventilation exit and intake filters		✓	
Clean detector optics		✓	
Confirm the alignment of the light source and detector		✓	
Verify system settings			✓

Table 8. Schedule of routine maintenance activities for TDLAS open-path analyzers.

Activity	Monthly	Quarterly	Annually
Visually inspect the system	✓		
Inspect detector and retroreflector optics; clean if necessary	✓		
Inspect all electrical cables for wear; replace as needed	✓		
Confirm the alignment of the light source/detector and retroreflector	✓		
Ensure that there are no obstructions between the light source/detector and retroreflector (e.g. refinery equipment, vegetation, or vehicles)	✓		
Archive historical data and remove from analyzer computer	✓		
Perform bump test	✓		
Document signal levels*		✓	
Perform 3-point calibration check		✓	
Verify system settings as described in the SOP			✓

* Although signal strength is recorded in real time, long-term trends are necessary to evaluate the status of optical components, effects of cleaning optical components, and the noise characteristics of the spectral data.

Table 9. Schedule of routine maintenance activities for FTIR open-path analyzers.

Activity	Monthly	Quarterly	Annually	Biannually	5 Years
Visually inspect the system	✓				
Inspect detector and retroreflector optics; clean if necessary	✓				
Confirm the alignment of the light source/detector and retroreflector	✓				
Ensure that there are no obstructions between the light source/detector and retroreflector (e.g., refinery equipment, vegetation, or vehicles)	✓				
Archive historical data and remove from analyzer computer	✓				
Perform bump test	✓				
Inspect and clean exterior heat sink for AC system		✓			
Test and document signal levels to establish a baseline for light source and retroreflector replacement frequency			✓		
Replace cryocooler or swap detector module assembly				✓	
Replace the light source					✓

Routine quarterly maintenance of the visibility sensors includes inspecting for dirt, spider webs, birds' nests, and other obstructions (Table 10). Obstructions are removed and the glass windows are cleaned if the sensor is dirty. There are no serviceable components in the sensor. Calibration is performed annually per the manufacturer's recommendation. Additional information regarding routine maintenance of the visibility sensor is provided in Attachment 4.

Table 10. Schedule of routine maintenance activities for visibility sensors.

Activity	Quarterly	Annually
Visually inspect the system, including all cables	✓	
Inspect detector optics; clean if necessary	✓	
Perform calibration (extinction coefficient)		✓

Routine maintenance activities for the AutoGC are summarized in Table 11, and additional details are provided in Attachment 5.

Table 11. Schedule of routine maintenance activities for the community site AutoGC.

Activity	Quarterly	Annually	Biannually
Replace micro dust filter for sample	✓		
Remove dust from ventilator	✓		
Clean the lamp		✓	
Clean the PID		✓	
Change the carrier gas filters		✓	
Clean the diaphragm		✓	
Renew external sample tubing		✓	
Replace preconcentration Tenax tube		✓	
Replace cooled preconcentration trap		✓	
Optimize hard disk		✓	
Clean internal gas tubing			✓
Clean lamp housing			✓

Routine maintenance activities for the H_2S point monitors are summarized in Table 12, and additional details are provided in Attachment 6. The North Richmond community H_2S monitor and Castro Street GLM are maintained following analogous practices. In addition, maintenance checks will be performed if data quality checks fail or data availability targets are not met.

Table 12. Schedule of routine maintenance activities for the community site H_2S analyzer.

Activity	Monthly	Quarterly	Annually
Perform Zero and Span (Z/S) check	✓		
Review and verify test functions	✓		
Inspect sample lines	✓		
Change inlet particulate filter	✓		
Perform flow check		✓	
Perform multi-point check		✓	
Replace SO_2 scrubber material and sintered filters			✓
Check for H_2S->SO_2 converter efficiency (CE), replace or service the converter if CE < 96%			✓
Replace the critical flow orifice assembly			✓
Perform a pump check and rebuild if needed			✓
Perform leak check			✓
Perform UV lamp adjustment			✓
Perform PMT sensor hardware calibration			✓
Calibrate offset and slope			✓

Emergency Maintenance and Corrective Actions

Emergency maintenance occurs when problems are identified with the fenceline monitoring network. Two teams of after-hours (on-call) support personnel remotely monitor the status of the instrumentation and the data pipeline (acquisition, DMS, public website) 24 hours a day, 7 days a week. Automated alerts are sent if potential issues are identified, such as:

1. Missing data
2. Reported concentrations are outside of an specified range
3. Instrument diagnostics indicate a potential malfunction

The Sonoma Technology field operations team (Field Ops) is led by the Field Staff Manager, and the data pipeline team, or information systems team (IS Ops), is led by the Data Systems Manager. The nature of the potential issue determines which team receives the automated alert. On-call personnel are required to acknowledge alerts within 30 minutes of receipt and attempt to resolve potential issues remotely. This approach ensures that issues are identified and addressed in a timely manner, which maximizes the uptime of the fenceline monitoring network.

The Field Ops team addresses most issues pertaining to instrumentation and equipment. In the case of missing data, the refinery is notified if the alert cannot be resolved remotely and a maintenance message is posted on the public website at the direction of the refinery, and BAAQMD is notified of monitoring downtime with a duration over 24 hours according to Regulation 1-530.[7] Spare instrumentation or equipment may be installed if an extended outage is anticipated. In the case of elevated concentrations, data are reviewed and the refinery is notified whether the detection is legitimate or due to a potential instrument malfunction. Data flags are updated on the public website during daily data checks to ensure accuracy, including for potential after-hours events. Any required field site visits occur on the next business day, and all corrective actions performed are documented in on-site logbooks.

The IS Ops team addresses most issues pertaining to data flow and the public website. Table 13 outlines examples of automated screening, which the IS Ops team may review to troubleshoot potential issues.

[7] Area Monitoring Downtime (BAAQMD Rule 1-530), available at http://www.baaqmd.gov/~/media/dotgov/files/rules/reg-1-general-provisions--definitions/documents/rg0100.pdf?la=en.

Table 13. Examples of automated screening pertaining to the data pipeline and public website.

Target	Test	Frequency	Threshold
Website Availability	HTTP test of the public and internal websites	300 sec	Pass/Fail
DMS	CPU utilization	300 sec	>60%
	Memory use		>75%
	Disk space used		>75%
Data Flow	Time since last datum received	30 min	Pass/Fail
Data Processing Errors	Process scheduler	300 sec	Pass/Fail

B.7 Instrument Calibration and Frequency

As discussed in Section A.7, DQIs for open-path and point analyzers are assessed through completion of bump tests, span tests, and calibrations. These are part of the routine operations and maintenance of the system, which are further detailed in Section B.6 and in the instrument SOPs (Attachments 1–6).

Bump and span testing verifies analyzer detection capability, accuracy, and precision. Concentrations are selected such that they are well above the level of quantitation, but near or below levels of concern for target compounds, and are shown in Table 4. Bump tests are performed when the atmospheric influence on sample variability is assumed to be minimal, so tests are not conducted in rain, fog, or when ambient concentrations of target compounds or interfering gases (e.g., ozone) are changing rapidly. Temperature control is accomplished by systems within the instrument enclosure itself, so instrument shelters are ventilated but not temperature controlled. Retroreflector housings include a heater/fan system designed to mitigate the effects of condensation and particulates on the retroreflector surface.

Bump and span tests are performed by introducing NIST-traceable reference gases into the open-sampling path using a test cell. During open-path bump tests, light from the analyzer source passes through the test cell and entire atmospheric path length to the retroreflector. Light is reflected back through the sampling path, test cell, and detector. Because the light travels through the ambient atmosphere, which includes other gases and particles as it would during a normal measurement, this test is a representative assessment of the instrument's capabilities under the influence of environmental conditions. During bump tests, a number (N) of replicated, raw time resolution measurements (x_i) of a standard reference material of known magnitude (x_{std}) are measured. An acceptable number of trials is defined as $7 \leq N \leq 15$, and a subset of test data which meet the acceptance criteria (see Section A.7) are used for subsequent calculations. The average value of these measurements is calculated as:

$$\bar{x} = \frac{\sum_i x_i}{N}$$

The standard deviation (σ) as:

$$\sigma = \sqrt{\frac{\sum_i (x_i - \bar{x})^2}{N-1}}.$$

From these definitions, accuracy (as % error) is defined as:

$$\%\ error = \left| \frac{\bar{x} - x_{std}}{x_{std}} \right| \times 100\%$$

Precision (as the % coefficient of variation, CV) is defined as:

$$Precision \equiv \%\ CV = \frac{\sigma}{\bar{x}} \times 100\%$$

The same calculations are used for span testing of point monitors.

B.8 Inspection/Acceptance of Supplies and Consumables

The Field Staff Manager is responsible for inspection and acceptance of all supplies and consumables for the monitoring project. A certification of reference gases used for routine bump tests will be requested from the gas supplier, and standards will not be used past their expiration date.

B.9 Non-Direct Measurements

Part of the data validation methods includes comparison of fenceline monitoring data to remote background and average urban concentrations with the goal of determining overall data reasonableness. This comparison includes a combination of qualitative and quantitative assessments of general spatial or temporal trends in target compound concentrations, such that measurements from this monitoring program may be compared against other external data sources. Though no direct quantitative data product is generated from this comparison effort, comparisons to external data sources generally increase the confidence in data products and, by extension, the overall value of the monitoring project.

External sources of data used for comparison may include the National Oceanic and Atmospheric Administration (NOAA), the National Aeronautics and Space Administration (NASA), the BAAQMD, and the U.S. EPA. Common target compounds may include smoke or ozone, depending on available data sets. Data used for comparison will include quality-controlled final data where available, though preliminary data may be considered for qualitative assessments.

Importantly, because these data sets are external and were not collected, verified, or validated by this project's personnel, they will not serve as an independent benchmark for data validation or invalidation. They will only be used as secondary references to gauge overall reasonableness of data

once all QC has been completed. Additional information regarding data verification and validation methods is provided in Section D.2 and Attachment 7.

B.10 Data Management

Raw data collected at each monitoring site are stored on the analyzer computer and only reviewed if data validation efforts identify potential issues that require additional investigation. A Data Acquisition System (DAS), or data logger, performs basic QC, averages to 5-min resolution, and aggregates data into a desired file format. This data containing 5-min concentration data, diagnostic parameters, and quality control and operational (QC/OP) codes assigned by the DAS are then transmitted from each sampling site to a cloud-based file storage service via cellular modems, where they are stored and available for retrieval as needed. Data from the cloud are ingested into Sonoma Technology's Insight© DMS where a robust AutoQC assigns data flags in real time based on instrument diagnostics and local meteorological measurements. Subsequent, automated DMS-level screening checks are performed according to Section D.2. From this point forward, data are persisted within the DMS and any changes to data are recorded via chain-of-custody logs.

These preliminary data are displayed on the public website within 10 minutes of collection. Data are reviewed daily by air quality data analysts to assess system operations, confirm the automated data flagging is correct, and ensure any corrections to data flagging are propagated to the public website immediately. Extended analyses are performed every calendar quarter and reviewed by the project QA Manager. Figure 3 illustrates the general data flow and QC schematic. Additional details regarding data verification and validation are provided in Section D.2 and Attachment 7.

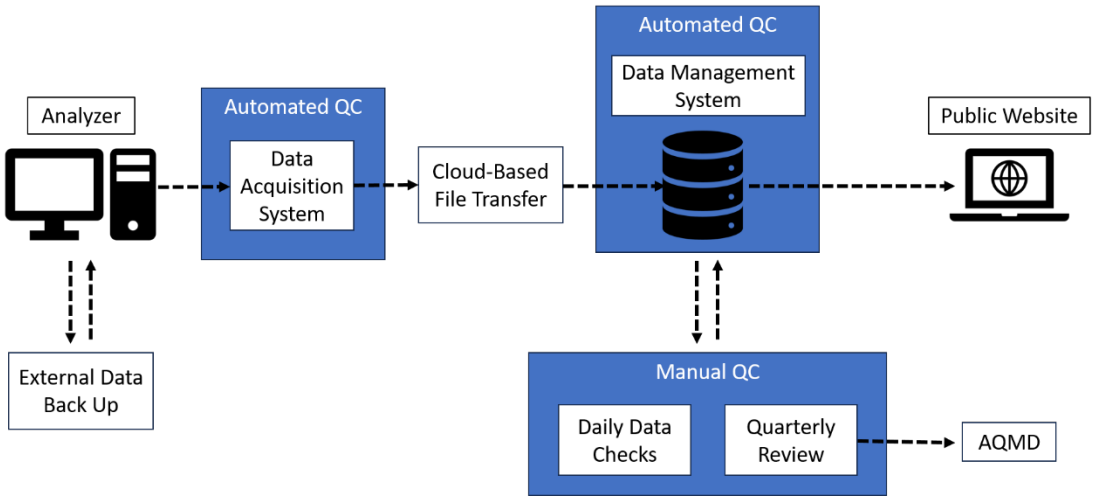

Figure 3. Data flow and QC schematic.

As described in Section B.6, data archival and management on the analyzer computers is part of routine operations and maintenance. Data are copied to external hard drives either manually or via

an automated copy script and deleted from analyzer computers after confirmation that copy efforts were successful. Old files are deleted from the analyzer computer to allow continued data collection.

All ingested data are retained in the DMS. During quarterly analysis, data are downloaded from the database, analyzed, validated, and then backfilled into the DMS as final data sets. Redundancy of DMS data is maintained on a cloud-based system, and will be stored for 5 years after sampling.

In addition to the AutoQC and DMS-level screening checks, individual absorbance spectra from open-path measurements are available for additional review when automated processes identify either an anomaly or a detection event. This manual validation process relies on analytic software packages provided by the instrument manufacturers. Reference libraries and runtime settings are copied from analyzers in the field onto the auxiliary system where analysis is performed. This process is typically performed when detection events are observed, and doing so ensures accuracy of spectral information and allows qualified analysts to view individual absorbance spectra and associated fits. The ability to retain absorbance spectra and independently validate spectral matches and reported concentrations is a key part of the data validation process for open-path analyzers. Raw spectral data is manually backed up to external hard drives and retained for 5 years, and will be made available to BAAQMD upon request.

C. Assessment and Oversight

C.1 Assessments and Response Actions

On an annual basis, the refinery will work with the fenceline monitoring contractor to assess the performance of the network through:

1. Review of data completeness by monitoring path/site, instrument, and compound
2. Comparison of bump test results via control charting
3. Analysis of reported concentrations in the context of refinery operations
4. Analysis of reported concentrations with respect to meteorological conditions
5. Review of QC/OP codes that led to invalid data, including potential repeating combinations
6. Determination of whether any measures could be taken to reduce future occurrences of repeating invalid QC/OP code combinations, and implementation of those measures as necessary and appropriate
7. Verification that data are realistically achievable and not beyond the limits of what can be measured by the instrument

Using analyses similar to those used to support the network design, the contractor will further evaluate the overall performance of the network to ensure it is meeting project objectives. The contractor will also prepare an internal technical memorandum summarizing findings for the refinery, which will be submitted to BAAQMD along with the next quarterly report submission following completion of the memorandum. Following the assessment of the monitoring network, any necessary changes will be reflected as an update to the AMP, QAPP, or SOPs, which will be submitted to BAAQMD for approval prior to implementing any changes.

C.2 Reports to Management

Public Website

Posting data to a public website constitutes the most immediate and frequent reporting effort. Preliminary data collected by the fenceline monitoring network are displayed on a public website (usually within ~10–15 minutes of acquisition) with time series plots and map marker visualizations of 5-min and rolling hourly concentration values. Data are quality controlled in real time with AutoQC logic, and the resulting data flags (QC OP codes) assigned to each data point determine how they appear on the website. Additional information regarding website data display on the public website is provided in Section D.2.

The website is operated and maintained by the refinery's fenceline monitoring contractor (Sonoma Technology), and the general public is the intended user of the preliminary data. Accordingly, the public website contains supplemental information written at a public-friendly level about the monitoring network, target compounds, how to interpret data visualizations, and frequently asked questions (FAQs).

Quarterly Data Delivery to BAAQMD

Final data sets are compiled quarterly and will be provided to the BAAQMD no later than 60 days after the end of each calendar quarter. Outside of the normal quarterly delivery, data will be made available to BAAQMD within 30 days of a request. Consistent with BAAQMD guidance, quarterly data deliveries will include:

- Data for all instrument and parameter combinations in the comma separated value (.csv). Data will contain:
  - The name of the facility where the equipment is located
  - A unique identification number assigned to each instrument or system
  - A short descriptive name for the instrument associated with the reported unique ID (e.g., TDLAS, UV-DOAS)
  - The name of the compound being measured
  - The date of measurement, formatted as "yyyy-mm-dd"
  - The hour of the day and the beginning of the 5-min period over which measurements were collected and averaged, reported in Pacific Standard Time (PST) and formatted as "hh:mm" using 24-hr notation
  - The mean 5-min concentration, reported as numeric values for detection events above and below the LOQ
  - The unit of measure corresponding to the reported mean concentration
  - The averaging period duration (in minutes) for the reported mean concentration
  - The number of values that comprise the reported mean concentration
  - An indicator representing whether the reported mean concentration represents a legitimate air measurement ("Y") or one that has been affected ("N") by an instrument malfunction, adverse environmental conditions, maintenance events, etc.
  - Error codes explaining the reason for invalid or missing data, with multiple codes separated by a semicolon without spaces and the field left blank for valid data
  - The maximum concentration measured during the averaging period, reported in the same units of measure as the mean concentration
  - The required LOQ for the corresponding instrument, reported in the same units of measure as the mean concentration
  - The real-time LOQ for the averaging period, reported in the same units of measure as the mean concentration
  - The average measured light signal for the corresponding averaging period
  - The unit of measure for the corresponding light signal

- A record for each 5-min period of the quarter for all instrument and parameter combinations. Records corresponding to missing data will include the facility name, instrument ID, instrument descriptor, parameter, date, time, and error codes with their respective values, and remaining fields will be populated with a value of "NA."
- An assessment of data completeness, as described in Section A.7.
- A summary of bump tests and calibration checks performed according to the QAPP, including the instrument or system, the type of test or check, the start and end date and time of the test or check, and the date and time that the instrument or system resumed normal operations. Potential failed bump tests or calibration checks will be included.
- The results of bump tests and calibration checks performed according to the QAPP, including accuracy and precision. Root cause analysis and a narrative description of maintenance or repairs performed to return the system to proper operations will be included for potential bump tests or calibration checks with accuracy and precision results that are not within the acceptance criteria.
- Data corrections accounting for the operational setup of bump tests and calibration checks, when they differ from ambient conditions.
- Meteorological data and a narrative explanation sufficient to justify where data have been excluded due to adverse atmospheric or environmental conditions.
- A summary of each instance of data invalidated for a reason other than failed acceptance criteria, including a brief statement of the cause.

D. Data Validation

D.1 Data Review, Verification, and Validation

Data verification is a process of comparing how the data were gathered to the procedures established by the project QAPP and SOPs. It is a data review technique that evaluates the conformance of data collection practices to established methods, procedures, or specifications. Data verification usually consists of checking that SOPs were followed and QC activities were performed.[8]

Data validation is a process of confirming that reported values meet the DQOs of the project. It is a data review technique that examines whether the particular requirements for a specific, intended use are fulfilled. Data validation examines whether acceptance criteria outlined in the QAPP were achieved.[7]

To produce defensible, quality environmental information for its intended use, Chevron shall:

- Meet regulatory requirements
  - Monitor in accordance with the AMP
  - Achieve the acceptance criteria outlined in the QAPP
  - Follow the procedures outlined in the relevant SOPs
- Maintain scientific robustness
  - Use validated methods and accepted practices for scientific quality
  - Use standard materials traceable to an authoritative source (NIST or equivalent)
  - Verify that the electronic output signals from instrumentation are representative of atmospheric conditions and real concentrations (vs. instrument noise)
- Ensure defensibility
  - Document all data collection steps and retain associated raw data
  - Maintain data integrity and reliability through chain-of-custody logging
  - Ensure ethical practices in achieving all project objectives

D.2 Verification and Validation

Data collected at each monitoring site receives five rounds of QC between the point of collection and final data set submission to the regulatory agency. A detailed process flow diagram of the data pipeline is provided in Section B.10, and additional details are provided in the Data Validation SOP (Attachment 7).

[8] EPA Quality Assurance Handbook Vol II.

Tiered Data Quality Control

Data proceed through a tiered order at each point of the data flow and QC schematic, described below.

Level 0. Raw data collected on analyzer computers are referred to as Level 0 data. They do not receive any QC, but are retained for future review as needed.

Level 0.5. These data have been logged by the DAS and received only the most basic AutoQC. This stage of QC includes checking basic instrument diagnostic thresholds and whether a sufficient number of raw analyzer data points were collected to generate a 5-min average, which results in the data preliminarily being flagged as valid or invalid. Maintenance and calibration periods are commonly flagged at this stage, which do not receive additional QC because they are not representative of ambient monitoring data. Level 0.5 data are retained at least through the completion of quarterly analysis and generation of final data sets.

Level 1. Upon ingest to the DMS, the AutoQC further assesses data quality and subsequent DMS-level screening checks are performed, resulting in revised QC/OP codes for each individual data point in real time. The QC codes categorize data as valid, suspect/questionable, or invalid, and the OP codes provide additional context relevant to the assigned data flag. Unique AutoQC logic trees are developed for each piece of instrumentation and equipment by air quality scientists with input from instrument manufacturers where needed. Level 1 data are displayed on the public website within 10 minutes of collection by the analyzer.

Level 2. Daily review by Data Analysts allows system operations assessment and ensures that automated data flagging is correct. Data Analysts may adjust the QC/OP codes to reflect recent operational issues and have the ability to adjust data values if an independent validation of the raw data requires this action. Any and all changes to QC/OP codes or data values are made according to processes outlined in the SOPs and QAPP, recorded by the DMS via the chain-of-custody logs, and immediately reflected on the public website.

Level 3. Extended analyses are performed by Data Analysts every calendar quarter to verify and validate data as described in Attachment 7. As with Level 1 data, any and all changes to QC/OP codes or data values are recorded by the DMS via the chain-of-custody logs and are made according to processes outlined in the SOPs and QAPP.

Level 4. The final stage of QC is an independent review of data by the QA Analyst to confirm that analysis activities have been conducted according to the QAPP. Final data sets are prepared for submission to the regulatory agency and in support of quarterly reporting activities.

QC/OP Codes

Data flags within the Insight DMS are composed of QC/OP codes.

Table 14. QC/OP codes assigned in the Sonoma Technology Insight DMS.

QC/OP Codes	
QC Codes	
0	Valid
5	Suspect/Questionable
7	Insufficient Data
8	Missing
9	Invalid
OP Codes	
0	Valid
5	Suspect
7	Insufficient Data
9	Invalid
17	Below MDL
28	Planned Instrument Maintenance
29	Unplanned Instrument Maintenance
70	Instrument Malfunction
72	Marginal Operating Conditions (Good Spectral Match)
73	Low-Visibility Conditions
74	Poor Spectral Match
76	Marginal Operating Conditions (Poor Spectral Match)
100	Manual Data Review
101	Range Check
102	Rate-of-Change Check
103	Sticking Check
108	Real-Time MDL Outside of Required Range

QC codes are defined as follows:

- **Valid (QC=0).** Data that meet all defined thresholds for acceptance are considered valid and flagged with this QC code.

- **Suspect/Questionable (QC=5).** Data which meet the defined thresholds for acceptance but indicate marginal operating conditions based on secondary review criteria are flagged with this QC code. For example, elevated integration time reported by the UV-DOAS analyzer that coincides with elevated signal strength may indicate that the data require additional review but are likely accurate. Other causes of suspect/questionable data include concentrations out of a specified range, concentrations exceeding a defined rate-of-change, or stuck data values.
- **Insufficient Data (QC=7).** If insufficient data to generate an hourly average are received by the DMS, rolling hourly data is flagged with this QC code.
- **Missing (QC=8).** The DMS does not contain records for missing data that was not received by the DAS, but null records are created manually during the quarterly reporting process and included in final data sets.
- **Invalid (QC=9).** Data that do not meet defined thresholds for acceptance are flagged with this QC code in the DMS. Causes of invalid data include low visibility conditions, maintenance and calibration, open-path analyzer misalignment, and instrument malfunction. Data are only invalidated if acceptance criteria are not met or if a clear cause is identified that warrants invalidation. If data are anomalous but no clear cause is identified, data are flagged as suspect/questionable.

OP codes are defined as follows:

- **Valid (OP=0).** Data that meet all defined thresholds for acceptance are considered valid and flagged with this OP code.
- **Suspect/Questionable (OP=5).** This OP code is used as a fallback condition for aggregated hourly data to indicate data which meet the defined thresholds for acceptance but indicate marginal operating conditions based on secondary review criteria.
- **Insufficient Data (OP=7).** If insufficient data to generate an hourly average are received by the DMS, rolling hourly data is flagged with this OP code.
- **Missing (OP=8).** The DMS does not contain records for missing data that was not received by the DAS, but null records are created manually during the quarterly reporting process and included in final data sets.
- **Invalid (OP=9).** This OP code is used as a fallback condition for aggregated hourly data to indicate data that do not meet defined thresholds for acceptance.
- **Below MDL (OP=17).** Data that meet the spectral match criteria but are associated with concentrations below the defined MDL are flagged with this OP code. Concentration values with this OP code are shown as reported and included in statistical analysis.
- **Planned Instrument Maintenance (OP=28).** Data that are not representative of ambient conditions because planned maintenance is being performed on the system are flagged with this OP code.

- **Unplanned Instrument Maintenance (OP=29).** Data that are not representative of ambient conditions because unplanned maintenance is being performed on the system are flagged with this OP code.
- **Instrument Malfunction (OP=70).** Invalid data that are not coincident with low-visibility conditions are flagged with this OP code.
- **Marginal Operating Conditions; Good Spectral Match (OP=72).** This OP code is assigned to data that meet the spectral match criteria but have been flagged with a QC code of 5. Concentration values with this OP code are shown as reported and are included in statistical analysis.
- **Low-Visibility Conditions (OP=73).** Invalid data that are coincident with low-visibility conditions are flagged with this OP code.
- **Poor Spectral Match (OP=74).** This OP code is assigned to valid data that do not meet the spectral match criteria. These data are considered non-detections because the concentration of the target compound was so low that the analyzer does not determine it was present. In this scenario, the numerical output of the analyzer usually represents instrument noise but can occasionally range in magnitude depending on the result of the analytical fitting routine to the reference spectra. To reflect the status as a non-detection, data with poor spectral matches are adjusted to 0 ppb and are subsequently shown on the public website.
- **Marginal Operating Conditions; Poor Spectral Match (OP=76).** This OP code is assigned to data flagged with a QC code of 5 that also do not meet the spectral match criteria. These data are considered non-detections because the concentration of the target compound was so low that the analyzer did not determine it was present. In this scenario, the numerical output of the analyzer usually represents instrument noise but can occasionally range in magnitude depending on the result of the analytical fitting routine to the reference spectra. To reflect the status as a non-detection, data with poor spectral matches are adjusted to 0 ppb.
- **Manual Data Review (OP=100).** This OP code is used as a fallback condition to indicate data that have undergone additional manual review and are not readily categorized by the AutoQC logic. If this OP code is used, an accompanying explanation is provided in the quarterly report explaining why.
- **Range Check (OP=101).** This OP code is assigned when data are flagged by the associated DMS-level screening check for additional review.
- **Rate-of-Change Check (OP=102).** This OP code is assigned when data are flagged by the associated DMS-level screening check for additional review.
- **Sticking Check (OP=103).** This OP code is assigned when data are flagged by the associated DMS-level screening check for additional review.
- **Real-Time MDL Outside of Required Range (OP=108).** TDLAS data with real-time MDL values outside of the required range are flagged with this OP code.

Automated DMS-Level Screening Checks

For open-path analyzers, the DAS determines if each raw data point should be included in the 5-min average based on whether real-time instrument diagnostics are above the defined thresholds shown in Table 4 (Section A.7), which include signal return and spectral fit metrics. For analyzers with raw data resolutions on the order of 2–4 minutes (e.g., FTIR), the DAS requires that one measurement with diagnostic parameters above the defined thresholds must be collected for the 5-min average data point to be generated. For open-path analyzers with raw data resolutions on the order of 30 seconds (e.g., UV-DOAS), the DAS requires that six measurements with diagnostic parameters above the defined thresholds be collected for the 5-min average data point to be generated. TDLAS analyzers with raw data resolutions on the order of 8 seconds do not have a completeness requirement for the 5-min average data point to be generated. The number of data points used to calculate the 5-min average data point are reported in the final quarterly data sets.

In addition to the AutoQC logic conducted upon ingest to the DMS, Table 15 summarizes DMS-level data screening checks, which help focus data review efforts on potentially anomalous data or where confirmation is otherwise needed that data values correctly reflect ambient conditions. These checks are based on expected instrument performance, and expected concentrations of target compounds relative to ambient background. The DMS auto-screening checks include:

- Range: This check flags data outside of a specified range when 5-min concentration values are greater than the defined threshold. With the exception of negative outliers, which are invalidated, this check does not alter the QC code and results in an OP code of 101.
- Rate-of-Change: Rapid changes between individual 5-min values are flagged for additional review as they may be anomalous. This check does not alter the QC code and results in an OP code of 102.
- Sticking: Stuck values are flagged for additional review as they may be indicative of an issue with the instrument and may not represent ambient data. Sticking checks are not applied to data that are below the instrument detection limit (i.e., concentration values of 0). This check does not alter the QC code and results in an OP code of 103.

QC/OP codes are assigned through a combination of AutoQC and DMS-level screening checks, and result in Level 1 data.

Table 15. DMS-level screening checks for 5-min data.

Compound	Range (ppb)	Rate-of-Change (ppb)	Sticking
Benzene	5	3	Four or more stuck values
Toluene	70	35	
Ethylbenzene	320	160	

Compound	Range (ppb)	Rate-of-Change (ppb)	Sticking
Xylenes	200	100	
SO_2	50	25	
H_2S	25	15	
Methane	1,520[a]	500	
Alkanes	1,000	5,000	

[a] Methane data is flagged when below this threshold because it is considered out of range of the expected global background.

Daily Data Checks

Following AutoQC and DMS-level screening checks, Data Analysts review the Level 1 data from the fenceline monitoring network on an at least a daily basis to identify operational issues and maximize system uptime, typically with a one- to two-day running time series plot of select parameters on an internal field operations website. The Data Analyst assesses the current operational status of the monitoring network and whether concentration patterns are reasonable with respect to the time of day, season, current meteorological conditions, facility operations, and concentration levels measured at other sites. Data are also reviewed on the public website to confirm that data flow and visualizations are current, and to additionally identify any anomalous behavior. Findings are documented after each check and made available to the Project Management, Field Staff, Data Analysts performing quarterly analysis, and the QA Manager.

Examples of observations requiring additional review include low signal strength or high integration time; spikes or dips in diagnostic parameters or reported concentrations; stuck or missing data; negative concentrations; and concentrations that are outside of a specified range based on nearby measurements or known atmospheric chemistry. Data are only invalidated if they do not meet defined acceptance criteria (see Section A.7) or a clear and verifiable cause has been identified and documented. This documentation is part of the daily data check logs and will be retained for a period of 5 years in accordance with Section 502 of Rule 12-15. Common reasons for invalidation include instrument malfunction, power failure, and bump test data that were incorrectly flagged.

Data flagged as suspect or invalid by AutoQC and DMS-level screening checks may also be validated during daily data checks if appropriate, meaning that temporary data flags are typically resolved within one to two business days. Following the daily data check, data are considered Level 2.

Unusual Observations

If unusual data are observed during daily data checks, the Data Analyst investigates whether an instrument malfunction occurred or if the anomalous data are explainable and therefore correct. Any

need for corrective action is communicated to the Project Manager and Field Staff for further coordination. Technical staff may remotely access analyzers in the field to perform basic troubleshooting, and site visits are conducted as required.

When elevated concentrations (i.e., concentrations greater than routine background observations) are reported by open-path analyzers, a visual review of individual absorption spectra is performed using data processing software provided by the instrument manufacturer. Additional information regarding spectral validation of open-path data is provided in the SOPs attached to this document (Attachments 1–3). If this additional review proves data to be invalid, they are flagged accordingly and may be removed from the public display. The rationale for data invalidation is maintained in the chain-of-custody logs, and corrective action is overseen by the Field Staff Manager usually within one to two business days. If extended instrument downtime is necessary to address a data quality issue, BAAQMD personnel will be notified in accordance with Regulation 1-530.

On-Call Response

Similar review processes are completed outside of business hours by after-hours support staff in the event of missing data alerts or an exceedance of defined concentration thresholds. This helps to maximize system uptime and ensure the accuracy of data reported to the public website in real time.

Quarterly Review and Reporting

Data undergo an extended analysis every 90 days in alignment with quarterly reporting requirements, after which they are considered Level 3. Where possible, quarterly analysis is conducted by the same analysts who have been completing daily data checks to ensure consistency and familiarity with the monitoring network. Any and all changes to QC/OP codes or data values are recorded by the DMS via the chain-of-custody logs, and are made according to processes outlined in the SOPs and QAPP.

Analysts verify that SOPs were followed and QC activities were performed according to the QAPP. Examples of quarterly data verification may include:

- Review of daily data check documentation and routine instrument maintenance records to ensure consistency
- Confirmation that routine maintenance, calibrations, and bump and span tests were conducted according to schedule
- Review of instrument logbooks to assess whether data flagged as invalid or suspect/questionable are explainable based on recorded observations
- Review of site operator logbooks to assess whether observations by Field Technicians require additional examination of data

- Review of changes to data QC/OP codes or data values, and confirmation that they were appropriately recorded

Data Validation

Analysts validate data by exporting quarterly data sets from the DMS and analyzing them with a robust QC analysis code. Analysis code is maintained through an internal code repository, reviewed regularly, updated as requirements evolve, and shared with all analysts. The primary goal of quarterly data validation is to ensure reported values meet the quality objectives of the project and the acceptance criteria outlined in the QAPP were achieved. Quarterly data validation typically includes:

- Generation of monthly and quarterly summaries of data statistics (including concentration minimums, maximums, averages, and standard deviations)
- Identification and review of statistical outliers; negative outliers are defined as concentration values below –3 * MDL, and positive outliers are usually identified with DMS-level screening checks (range)
- Inspection of measurements before and after unusual data, missing data, instrument bump tests, and maintenance activities
- Review of data flagged as suspect/questionable, and flag adjustment to valid or invalid status, as appropriate
- Confirmation bump and span test results are within acceptance criteria detailed in the QAPP
- Comparison of data to remote background concentrations and average urban concentrations, including assessment of data consistency over longer time periods; as described in Section B.9, this comparison will not serve as an independent benchmark for data validation or invalidation and will only be used as secondary references to gauge overall reasonableness of data
- Verification that data are realistically achievable and not beyond the limits of what can be measured by the instrument
- Review of data completeness as detailed in Section A.7

Independent Review

An independent review of post-QC quarterly data sets ensures that data are reasonable and analysis activities were conducted according to the QAPP. This independent review is conducted on a representative sub-set of data using similar methods to those described for quarterly analysis by the QA Manager or another data analyst. Daily data check documentation and routine instrument maintenance records are also reviewed to ensure that the appropriate QC checks were applied. After this review, data are considered Level 4 (final).

Final data sets are prepared as a part of quarterly data review and reporting and are submitted to BAAQMD as discussed in Section C.2.

Public Website Display

Invalid Data (QC=9) are not representative of ambient conditions and are therefore omitted from the public website display. As noted above, causes of invalid data include low visibility conditions, maintenance and calibration, open-path analyzer misalignment, and instrument malfunction. On the time series plot and associated "tooltip" detail pane, no concentration value is shown and data are labeled "Invalid." The map marker behavior is similar, but provides an extended message with additional information, such as the identification of maintenance periods, instrument malfunctions, or low-visibility conditions. Concentration values and diagnostic information for invalid data are retained within the DMS and included in final data deliveries to the regulatory agency.

Missing Data (QC=8) are not displayed on the website. Tooltip detail panes on the time series and map markers indicate where data are missing for each 5-min record. Null record indicators are created for these periods as a part of quarterly analysis, and are included in final data deliveries to the regulatory agency.

Insufficient Data (QC=7) only applies to the rolling hourly average concentrations, and the public website display behavior is the same as described for missing data.

Suspect/Questionable Data (QC=5) and **Valid Data (QC=0)** are displayed on the time series and map marker visualizations. Because suspect/questionable data do not coincide with failed acceptance criteria and merely indicate marginal operating conditions or the need for further manual review, concentration values are included in completeness calculations and statistical analyses. The suspect/questionable QC/OP code(s) may rarely remain following quarterly validation if they are unresolvable, but these data are considered valid despite unresolved questions. As such, they are also displayed on the public website.

Open-path data with a poor spectral match are considered **non-detections** because the concentration of the target compound is so low that the analyzer does not determine it was present. In this scenario, the numerical output of the analyzer usually represents instrument noise, but can occasionally range in magnitude depending on the result of the analytical fitting routine to the reference spectra. To reflect the status as a non-detection, data with poor spectral matches are adjusted to "0 ppb" and subsequently shown on the public website. Tooltip detail panes on the time series and map markers show "<MDL" or "BD" (below detection) for non-detections. Unadjusted concentration values for these non-detections are retained by the DMS.

Open-path data with a spectral match greater than the acceptance criteria (Table 4 in Section A.7) are considered **detections**, and the concentrations are displayed on the public website time series plots as recorded. If the recorded concentration is less than the defined instrument MDL, the tooltip detail panes on the time series and map markers show "<MDL" or "BD." If the recorded concentrations are

greater than the defined instrument MDL, the tooltip detail panes on the time series and map markers show the recorded concentration.

Concentration data are always reported on the public website as recorded, unless the spectral match criteria are not met or the data are invalid or missing. A summary of public website display behavior according to QC/OP codes is shown in Table 16. Additional information regarding data display on the public website is included in the SOP for Data Verification and Validation (Attachment 7).

Table 16. Summary of public website display behavior according to QC/OP codes.

QC Code	OP Code	Concentration	Flag
0	74	0	Below Detection (BD or <MDL)
	17	As Recorded	Below Detection (BD or <MDL)
	0, 100, 101, 102, 108	As Recorded	Valid
5	76	0	Below Detection (BD or <MDL)
	17	As Recorded	Below Detection (BD or <MDL)
	0, 5, 72, 100, 101, 102, 103, 108	As Recorded	Suspect (Questionable)
7	7	None	Missing
8	8	None	Missing
9	28, 29, 70, 73	None	Invalid

D.3 Reconciliation with User Requirements

As discussed in Section C.2, the public website constitutes the primary, real-time reporting effort of preliminary data to the general public. Changes to data concentrations or data flags affect how data are displayed on the website, and are immediately propagated to the public website. In this manner, the refinery routinely provides the public with information regarding concentrations of target compounds at the fenceline of refining facilities, consistent with Rule 12-15 requirements.

Key components of the public website intended to meet user requirements of BAAQMD Rule 12-15 include visual display of data in real time, context for the public to better understand the concentrations displayed, and a mechanism for feedback. The website also includes a functionality to notify the public with custom messaging about instrument maintenance activities, potential issues with the monitoring network, or any other relevant information affecting the use of data.

E. Standard Operating Procedures

Instrument-specific SOPs for the systems listed below and an SOP for Data Verification and Validation are provided as attachments to this document.

- **Attachment 1**: Standard Operating Procedures for UV-DOAS
- **Attachment 2**: Standard Operating Procedures for TDLAS
- **Attachment 3**: Standard Operating Procedures for FTIR
- **Attachment 4**: Standard Operating Procedures for Visibility Sensor
- **Attachment 5**: Standard Operating Procedures for AutoGC
- **Attachment 6**: Standard Operating Procedures for H_2S Point Monitors
- **Attachment 7**: Standard Operating Procedure for Data Verification and Validation