APPENDIX E.
STATEWIDE AIR MONITORING PLAN

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I. INTRODUCTION

Community air monitoring plays an important role in supporting effective action to reduce emissions and exposure within impacted communities. Assembly Bill (AB) 617[1] requires the California Air Resources Board (CARB) to prepare a statewide monitoring plan by October 1, 2018 that must evaluate the availability and effectiveness of air monitoring technologies and existing community air monitoring systems.[2] As air monitoring technologies and systems will continue to evolve and advance, this evaluation will be housed in the community air monitoring toolbox within the online Resource Center.[3]

The CARB Governing Board must also annually consider the selection of communities for the deployment of community air monitoring, as deemed appropriate. Once CARB has selected communities, air districts, working with the community, must deploy community air monitoring within 12 months following selection. However, for the first set of communities selected for community air monitoring under the Community Air Protect Program (Program), monitoring must begin by July 1, 2019. This new community air monitoring will augment other community-led and government-led air monitoring programs and enhance community-level coverage throughout the State.

With the advent of low-cost air quality sensors, community members are themselves taking more and more responsibility for measuring the air quality where they live, including community groups operating sophisticated air quality systems. Many of the initial community assistance grants[4] CARB awarded in the first year were for projects that include robust community-operated air quality sensor systems. CARB will work with community groups and air districts to incorporate the elements and guidance in this appendix into the design and operation of the community-operated systems so that the data from those systems can effectively support community needs.

The goal of air monitoring is to enhance our understanding of pollution impacts within communities, and support effective implementation of emissions reduction programs. A variety of air monitoring approaches may be utilized for community air monitoring, and the objectives, tools, and stakeholders involved may differ from community to community.

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[1] Assembly Bill 617, Garcia, C., Chapter 136, Statutes of 2017, modified the California Health and Safety Code, amending § 40920.6, § 42400, and § 42402, and adding § 39607.1, § 40920.8, § 42411, § 42705.5, and § 44391.2. See Appendix H for complete bill language.
[2] California Health and Safety Code § 42705.5(b).
[3] Appendix F provides more detail on CARB's online Resource Center, which includes monitoring information, along with CARB points of contact and links to air district webpages and other resources to improve Program implementation.
[4] California Air Resources Board, *2017-2018 Grant Guidelines, California Assembly Bill 617: Community Air Grants Program*, February 26, 2018, available at: https://ww2.arb.ca.gov/our-work/programs/Community-Air-Protection-Program.

For example, air districts may require fence-line monitoring[5] (i.e., air monitoring at or adjacent to a known stationary source) to determine where and when emissions are occurring, at what rate emissions are leaving the source, and what chemicals are released when fugitive emissions are present. Other air monitoring objectives include using more granular, local-scale monitoring methods to communicate air quality conditions within a community, identify contributing sources, and support the development of mitigation strategies. Air monitoring can also be utilized as a method to track progress on the community emissions reduction programs. Community air monitoring may not necessarily require U.S. Environmental Protection Agency (U.S. EPA)-designated methods and equipment, which provides the opportunity to utilize advanced air monitoring methods and big data solutions capable of providing greater spatial coverage and faster access to the resulting air quality data as they become available.

This appendix identifies and describes criteria for air districts and communities that are planning to conduct community air monitoring under the Program. Community organizations, air districts, and CARB have conducted successful community air monitoring programs that provide valuable best practices and learnings to jumpstart implementation of the Program. CARB staff have defined 14 elements to include in community-specific air monitoring plans that build from these existing programs. The 14 elements are flexible enough to apply to a variety of monitoring needs, yet rigorous enough to ensure that the data collected will support actions to reduce emissions and exposure within communities with high cumulative exposure burdens.

Planning elements fall into three key areas: (1) determine the reason for conducting community air monitoring; (2) describe how the community air monitoring will be conducted; and (3) identify how the data will support action to reduce air pollution within the community. These elements include specific criteria and best practices for: conducting community air monitoring; supporting collaborative partnerships between communities, air districts, and CARB in conducting air monitoring; and making the data accurate, accessible, transparent, and understandable. CARB has also created checklists to clarify the criteria required for community air monitoring plans (see the "Checklist for Community Air Monitoring Evaluation" section and Table E-2 in this appendix).

A number of activities are essential to support the successful implementation of community air monitoring. In addition to the criteria and evaluation checklists, community groups and air districts can access air monitoring guidance in CARB's community air monitoring toolbox housed within the online Resource Center. The goal of the community air monitoring toolbox is to:

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[5] California Health and Safety Code § 42705.5(c).

- Support the process of fostering collaborative relationships for community air monitoring.

- Streamline data collection, display, and interpretation.

- Support the advancement and utility of air monitoring methods.

CARB's community air monitoring toolbox serves as a repository of community air monitoring information and guidance to be used by community members, air districts, health scientists, land use and transportation planners, and the public. This includes:

- Reviews of advanced sensing monitoring technologies.[6]

- Reviews of existing community air monitoring systems.[7]

- Supporting material for the development of community air monitoring plans.

- Resources for community scientists.

The air monitoring technology review will cover techniques ranging from deploying dense systems of small air sensors, to using approved criteria air pollutant or air toxics methods, to utilizing advanced remote sensing systems with a focus on characterizing performance and identifying appropriate applications for each method. CARB staff will conduct laboratory and field-based air sensor evaluations alongside partner programs at the South Coast Air Quality Management District (which operates the Air Quality Sensor Performance Evaluation Center program[8]), the U.S. EPA, and others who have experience conducting sensor evaluations. Information from these evaluations will be provided to assist communities and others in selecting methods they can trust to produce the type and quality of data required to meet their needs. Best practices gleaned from existing air monitoring systems will be compiled and documented to inform future air monitoring activities.

The community air monitoring toolbox will be periodically updated and expanded as new air monitoring information becomes available. Additional details on what information is provided in the community air monitoring toolbox and the online Resource Center can be found in Appendix F.

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[6] California Health and Safety Code § 42705.5(a)(1).
[7] California Health and Safety Code § 42705.5(b).
[8] More information on the South Coast Air Quality Management District, Air Quality Sensor Performance Evaluation Center (AQ-SPEC) program is available at: http://www.aqmd.gov/aq-spec.

II. COMMUNITY AIR MONITORING PLAN ELEMENTS AND REQUIRED CRITERIA

CARB staff have defined criteria that air districts, communities, and others need to include in community-specific air monitoring plans developed under the Program. The elements are based on sound scientific principles and successful practices that build from knowledge gained through existing community air monitoring programs and accommodate the diversity of air monitoring objectives from community to community.

Community air monitoring may be employed to meet a number of objectives, from communicating current air quality conditions, to identifying the contribution of emission sources to community exposure, to evaluating air quality concerns within a community, to supporting public health research, or tracking progress for a community emissions reduction program. Air districts will report community air monitoring data to CARB and CARB will publish these data online.[9] Following the 14 elements helps CARB and the public understand the nature of the data generated and how it can be used. This will ensure that monitoring has been designed at a level of scientific rigor and the necessary duration of the monitoring has been defined to meet air quality goals and support actions for each community. CARB will review air district community air monitoring plans using the evaluation checklists to verify that criteria for each of the 14 elements are met prior to making the data available on the statewide data portal.

Although the 14 community air monitoring elements are presented sequentially (Figure E-1), air monitoring planning is often an iterative process that can occur in phases. An example of this is air monitoring that begins with an initial screening of the community to identify the most appropriate placement of more robust instrumentation. Establishing community partnerships at the onset of plan development is the first step to foster strong community participation throughout plan development and lay the groundwork for ongoing involvement during implementation. Working with community members is essential to develop an action-focused air monitoring objective specific to the community. Other elements may be addressed outside of the suggested sequence presented in this appendix, depending on the information and resources available and the specific concerns within a community. Broadly speaking, the 14 elements are used to define the scope of work and understand:

- What is the reason for conducting community air monitoring? (Elements 1-5)
- How will monitoring be conducted? (Elements 6-11)
- How will data be used to take action? (Elements 12-14)

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[9] California Health and Safety Code § 42705.5(e).

Figure E-1   Community Air Monitoring Plan Elements

WHAT IS THE REASON FOR CONDUCTING COMMUNITY AIR MONITORING?

1. Form community partnerships.
2. State the community-specific purpose for air monitoring.
3. Identify scope of actions.
4. Define air monitoring objectives.
5. Establish roles and responsibilities.

HOW WILL MONITORING BE CONDUCTED?

6. Define data quality objectives.
7. Select monitoring methods and equipment.
8. Determine monitoring areas.
9. Develop quality control procedures.
10. Describe data management.
11. Provide work plan for conducting field measurements.

HOW WILL DATA BE USED TO TAKE ACTION?

12. Specify process for evaluating effectiveness.
13. Analyze and interpret data.
14. Communicate results to support action.

There may be instances where specific criteria are not applicable to an air monitoring plan, and the level of detail contained in each element may differ from community to community.[10] If criteria are not applicable, plans should indicate why the criteria are not relevant to the specific community air monitoring.

Air monitoring plans may undergo revisions and be resubmitted for review if air monitoring will occur in phases (e.g., screening for problems and then focusing in on problem areas or sources) or if new information becomes available as long as the community air monitoring planning process is followed. This allows air monitoring plans to accommodate changes and adapt as new information becomes available.

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[10] CARB acknowledges that there may be cases where a community air monitoring plan fails to meet all procedural requirements but is still being developed in the spirit of these requirements. CARB will evaluate the extent to which deviations from these requirements are acceptable on a case-by-case basis and will communicate findings in writing.

Each element is discussed in more detail below. For the full list of criteria to be met within each element, refer to the "Checklist for Community Air Monitoring Evaluation" section and Table E-2 of this appendix.

WHAT IS THE REASON FOR CONDUCTING COMMUNITY AIR MONITORING?

Following community selection, the first step to developing an air monitoring plan is to form community partnerships through a community steering committee. Community members have detailed knowledge and awareness of community issues based on their experience of living and working in the community. Leveraging this knowledge and that of the air district to define community-specific air monitoring needs will form the foundation of the entire air monitoring process. Example needs could include: providing real-time air quality data to support notification systems and school flag programs; quantifying pollutants that are burdening the community; identifying sources of air pollution impacting the community; and evaluating pollution trends in the community prior to and after implementation of community emissions reduction programs. The air monitoring needs should be described in enough depth so the community steering committee can develop air monitoring objectives that yield data that can be used to establish air pollution levels within the community and support actions that reduce emissions or exposure. This should also include defining the appropriate duration for the air monitoring. Defining roles and responsibilities as part of the community partnership process will ensure expectations are understood and clarified as needed prior to beginning air monitoring. For example, in some communities residents may take an active role in leading or conducting air monitoring while in other communities residents may be involved in selecting monitoring locations with air monitoring conducted by air district staff. In total, working through these first five elements will help the air district, with input from the community steering committee, determine which air monitoring approaches are most appropriate.

FORM COMMUNITY PARTNERSHIPS

Community members have first-hand knowledge that is vital in understanding and addressing local air quality challenges in their community. A collaborative partnership with the community throughout the air monitoring planning, development, and implementation process is essential to support effective community-focused monitoring. To facilitate this community-driven process, air districts must work with selected communities to convene a community steering committee. The community steering committee will have a fundamental role in designing and carrying out air monitoring goals and objectives, disseminating results to the community, and supporting effective local actions. More specific details related to participation in the community steering committee and committee meetings (e.g., public process, membership criteria, roles, responsibilities) are included in Appendix C.

Air districts must document relevant information on the community steering committee in the air monitoring plan. This includes:

- Proposed workshops.

- Community outreach frequency and materials.

- Contact information for a dedicated air monitoring contact person.

- A link to a webpage developed to inform the public on the community air monitoring initiative.

Development of community air monitoring plans will be a collaborative process with the community steering committee. The purpose of preparing an air monitoring plan with the community steering committee is to bring all parties to a common understanding of what air monitoring will achieve, potential limitations, what tools will be utilized to collect, review, and interpret data, and how data will be used. Some communities may participate only in the planning process, whereas some may play a leading role throughout implementation, for example, by securing sites for air monitoring, conducting measurements, or analyzing data. Community participation is important throughout the planning process to increase participants' technical capacity. The approach for community involvement should be documented to verify that the community has and will continue to contribute to decision-making processes. Community engagement will also be a crucial component during the development of CARB's community air monitoring data portal. Community steering committees will provide essential recommendations to help determine data display and interpretation needs for each unique community.

STATE THE COMMUNITY-SPECIFIC PURPOSE FOR AIR MONITORING

The plan must clearly define the purpose for air monitoring. This may include background information on the community, pollutants of concern, known or expected locations of pollution, and potential sources.

If relevant air monitoring is currently being conducted, the planning team should also identify how the proposed community air monitoring will build from current air monitoring. Alternative approaches to investigating and addressing the air monitoring need(s) should be evaluated. Results from ancillary studies that may not directly include air monitoring (e.g., truck counts) should be discussed in the plan if they have informed the identification of the concern that will be addressed by air monitoring.

The systematic development of the community-specific air monitoring plan should not delay action that can quickly deliver emissions and exposure reductions. CARB encourages immediate implementation of any feasible activities identified in parallel with development of the plan.

IDENTIFY SCOPE OF ACTIONS

The plan must identify the desired scope of actions that may potentially be supported by air monitoring data, such as whether data will be collected to support real-time air quality notification systems; to identify areas that may be more heavily burdened by air pollution; or tracking the progress of community emissions reduction programs, including the potential need for additional emissions mitigation strategies. Identifying the desired action(s) that air monitoring data are intended to support will guide the process of defining the level of data quality needed and further set the context and focus for planning activities that follow.

DEFINE AIR MONITORING OBJECTIVES

The plan must describe the community's air monitoring objectives, discuss how meeting these objectives will address the monitoring need(s), and establish benchmarks for determining when air monitoring objectives have been met. These benchmarks will inform resource allocation in the "Specify Process for Evaluating Effectiveness" element. Per the requirements of AB 617, community air monitoring objectives should be designed to support action(s) that reduce emissions or exposure within a community.[11] While it is possible that air monitoring data may be used to address more than one objective, prioritizing objectives will help to ensure that air monitoring can be directed to address the most important objective.

Objectives that community air monitoring might be designed to address include:

- Identifying and characterizing areas experiencing disproportionate air pollution impacts.

- Identifying emissions sources and assessing their impact on air quality, including fence-line monitoring.

- Determining effectiveness of emission controls in reducing air pollution and assessing progress in improving community air quality.

- Providing real-time air quality information to inform community members of current conditions within the community.

Along with the air monitoring objective(s), the plan should include other relevant information such as background concentrations of the pollutant of interest, specific time periods of interest, threshold levels of concern, and known sources. Supporting measurements needed to address the objective, which may include meteorological data or measurements of pollutants other than criteria air pollutants or toxic air contaminants, should be defined in this step. The plan should include or reference existing information

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[11] California Health and Safety Code § 42705(c).

and materials such as maps, diagrams, tables, and previous studies that can augment community air monitoring. If existing community air monitoring data are available, the plan should document the scope of the monitoring and explain how additional monitoring will expand or complement these existing programs. Example objectives and associated information inputs necessary to inform objectives can be found in the community air monitoring toolbox in the online Resource Center.

ESTABLISH ROLES AND RESPONSIBILITIES

All parties responsible for major aspects of community air monitoring need to be identified in the plan and their roles and responsibilities be described. Air monitoring teams are typically composed of a project manager, technical staff, and stakeholders that are directly affected by air monitoring. Community members may also lead some community air monitoring or be direct participants and partners in air monitoring. An organizational chart can be provided to clarify group roles and interactions, and specific tasks, duties, and training that each party involved with air monitoring are expected to complete as a function of their role should be documented. Contact information for key members should be made available on the air district's designated community air monitoring webpage.

HOW WILL MONITORING BE CONDUCTED?

Documenting how air monitoring will be conducted is the next step in the planning process. Defining the quality of data that is needed for the proposed actions supports the selection of methods and equipment that are capable of producing data of appropriate quality. For example, more rigorous methods are required to support a regulatory action compared to an air quality awareness program. Identifying areas where monitoring is needed may also be important to selecting appropriate methods and equipment. For example, mobile monitoring may be effective at covering a broad area and determining where fixed sites should be established to observe trends. Once the methods and equipment are selected, defining quality control procedures and data management steps help ensure the resulting data is useful to inform the stated community-specific purpose for air monitoring and all parties can understand how the data was generated. After making these decisions, documenting the work plan provides clarity on how the field measurements will be made.

DEFINE DATA QUALITY OBJECTIVES

Plans must describe the level of data quality that will be required to support community air monitoring objectives, and list the data quality indicators that will be used to assure data quality objectives are met. Identifying data quality objectives early in the planning process will inform subsequent choices of methods and equipment capable of collecting data that meets community needs. Table E-1 lists the recommended data quality indicators that should be defined in community air monitoring plans, where appropriate.

Examples of air monitoring measurement methods and equipment and how each may meet specific data quality objectives are available in the community air monitoring toolbox in the online Resource Center.

Table E-1   Data Quality Indicators for Air Monitoring

DATA QUALITY INDICATORS	DEFINITION
Precision	The measure of agreement among repeated measurements of the same property under identical or similar conditions.
Bias	The systematic or persistent distortion of a measurement process which causes error in one direction.
Accuracy	A measure of the overall agreement of a measurement to a known value.
Sensitivity	The smallest absolute amount of change that can be detected by an instrument or method.
Completeness	A measure of the amount of valid data needed from a measurement system.
Representativeness	A qualitative term that expresses the degree to which data accurately and precisely represent the condition that is being measured in order to meet a specific monitoring objective.

SELECT MONITORING METHODS AND EQUIPMENT

Selecting appropriate methods and equipment is crucial to the success of community air monitoring because the resulting data needs to support effective action. Air monitoring methods include not only the air monitoring equipment used but also how it is operated and applied, whereas equipment solely describes the specific technology used for air monitoring. Methods and equipment must be capable of meeting the data quality objectives defined in the "Define Data Quality Objectives" section of this appendix.

There are a wide variety of methods and equipment. The plan must identify the selected method(s) and include a full description of the equipment that will be used (e.g., make, model, characteristics) and how it will be applied. The plan should justify the suitability of the method and equipment to meet the level of action required and include a description of how the selected method will achieve the data quality objectives. Limitations of selected air monitoring methods and equipment should be made clear to stakeholders and documented in the plan. Other method requirements or needs considered in the selection process should also be documented (e.g., maintenance requirements, operating costs, specific features). The plan should

also identify and describe any additional equipment needed to meet air monitoring objectives, such as meteorological monitoring equipment.

Information regarding applicability, performance, and example uses of air monitoring methods and equipment will be available in the community air monitoring toolbox section of the online Resource Center.

DETERMINE MONITORING AREAS

The plan should indicate where monitoring will be conducted within the community, describe the rationale for selecting specific locations, and document each site's purpose and characteristics. The process for identifying specific monitoring areas that will achieve the monitoring objective should be based on factors such as: public input from community members, review of existing air monitoring data, locations of source emissions, locations of sensitive populations, and results from air quality modeling. Selecting carefully designed locations with known characteristics will assist analysts in understanding what the data represents and how it can be used to support actions to reduce emissions and exposure in communities with high cumulative exposure burdens. The exact monitoring location will be a balance of a number of factors, often depending on the logistics of the specific area chosen for monitoring, such as site access, communications systems, security, and power availability.

It may be necessary to select alternative locations when determining specific monitoring areas due to factors such as site availability, site safety, source activity, etc. The reasons for selecting alternative locations should be documented in this element of the plan. Air districts should identify all areas where community air monitoring is taking place in support of the Program on their designated community air monitoring webpage.

DEVELOP QUALITY CONTROL PROCEDURES

Quality control is a set of routine procedures implemented during air monitoring to ensure that data quality objectives are being met and the resulting data will be scientifically defensible. These technical activities should be routinely performed to measure or estimate the effect of any errors and determine when corrective action should be taken.

The community air monitoring plan must specify the quality control procedures and the frequency at which they will be performed for each monitoring method. Examples of quality control procedures include describing field and laboratory calibration practices, periodic precision and accuracy checks, and routine audit functions. Specific quality control procedures will depend upon the method used for air monitoring. Examples of quality control procedures for different air monitoring methods are available in the community air monitoring toolbox in the online Resource Center.

DESCRIBE DATA MANAGEMENT

The plan must describe how data will be collected, managed, and stored. This is often done by providing data descriptors, data storage attributes, and data review and flagging procedures. The first phase of data management (Figure E-2) begins with the collection of analytical results. Besides capturing the value of interest, it is essential to capture additional descriptors, including instrument identifiers, date stamps, measured units, and other parameters that identify important attributes of the data.
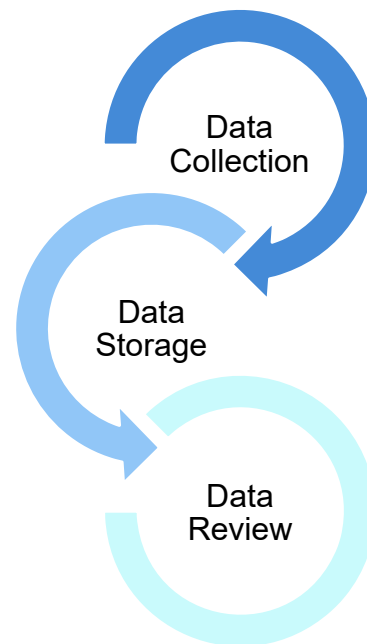
Data storage is the second phase of data management. Generally, this takes place in some form of database. In addition to the data descriptors established in the first phase, the stored data must also maintain data storage attributes, which are specific to how the data is stored and processed. These additional attributes include data quality indicators, data qualifiers, ingest dates, and chain of custody.

Figure E-2   Data Management Phases

The attributes and values collected in the data acquisition and data storage phases must provide ample tools for an operator or system to conduct detailed and thorough reviews of the data in the data review phase. Data review and flagging procedures that will be utilized should be documented in this element of the plan. Examples include confirming that calibrations are excluded from data aggregation, confirming that incompletely sampled time periods are not included, and confirming that temperature controls required for proper instrument functioning were maintained.

PROVIDE WORK PLAN FOR CONDUCTING FIELD MEASUREMENTS

The plan must describe field procedures that will be followed by those conducting measurements and provide the timeline for community air monitoring. Field procedures spell out individual tasks with enough detail so that air district staff or community members with the necessary training can complete the tasks. Examples of specific field procedures include documenting actions in logbooks, completing chain of custody forms, and conducting specific quality control procedures. The timeline needs to establish the duration of field measurements and denote milestones for completing key

tasks. The plan will also describe communication and coordination steps to ensure field personnel know whom to contact for questions and how work products are delivered. Relevant safety considerations should also be documented.

HOW WILL DATA BE USED TO TAKE ACTION?

Defining how the data will be evaluated and applied to the stated community-specific purpose and objectives is the final step towards ensuring that the results will meet the needs of the community and support actions to improve air quality. Plans need to include a process for evaluating effectiveness, for example monthly or quarterly meetings to review results and determine if adjustments are needed. Determining in advance how data will be analyzed and interpreted, for example trends analysis or identification of source impacts, or providing real-time information for health alerts, provides another opportunity to confirm that air monitoring methods and equipment will achieve the desired objectives. Finally, planning in advance how and when the air monitoring results will be communicated, for example in real-time on a webpage or in written reports on a periodic basis, helps communities and stakeholders understand where and when they will be able to access the information.

SPECIFY PROCESS FOR EVALUATING EFFECTIVENESS

The purpose of this element is to designate a procedure that will serve as a check to ensure that the air monitoring objectives are being met in a timely fashion. The process to revise the monitoring plan or make corrections if it is not meeting the air monitoring objectives or timeline must be described in this element of the air monitoring plan. If issues arise during air monitoring and data quality objectives should be adjusted, describe the process that will be utilized to make alterations and how they will be documented.

The plan should address the planned duration of the monitoring, whether it is intended to be a long-term sustainable program or a shorter-term investigation, and the timeframe for demobilization of air monitoring when objectives are met. This should also include recommendations for any necessary ongoing actions to track progress and ensure air quality improvements continue.

ANALYZE AND INTERPRET DATA

There are many approaches to data analysis and interpretation that vary in scope and complexity. Approaches such as conducting fence-line monitoring may require both real-time analysis and interpretation to screen for fugitive emissions and subsequent analysis of long-term data to track emissions reductions over time. This element of the plan must describe how data analysis will be conducted, including data preparation procedures utilized throughout the process, and how air monitoring results may be translated into actions.

The significance of results depends on the quality of the data, so data preparation is a critical component in data analysis. Data preparation procedures that will be utilized (e.g., formatting and quality assurance of data) must be documented. The protocol for providing data handling algorithms for the raw data should be documented to ensure transparency. Procedures used must document how data are handled and processed so that all changes to data are annotated and provide a clear, transparent data path that can be followed from initial data production to a final, quality-checked end point.

Ultimately, results from data analysis should be responsive to the established community air monitoring objectives. The types of analyses will depend on the specific community's goals, and each community is likely to require a unique analysis. Some analysis examples include, but are not limited to:

- Comparing trends in community air monitoring data to trends in data from nearby regulatory air monitors.

- Performing analysis to determine which source(s) may be primarily responsible for elevated concentrations in order to develop appropriate control strategies.

- Tracking progress over time to determine if strategies put in place by community emissions reduction programs yield ambient air quality improvements.

The plan should describe the anticipated data analyses along with a process for interpreting results based on the community-specific monitoring objective(s). This includes reviewing the scope of actions that the specific type of data analysis will support, since results produced through this element will be the direct link to action in a community. Thoroughly documenting data preparation procedures and types of analyses that will be conducted with the data is pivotal to ensuring that conclusions drawn from data analyses are defensible.

COMMUNICATE RESULTS TO SUPPORT ACTION

Communicating results is critical for ensuring that the air monitoring results in effective action. The community steering committee must establish a transparent process for systematic information sharing and communication. The monitoring plan must indicate how results will be delivered and discussed with community members, decision makers and organizations that have influence to take actions for a specific community. Air districts must communicate ongoing monitoring activities, provide interim progress updates, and publish final results.

The plan should detail what information will be provided on the designated air district webpage (e.g., web portals, factsheets, notices, timeline, meeting agendas, deliverables) and the frequency at which material will be provided and updated. The frequency and content that will be included when updating CARB must be documented.

The plan should also lay out the general content and frequency of reports. The final report includes, at a minimum:

- A summary and timeline of air monitoring with background on the reasons for air monitoring.

- A discussion of how data were collected, validated, analyzed, and disseminated to address the stated community-specific purpose for air monitoring.

- Recommendations and next steps, which may include recommendations for ongoing air monitoring to track progress or verify results achieved by community emissions reduction programs.

- A dissemination plan describing how the data will be disseminated and discussed with appropriate decision makers so that it may lead to the intended action.

AB 617 requires air districts report community air monitoring data to CARB.[12] Air quality data generated under the Program will be made available on CARB's webpage to ensure that community air monitoring data are publicly accessible. To this end, CARB will work to establish or recommend consistent data exchange standards to be used for community air monitoring. These uniform data formatting requirements will inform users about the conditions under which data were collected and will ensure that all community air monitoring data are compatible with CARB's statewide data portal. When established, formal data exchange standard requirements will be available in the community air monitoring toolbox in the online Resource Center.

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[12] California Health and Safety Code § 42705.5(e).

III. CHECKLIST FOR COMMUNITY AIR MONITORING EVALUATION

Table E-2   Checklist for Community Air Monitoring Evaluation

MONITORING PLAN ELEMENT 1: FORM COMMUNITY PARTNERSHIPS	
CRITERIA	✔
Identifies community steering committee members and their affiliation.	☐
Documents community steering committee meeting information: • Date of first meeting. • Date, time, number of attendees for all meetings that have been held. • Frequency of future meetings and expected attendees.	☐
Details level of community involvement in planning and resources made available to accommodate community's desired level of involvement throughout implementation.	☐
Provides link to air district webpage dedicated to community air monitoring and documents what will be posted on this webpage.	☐
Identifies dedicated contact person to address questions on the community-specific air monitoring plan.	☐

MONITORING PLAN ELEMENT 2: STATE THE COMMUNITY-SPECIFIC PURPOSE FOR AIR MONITORING	
CRITERIA	✔
Identifies the community-specific air monitoring need(s).	☐
Provides background information on how the need was discovered.	☐
Documents relevant information from previous, ongoing, and proposed air monitoring and identifies gaps that this community air monitoring will address.	☐
Explores alternative approaches to investigating and addressing the air quality monitoring need(s).	☐

MONITORING PLAN ELEMENT 3: IDENTIFY SCOPE OF ACTIONS	
CRITERIA	✔
Defines action(s) that air monitoring aims to support.	☐

MONITORING PLAN ELEMENT 4: DEFINE AIR MONITORING OBJECTIVES	
CRITERIA	✔
States the air monitoring objective(s) that will address the stated community-specific purpose for air monitoring.	☐
Specifies the community air monitoring design: • Type(s) of data needed. • Measurements to be made. • Duration of monitoring.	☐
Defines other information necessary to address objective(s), such as: • Supporting measurements (e.g., meteorology). • Action limits, threshold levels, regulatory information. • Data sources to be accessed and used.	☐
Includes reference information and materials (e.g., maps, diagrams, previous studies).	☐

MONITORING PLAN ELEMENT 5: ESTABLISH ROLES AND RESPONSIBILITIES	
CRITERIA	✔
Identifies all parties responsible for major aspects or phases of air monitoring (includes contractors).	☐
Clarifies group roles and interactions; specifies training requirements for individuals conducting air monitoring.	☐

MONITORING PLAN ELEMENT 6: DEFINE DATA QUALITY OBJECTIVES	
CRITERIA	✔
Sets performance and acceptance criteria for all data to be collected.	☐
Identifies precision, bias, accuracy, sensitivity, and data completeness needs.	☐
Defines temporal and spatial representativeness.	☐

MONITORING PLAN ELEMENT 7: SELECT MONITORING METHODS AND EQUIPMENT	
CRITERIA	✔
Identifies and describes method(s) and equipment selected (e.g., make, model, characteristics).	☐
Justifies suitability of the method to meet the level of action required by monitoring objective.	☐
Provides field and lab Standard Operating Procedures that will be followed.	☐

MONITORING PLAN ELEMENT 8: DETERMINE MONITORING AREAS	
CRITERIA	✔
Indicates where monitoring will be conducted within the community.	☐
Describes rationale and considerations for each monitoring area.	☐
Details location characteristics (e.g., meteorology, sources, land use) and important logistical details (e.g., site access, security, power availability).	☐

MONITORING PLAN ELEMENT 9: DEVELOP QUALITY CONTROL PROCEDURES	
CRITERIA	✔
Specifies quality control activities for each type of measurement and the frequency at which they should be conducted – this includes, if applicable: • Reference materials. • Calibration. • Ongoing quality control measures (e.g., zero point, span point, one point). • Blanks. • Spikes. • Duplicates/collocation. • Audits.	☐
Details process to follow when control limits are exceeded.	☐

MONITORING PLAN ELEMENT 10: DESCRIBE DATA MANAGEMENT	
CRITERIA	✔
Describes the data management system by identifying all of the following: • Data descriptors. • Data storage attributes. • Data review and flagging procedures.	☐
Identifies measures that will be taken to account for errors.	☐

MONITORING PLAN ELEMENT 11: PROVIDE WORK PLAN FOR CONDUCTING FIELD MEASUREMENTS	
CRITERIA	✔
Identifies field procedures and materials to be utilized for conducting community air monitoring.	☐
Defines field communication and coordination steps.	☐
Provides timeline that denotes air monitoring duration, frequency, and milestones.	☐

MONITORING PLAN ELEMENT 12: SPECIFY PROCESS FOR EVALUATING EFFECTIVENESS	
CRITERIA	✔
Identifies evaluation process that will be utilized to ensure air monitoring objectives are being met, including number, frequency, and types of evaluations that will be conducted.	☐
Describes how issues will be documented and addressed.	☐
Defines an end point for air monitoring.	☐

MONITORING PLAN ELEMENT 13: ANALYZE AND INTERPRET DATA	
CRITERIA	✔
Documents data preparation procedures that will be utilized.	☐
Describes how data will be analyzed to address the stated community-specific purpose for air monitoring.	☐

MONITORING PLAN ELEMENT 14: COMMUNICATE RESULTS TO SUPPORT ACTION	
CRITERIA	✔
Establishes process for information sharing and communication with community throughout air monitoring.	☐
Indicates how results will be delivered to affected community, stakeholders, CARB, and other decision-makers (e.g., content, frequency).	☐
Details what information will be provided on district webpage (e.g., factsheets, notices, timeline, meeting agendas) and the frequency at which material and progress updates will be provided.	☐
Defines the format and schedule of reports.	☐

IV. COMMUNITY AIR MONITORING DATA PORTAL

While displaying data and communicating results is an essential element of each community air monitoring plan, the State also has a role in improving communication and information sharing with communities. This is further prescribed by AB 617, which requires that air districts report data from community air monitoring to CARB, and that CARB publish these data online.[13] To address this requirement, CARB is developing a data portal, which will allow reporting of both real-time preliminary data and validated final data. This data portal will be available on CARB's webpage to ensure that

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[13] California Health and Safety Code § 42705.5(e).

community air monitoring data are publicly stored and accessible, and not housed solely in proprietary systems. Within and outside of CARB, a number of monitoring efforts and data portals, ranging from the regional to community level, have already been developed. Staff intend to use these projects and portals as models, and build on those past experiences and learnings. Staff also anticipate that many community groups and air districts will develop and maintain their own data display systems. Staff will collaborate with these entities to ensure that data display systems for community monitoring efforts are complementary. By partnering with communities, air districts, and other stakeholders, CARB will leverage existing and future resources to ensure that Program goals are met. CARB staff expect the data portal to be available by summer 2019. Additional information on the data portal can be found in Appendix F.

V. RESOURCES FOR COMMUNITY AIR MONITORING

CARB's community air monitoring toolbox, housed within the online Resource Center, will serve as a repository of community air monitoring information and guidance to be used by community members, air districts, and the public alike. This will include reviews of advanced sensing monitoring technologies,[14] reviews of existing community air monitoring systems,[15] supporting material for the development of community air monitoring plans, and resources for community scientists. CARB staff will partner with air sensor testing programs conducted by the South Coast Air Quality Management District's Air Quality Sensor Performance Evaluation Center, U.S. EPA, and others to evaluate air sensor performance and will house this information in the community air monitoring toolbox. Further, the community air monitoring toolbox will provide educational or informational materials on monitoring equipment, data collection methods, limitations of data, and so on. This toolbox will build on and complement learnings from community-led air monitoring activities, the California Environmental Health Tracking Program, the U.S. EPA Air Sensor Toolbox, and air monitoring resources developed under South Coast Air Quality Management District's U.S. EPA "Science To Achieve Results" grant. These informational resources will provide insight on how to appropriately interpret and use the data residing in the data portal. Therefore, the data portal will have direct materials and links to the community air monitoring toolbox, and vice versa. CARB staff will continue to work with air districts, community members, industry, and others to update and expand the air monitoring toolbox as new air monitoring materials and data become available.

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[14] California Health and Safety Code § 42705.5(b).
[15] California Health and Safety Code § 42705.5(b).