OUR AIR:
MONITORING POLLUTION & AIR QUALITY

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PREFACE

This guidebook is for community organizations that have concerns about air pollution. It will guide you through setting up and implementing an air quality monitoring project on your own to produce the information needed to tell a story about your neighborhood's air quality levels.

Whether your organization is looking to engage community members to be more informed about the reality of air quality levels in the neighborhood or to advocate for policy changes to improve local air quality, this guidebook provides tools and step-by-step guidance to help. We hope that our experience in monitoring local air quality can help inform yours so that you reach your goals.

Good luck on a successful air monitoring project!

Sincerely,

The Shared Air Shared Action Team

Alliance for a Greener South Loop (AGSL)
Delta Institute
Kansas State University
Little Village Environmental Justice Organization (LVEJO)
People for Community Recovery (PCR)
Respiratory Health Association
Southeast Environmental Task Force (SETF)
University of Illinois Chicago Campus Department of Public Health
The University of Memphis

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Introduction

Air quality affects everyone's health and quality of life. Over the years, air quality across the nation as a whole has improved (1). However, you may still feel that your own community is burdened by air pollution and related health consequences. This is because poor air quality can be due to sources of pollution (such as vehicle tailpipe emissions in heavy, congested traffic) that are experienced by many neighborhoods throughout the United States. However, air pollution may most affect Environmental Justice (EJ) communities. This is because sources of air pollution are more likely to be located in communities where residents are lower income and people of color (3, 4). In some cities, industrial activities are concentrated in certain areas, many of which are EJ communities. A disproportionate number of residents in EJ communities, especially vulnerable groups such as children, suffer from asthma and other respiratory diseases. For example:

- In the Little Village neighborhood, home to Dirty Diesel alley, an average of 17 to 25% of children have asthma (5).

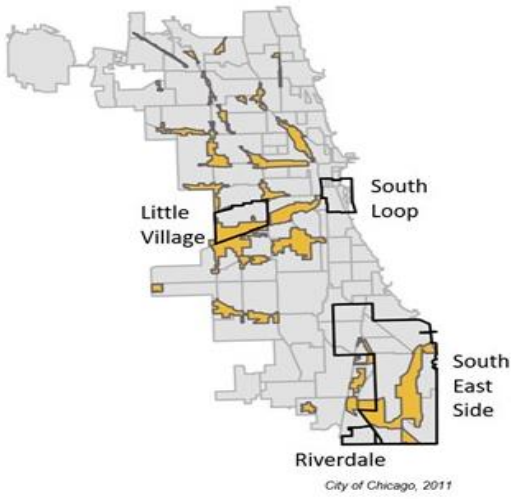
- Air quality on the south side of Chicago has been affected by coal ash piles, metal shredders, heavy diesel truck traffic, and landfills.

Manufacturing can be a source for air pollution.

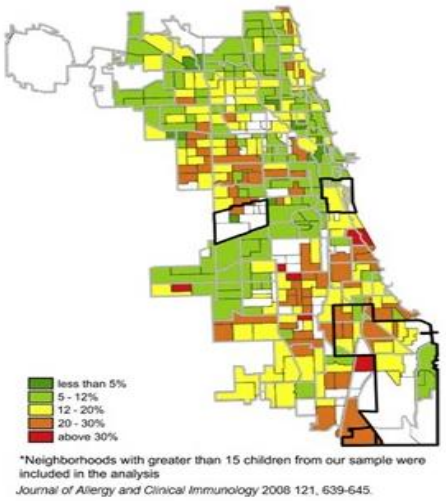
Vehicle emissions are another source for air pollutants.

If you want to improve air quality at your local level, having detailed information about pollution levels and how these levels change block by block and at different times of the day is important. Without community-level information, it will be difficult for you understand how local air pollution affects residents' health and develop ways of solving the problem. However, this local level of information can be hard to come by. For example, the 2016 Illinois Air Quality Report (2) shows that there are only nine official air quality monitoring stations in the City of Chicago. On the Southeast side of Chicago, the closest official monitoring station (over one mile away) does not pick up the high levels of particulate matter (solid particles like dust or soot suspended in the air) generated by pet coke piles stored in the open air and deposited on homes across the street.

The Shared Air Shared Action ("SASA") Team was formed to pilot a community air quality monitoring project in Chicago to obtain local-level air quality data. The SASA team was a local network of residents, technical experts, and advocates and included four community organizations from the Southeast Side, Riverdale Community Area (Altgeld Gardens), Little Village, and South Loop neighborhoods, as shown on the maps below.



Location of the four SASA community groups (black outline) in relation to industrial corridors (orange shapes).



Location of the four SASA community groups (black outline) in relation to asthma levels in Chicago.

Our four community groups hope to use the data they collected to advocate for better air quality and inform strategies to reduce air pollution in their neighborhoods.

The SASA team wrote this guidebook to share with you the lessons that we learned over the three years of our air quality monitoring project. Our insights and recommendations are based on the experiences of the four SASA community organizations as well as other project partners, and pertain to everything from deciding what pollution types to monitor and where; when, and how to monitor; sending out volunteers to collect data; making sense of your data; and, everything in between. We also describe the skills and resources you will need in your organization to be successful, and the kinds of additional local expertise you may want to bring on board, depending on your goals.

The guidebook is composed of four sections: 1) Before Monitoring, 2) During Monitoring, 3) After Monitoring, and 4) Resources to walk you through step by step how to set up and run an air quality monitoring project based on your community's needs, goals, and resources.

Section I: Before Monitoring

- **Chapter 1: Are you ready?** Deciding if you have the right team and resources to set and accomplish your goals.
- **Chapter 2: How will you do it?** Narrowing down your focus and starting to plan for monitoring.
- **Chapter 3: How will you communicate about it?** Identifying people with a stake in the process and crafting strategies to communicate with them.

Section II: During Monitoring

- **Chapter 4: Running air monitoring in the office -** Creating tracking forms to manage equipment from the office and managing data.
- **Chapter 5: Running air monitoring in the field -** Keeping track of people and equipment and keeping things running smoothly in the field while air monitoring.
- **Chapter 6: Communicating during monitoring** - Implementing the communication plan developed in Chapter 3.

Section III: After Monitoring

- **Chapter 7: Analyzing data -** Analyzing your data and building an understanding of the story your data tells.
- **Chapter 8: Sharing Your Results** – Considerations to keep in mind when sharing your data.

Section IV: Resources

References:

1. U.S. EPA Office of Air & Radiation. (2018). Air Quality Improves as America Grows. Retrieved November 2, 2018, from https://gispub.epa.gov/air/trendsreport/2018/
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4. Clark, L. P., Millet, D. B., & Marshall, J. D. (2014). National patterns in environmental injustice and inequality: outdoor NO_2 air pollution in the United States. *PloS One*, *9*(4), e94431.
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Document Wayfinding

Throughout this guidebook different design elements highlight and emphasize different levels or types of information. The four primary design elements and how they can be used to navigate the guidebook are described below.

Skills: At the beginning of each chapter, a series of icons indicate the skill requirements for each phase of the air monitoring process. Skills and their icons are:

Community Knowledge | Administration | Outreach | Technical | Activist

Monitor Types: Two different air monitoring types, Stationary Monitoring and Mobile Monitoring, are referenced throughout the guidebook. These icons will let you know when information presented pertains to only a particular Air Monitoring Type.

Stationary Monitor

Mobile Monitor

Call-Out Boxes: Call out boxes provide information from SASA team members. **Yellow** boxes include important quick tips for your project. **Blue** boxes are stories and anecdotes from SASA's community organizations. **Green** boxes are lessons learned from the SASA technical team.

Tips

"Community anecdotes and stories"

-Community Name

Lessons Learned from the SASA Team:

Technical Guidance

Goals: Throughout the guidebook, you are encouraged to reflect on your project through the lens of three different goal types: **Capacity Building and Engagement**, **Research**, and **Advocacy**.

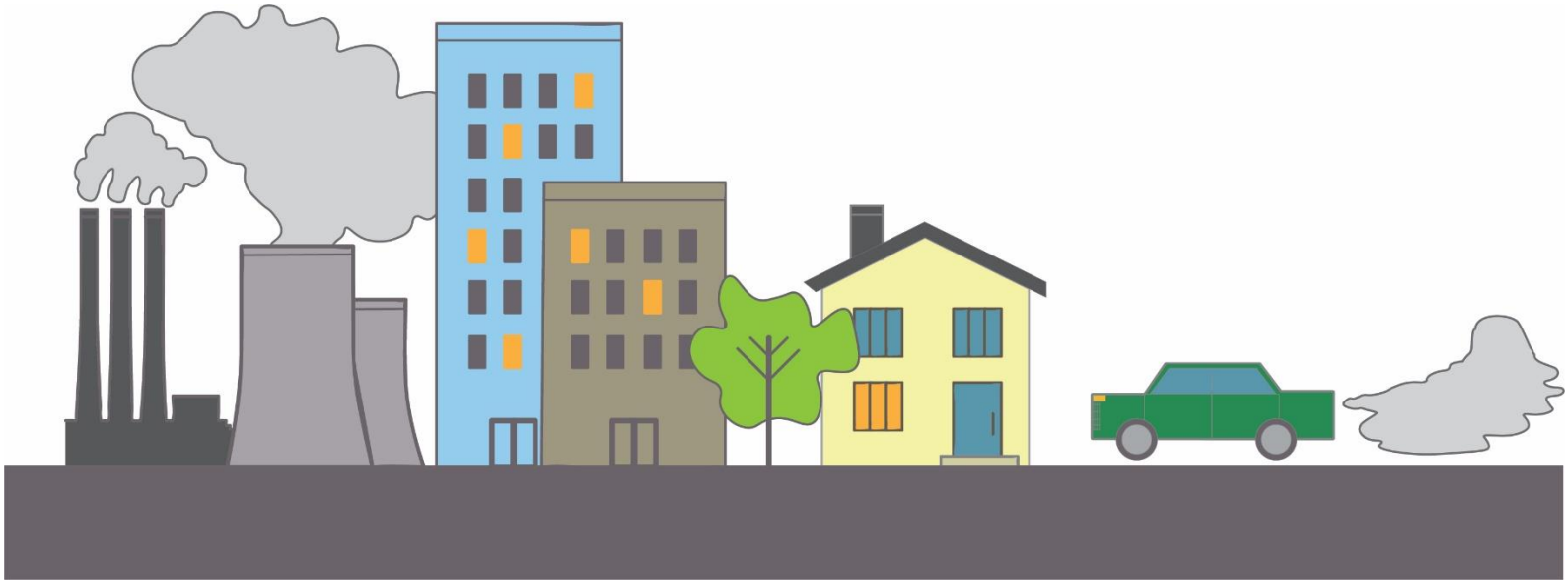
Capacity Building and Engagement

Research

Advocacy

SECTION 1:

BEFORE AIR MONITORING



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CHAPTER 1: ARE YOU READY?

<u>Chapter 1 overview:</u> To plan your air quality monitoring project, you must first decide if you are ready with the right team and resources to set and accomplish your goals.

Step 1. Assemble your team
Step 2. Define Your Goal
Step 3. Consider Your Timeline
Step 4. Scan Public Information
Step 5. Decide to Commit

This process can repeat - after going through the 5 steps you may need to revisit some steps before committing to the project.

Step 1: Assemble Your Team

Certain skills and roles are essential for a team starting an air monitoring project. These roles could be filled by a handful of people on your staff, by one person covering multiple skill sets, or by external partners and/or volunteers from the community. Some skills may be more or less essential depending on your goal (see Step 2).

Project Team Skills and Needs

Community Knowledge:
Someone on your team needs to know your community's concerns and priorities, have relationships within the community, and be able to identify who current polluters may be.

Administrative:
Administration calls for a "go getter" who will keep the team on track! Organization and responsiveness is needed to manage schedules, keep track of equipment, fill out important forms, help write training materials, and train/manage volunteers.

Outreach:
Someone will need to build support for the project in the community, recruit a core of volunteers who will actually do the air monitoring, and keep the community updated about the project. Outreach motivates community members to stay involved in the project, understand why it is important, and work to improve the air quality.

Technical:
Technical understanding is needed to develop a monitoring plan that meets project goals, choose the best air monitor model to use, train volunteers to use monitors, troubleshoot equipment problems, determine where and when to monitor, possibly understand publicly-available air quality information, and make sense of the data you collect.

Tip: *If your project's goal is research or advocacy (see Step 2), skill sets with an asterisk are particularly important.*

Activist:
If advocacy is the project's goal, then you will need to work with local stakeholders (local, state, and/or federal government leaders, local businesses) to advocate for improvement to your air quality based on your data. This can be a big undertaking that takes time and know how.

Volunteer Capacity

You will need volunteers such as community residents to conduct air monitoring and collect data in different parts of the neighborhood. Begin thinking about:

- How many volunteers you will need.
- How to align volunteer schedules and availability with times of day you want to monitor.
- How much time and what materials you will need to train volunteers.
- What you want volunteers to learn from being involved.

"LVEJO tries its best to be responsive to folks' needs and availability. When we created our air monitoring plan, we weren't sure when we would be able to start it and who would be available to do it. We needed to work with our volunteers to fit the monitoring into their lives." ***– LVEJO***

External Relationships

While your organization's staff may have all the skills that your project needs, you can also build partnerships with other organizations to help advance your project goals. Partners can help validate priorities, provide additional resources, and build broad support among residents and decision makers.

- A local university public health department, a health-focused advocacy organization, or public health agency in your area. These types of partners can work with you to strengthen your knowledge about air quality and can enhance the technical expertise of the team.
- Talk to a local alderman or hold public meetings to gather resident input.

Step 2: Define Your Goal

Defining your goal will help guide your air monitoring project. Your project team may already have motivations and reasons for wanting to monitor:

- Concerns about health issues in the community.
- Concerns about actions of a particular polluter.
- Desire to educate community members about air quality and related health risks.

AGSL discussing goals with SASA partner University of Illinois (Chicago Campus).

Your goal statement should reflect the project team's aspirations and skill sets and be informed by the community's priorities and concerns. The goal will inform your approach to monitoring; help you stay focused over time if conditions in the community change; help you explain to your community why you want to start an air monitoring project; and guide you in decision making. Use the below 3 goal types and examples to help you craft your goal statement. You might want to draw elements from more than one type.

Goal Types

Capacity Building and Engagement

- **Effort Required**: *Lowest*
- **Example** : Our goal is to increase air quality knowledge in the community by giving residents first-hand experience to understand and speak knowledgeably about their air quality.

Research

- **Effort Required**: *Medium*
- **Example**: Our goal is to validate and support community concerns about local air pollution with data that's specific to our community.

Advocacy

- **Effort Required:** *Highest*
- **Example**: Our goal is to generate robust data that 1) supports an advocacy campaign for policy change needed to improve air quality or 2) influences a specific "bad actor" in the community.

Shared Air Shared Action Community Goals:

"Our primary goal was to become more informed about air quality and health risks in the South Loop. It was also to understand how our communities in Chicago have similar or different issues related to air quality, and if we had similar issues and concerns how we might work together to have a stronger voice."

- AGSL

"Our neighborhood has been coined 'the toxic donut' partly because of the air quality in our area. Our goal was to educate the community and those at risk about the quality of our air and how to minimize their risk."

– PCR

"We were trying to discover the impact of the industrial corridor on our community, so that's why we were looking at truck traffic and diesel emissions and why we looked at certain locations by schools. Was the air quality bad by the schools, and if it was could we connect it to the amount of truck traffic? We were looking to capture the air quality that the industrial corridor had impact on."

– **SETF**

"Actions and goals may look different for different groups. Overall with our goals, one of the biggest reasons why we wanted to do air monitoring was so that we can understand our air quality, but mainly so we can advocate and change policy around our industrial corridors."

– LVEJO

After setting goals, go back to Step 1 to see if your project team's skill sets align with your draft goal statement. If not, adjust or refine the goal to meet your skills or add additional skill sets needed to match your goal. For example, Research and Advocacy goals require greater technical skills because you will need to produce a higher quality of data and put in more effort to understand your data.

Industrial operations near Southeast Side of Chicago.

Goal Types and Technical Resources

Capacity Building and Engagement

- **Guidance**: You don't need an engineer or an air quality expert, but having someone who is tech savvy and analytical within your project team is a must.
- **Technical Resources:** Look for a "super" volunteer within your organization or community - someone who is good at fixing equipment or who likes to do online research. Reach out to organizations within the community such as a high schools to ask a local science teacher to help.

Research

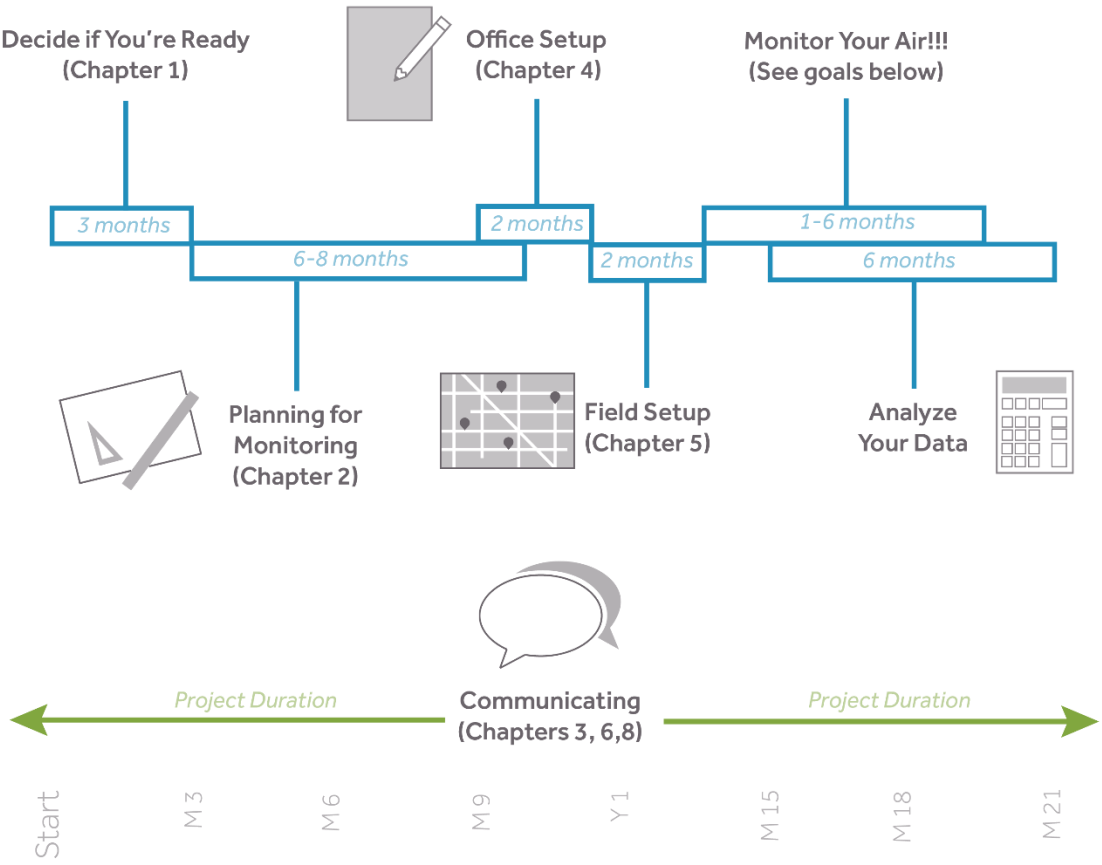
- **Guidance**: Examining trends and analyzing data may require a particular air monitoring plan with specific locations for data collection as well as the ability to handle data spreadsheets and create graphs.
- **Technical Resources:** A university partner could be a good partner if a person with such a skill set isn't already part of the team. If funding is limited, a researcher from a university or community college could serve in an advisory role as the team members hone technical skills in the initial phases of the project.

Advocacy

- **Guidance**: For advocacy work, certain data standards may need to be met, or the results may need to be interpreted by an expert to increase credibility of the story your data tells.
- **Technical Resources:** Consider fundraising to expand the project team to include a university partner or air quality data statistician.

Step 3: Consider Your Timeline

The graphic below can guide you on expected time commitments for the main phases of air monitoring discussed in this guidebook.



Actually conducting air monitoring is the phase that is the most time sensitive and dependent on your goal.

Goals Types and Air Monitoring Time Commitment

Capacity Building and Engagement

- **Time Required**: Shorter
- **Example**: If you are working with a science club or summer intern program, monitoring could be done during a semester or for a few weeks during the summer.

Research

- **Time Required:** Longer
- **Example**: If you want to understand air quality changes in your community across seasons, monitoring could be done throughout the year. Alternatively, you could schedule short monitoring sessions during different times of the year.

Advocacy

- **Time Required:** Longest
- **Example**: You may want to monitor non-stop for several months in a row to capture enough data to satisfy data standards. You may also need to obtain and use more air monitors and find more volunteers to do the monitoring.

Step 4: Scan Public Information

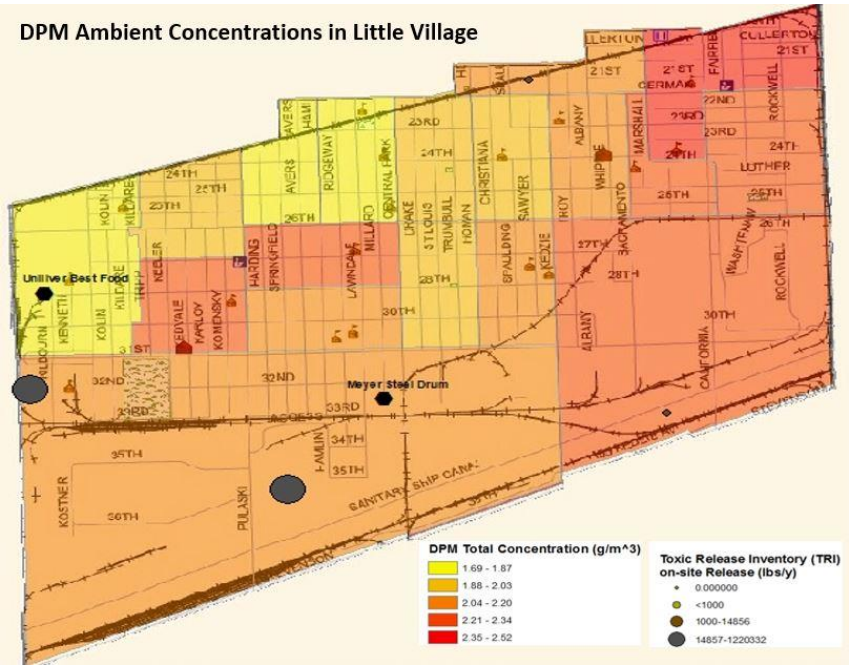
Reviewing publicly available air quality data and relevant policies and ordinances in your community will help you refine your goal. Consider the following questions:

- Community knowledge: Where should we monitor? Areas of concern are those places where the community believes air quality is poor or where air pollution might be negatively affecting the health of community members.
- Public data we can access online: What gaps (in terms of where data is or is not collected) could our project try to fill?
- Policies, ordinances, and zoning in our community: Should we refine our goal to advocate for a particular action?
- USEPA's Air Quality Index: What air quality levels should we use to analyze our data? See **Resources.**

Tip: *Online data may include locations of diesel bus routes, locations of dust-generating construction sites, locations of manufacturers, and demographics that tell where sensitive populations like children and the elderly live.*

"One of the biggest hurdles in communities like mine is that you don't have the information, or know where to find the information, if you're not familiar with the different outlets that you can go to find out about air quality, like U.S. EPA or Illinois EPA."

- PCR



US EPA National Air Toxics Assessment Data showing different estimated levels of diesel particulate matter and Toxic Release Inventory Data showing toxic release of air emissions in Chicago's Little Village neighborhood.

Goal Types and Public Information

Capacity Building and Engagement

- **Information Required:** Community Knowledge is Key!
- **Example**: Hold a community meeting to gather input from residents about areas of concern to help prioritize where to monitor.

Research

- **Information Required:** Online Data is Also Important!
- **Example**: Review publically available, online air quality and demographic data and information about activities in your community. Agencies tasked with protecting public health or environmental quality are good resources for this type of information. See Resources for a list of information sources and tools.

Advocacy

- **Information Required:** Understanding Policies, Ordinances, and Zoning is Also Needed!
- **Example**: Review municipal, county, and state codes related to how vehicles and companies are allowed to operate in your community. This will help you decide whether you need to come up with a new rule, change an existing rule, or push for its enforcement supported by the air monitoring data that you collect. Codes can be found by contacting your city or county clerk or going to their website. See Resources for more information on policy review.

Step 5: Decide to Commit

Now that you have assessed the capacity and skills of your team, drafted your goal, and thought through how much time and what information you will need, revisit your goal statement with the project team and your community:

- Is it reflective of everyone's thoughts and concerns?
- Is it achievable given the resources available?
- If not, you might need to further refine or even change the goal.

> *"You have to be committed to the project because it may require you to adjust your personal schedule. It is always good to have a partner but remember your schedule and your partner's schedule have to coincide."* - **SETF**

Once the team reaches consensus on the monitoring goal, you are ready to commit and move forward. The next chapters in this section will help you turn your goal statement into an action plan and get ready to launch your air quality monitoring project.

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CHAPTER 2: HOW WILL YOU DO IT?

<u>Chapter 2 Overview:</u> In this section are the six steps needed to plan your air monitoring project:

Step 1. Why Monitor - Draft Air Quality Question(s)
Step 2. What Pollutants to Monitor
Step 3. Where to Monitor
Step 4. Why Monitor - Refine Air Quality Questions(s)
Step 5. When to Monitor
Step 6. How to Monitor:
- *Monitor Type*
- *Monitor Models*
- *Monitor Data Transmission & Viewing*
- *Health & Safety Plan*
- *Air Monitoring Plan*
- *Purchasing Monitors*

Step 1. Why Monitor - Draft Air Quality Question(s):

As a first step, it is very important to draft a specific Air Quality Question (or more than one question) that you want to answer through your air monitoring project. This question will help you with subsequent steps of deciding what, where, when, and how to monitor. Example Air Quality Questions for each of the goal types introduced in Chapter 1 include:

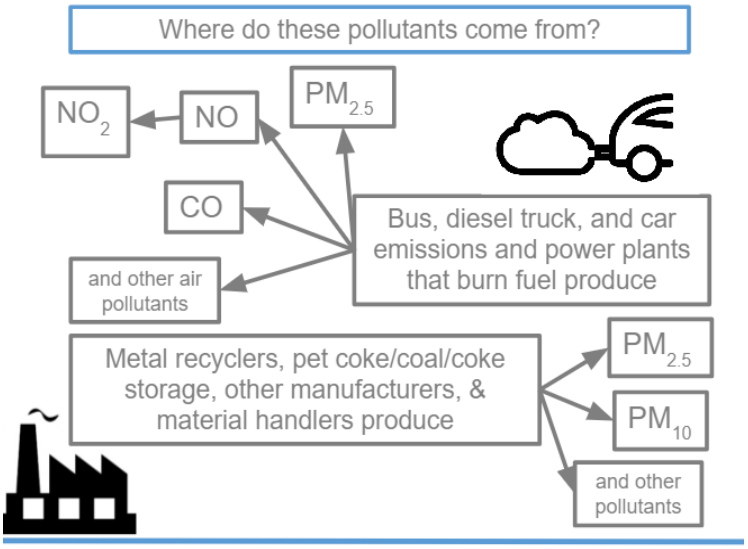
Capacity Building and Engagement	•**Question**: What levels of air pollution exists on busy streets in our community?
Research	•**Question**: What levels of air pollution are community members exposed to on a daily basis?
Advocacy	•**Question**: Are air pollution levels higher near manufacturers in our community?

"We have the busiest, little mini highway by us named Hazel Johnson EJ Way. One of our questions was to see how polluted the highway was." - **PCR**

"Because our community does not have overt point source polluters, we were very interested in just the general urban context and had in mind vulnerable populations, children, and the elderly. Looking at the intersection of public transportation and vulnerable populations, we asked how is the air quality along our transportation routes, especially major bus routes? How's the air quality at schools? How's the air quality near senior housing?" - **AGSL**

Step 2. What Pollutants to Monitor

Discuss with your team what pollution sources you are interested in monitoring, such as cars or diesel trucks, manufacturers or other facilities, waste disposal sites, or construction sites. Review the diagrams and photos below to determine what typical pollutants to monitor based on the source.



Definitions

$PM_{2.5}$: fine particles that are less than 2.5 microns in size, at least 30x smaller than the width of a human hair, and can enter the lungs and bloodstream.

PM_{10}: fine particles that are less than 10 microns in size and can enter the lungs.

NO: nitrous oxide

CO_2: carbon dioxide

CO: carbon monoxide

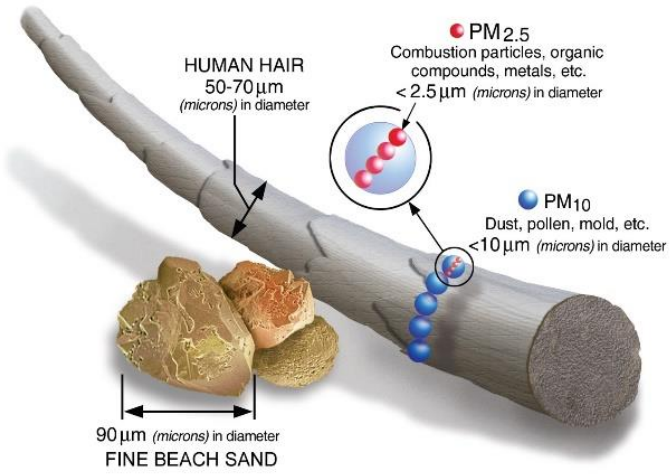
NO_2: nitrogen dioxide

O_3: ozone

Potential sources for common pollutants

Possible industrial source of PM on Southeast Side of Chicago

Metal recyclers can emit particulate matter (PM) as part of their operations



Comparative sizes of types of Particulate Matter (PM)

Lessons Learned from the SASA Team: Consider monitor availability when selecting pollutants

Become familiar with the number of low-cost air monitoring models available on the market for different pollutants. SASA collected data on gaseous pollutants (nitrogen dioxide, nitrous oxide, carbon dioxide, ozone, carbon monoxide) and particulate matter ($PM_{2.5}$ and PM_{10}). Low cost monitors are scarce for gaseous pollutants. The monitor we used has been discontinued, and in 2018 almost no other low-cost monitors were available to monitor for these gases. A large variety of reliable, low cost monitors are widely available for particulate matter (PM) pollutants and new models continue to be introduced into the marketplace.

Step 3. Where to Monitor

Use the information from **Chapter 1 Step 4** and the table below to identify pollution sources and where populations sensitive to air pollution are in your community. Map the information you find. An easy way to create your map is to take a screenshot of your neighborhood from Google Maps or use a hardcopy map of your community.

> *"For folks to think about what to monitor, it is helpful to notice if smells are associated with the air quality you are concerned about. Smells might be due to a gaseous contaminant versus particulate matter."* **- LVEJO**

Consideration	Action
What manufacturing facilities are pollution sources in our community?	Put these on the map. If there are industrial corridors in your community, consider outlining the borders as well. Discuss how many blocks you want to cover surrounding those areas based on how far you believe pollution travels.
Are there high traffic areas in our community?	Mark high traffic intersections and streets on the map, particularly those with diesel bus or truck traffic - high producers of $PM_{2.5}$.
Are there any waste disposal sites in our community that we are concerned about? (ex: metal recycler, coal ash impoundment from a coal plant)	If so, mark these on the map. They can be large producers of $PM_{2.5}$.
Is there ongoing construction in our community? If so, is this a priority?	Consider documenting these sites on the map as well. Unmanaged construction dust can be a source of PM_{10}.
Where are populations that are more sensitive to poor air quality (elderly, children) located?	Mark schools, hospitals, and senior centers on the map.

> *"Answering certain questions made us very strategic about where we placed our monitors. For example, if there is industry super close to the schools or residential areas, what does that mean in terms of our air quality? We can't tell them to stop emitting if we don't know what they are emitting, how much, or what time of day. If you have a lot of factories, then you want to do a little bit of research around what they are doing. Do they burn anything? Is their operation about recycling? Do they manufacture anything? Are there smells coming from the factories? Because of our history in the neighborhood, we already kind of knew where some of these facilities were and where some of the areas of concern were."* **- LVEJO**

The SASA team printed out each community map on a large poster and used sticky notes, pins, and dry erase markers to show available information and to mark Areas of Concern for monitoring. Areas of Concern are those places where the community believes air quality is poor or where air pollution might be negatively affecting the health of community members more specifically.

PCR mapping out Areas of Concern in their neighborhood

Map of LVEJO neighborhood showing Areas of Concern and where to monitor

Once your map of available information is complete, discuss priorities and define your Areas of Concern. For example:

- **Area of Concern:** James Street because it experiences high diesel truck traffic and has a local grade school.
- **Area of Concern:** A five-block-radius around the metal recycler where the dust seems to get carried several blocks by the wind.

Lessons Learned from the SASA Team: Areas of Concern

Some communities may not have particular Areas of Concern and simply want to discover what air quality is like in their community. If this is the case, monitoring may be done evenly throughout the community, and not focused in a particular area. For example, monitors may be used every third east-west block or every other north-south block or in the northwest, northeast, southwest, and southeast portions of the neighborhood.

Step 4. Why Monitor - Refine Air Quality Question(s)

Hone your Air Quality Question(s) created in Step 1 based on what and where you want to monitor. For example:

Capacity Building and Engagement	• **Question:** *What levels of NO_2 can we observe along Johnson Street and Main Street where the city buses run?*
Research	• ***Question:*** *Are $PM_{2.5}$ pollution levels higher on the south end of Clark Street near Jackson Elementary School?*
Advocacy	• ***Question:*** *Do levels of PM_{10} pollution increase within a five block radius of the metal recycler in our community?*

Your refined Air Quality Question(s) will help you to complete the remaining steps.

Step 5. When to Monitor

Your goal (see **Chapter 1**) and your refined Air Quality Question(s) will inform when you need to monitor and how flexible your monitoring schedule can be.

If the time of day or the time of year that you want to monitor is important, you may not have as much flexibility as to when monitoring occurs. If timing is not an issue, consider just setting deadlines for when to have monitoring completed to give your team more flexibility.

> *"We discovered, in terms of traffic, that we may have been out there too early. What we assumed we knew, we didn't know. We discovered the truck count goes up later in the morning than the time we were out here. We thought we knew the facts, but we didn't."*
>
> **- SETF**

To think through time needs, constraints and flexibility review **Chapter 1 Step 3** and think about your Monitoring Interval - how long and what times of the day, month, or year you will need to monitor. Some questions to ask yourself include:

- Do we need data collected nonstop over 24 hours to answer our Air Quality Question or do we just need data collected during certain times of day?
- Are we interested in air quality throughout the year or will a short period during a certain season suffice for monitoring work?
- Do we want to monitor in one round or multiple rounds?

Capacity Building and Engagement

- **Flexibility:** High
- **Example:** If you just want to see what NO_2 levels are like on high traffic streets at different parts of the day, let people monitor any days or times that they want.

Research

- **Flexibility:** Low
- **Example:** If you want to research if $PM_{2.5}$ levels are higher when children are going back and forth to school, monitor from 7:30 a.m. until 9:00 a.m. and 2:30 p.m. until 4:00 p.m. one school semester from September to December.

- **Flexibility**: High
- **Example:** Also randomly monitor at other times of the day or other times of the year for comparison.

Advocacy

- **Flexibility:** Low
- **Example:** If you want to influence a metal recycler emitting PM_{10} in your community throughout the day, you may want to generate a large body of data that is as credible as it can be. Monitor 24 hours a day 7 days a week in the summer and again in the winter.

Step 6. How to Monitor

Monitoring Type

Consider whether a stationary or mobile monitor type will work best. A stationary monitor is mounted in a fixed place for an extended period of time and collects data continuously. A mobile monitor is carried by a person and collects data only when switched on as the person walks through various areas.

Example of Stationary Monitor

Example of Mobile Monitor

The SASA team recommends that you select *either* mobile *or* stationary monitoring type for your project, *but not both*. Planning elements and considerations are different for each type, so we advise picking just one and learning how to use it well. Once you have become accustomed to running the project using a particular monitor type, it will be easier if you would like to add the other type of air monitor to your project.

> *"Mobile monitoring was easier than stationary monitoring, although the stationary monitoring provided more data because it monitored all day long."*
> **– SETF**

	Stationary	Mobile
Data Collection	Can collect data 24 hours a day	Collects data only for a limited time
Labor	Less required of volunteers, less volunteer management	More required of volunteers, more volunteer management
Engagement	Less community engagement	More community engagement
Geographical Range	Tied to one location	Can survey larger area
Installation	Need access to specific homes or businesses (hosts) for set up and repair	Volunteers walk around with monitors
Compatibility to AQI	Allows direct comparison to US EPA's Air Quality Index (AQI) for data interpretation *	Comparison to EPAs (AQI) is more difficult

** See **Resources** for more on US EPA's Air Quality Index (AQI)*

US EPA AQI averages 24 hours-worth of data to assess air quality on a given day. To use EPA AQI you need 24 hours-worth of data collected by doing stationary monitoring. The average equals the sum of all your readings in a 24-hour period divided by the total number of readings.

Discuss with your team the pros and cons of each type of monitor and determine whether stationary or mobile monitoring best fits your goals and the specific Air Quality Question(s) you are trying to answer.

Monitoring Models

New monitoring models within each monitoring type are being released every year. To see monitoring models for your monitoring type and for the pollutant you want to monitor, visit the South Coast Air Quality Management District's website. You can also go to Resources, where we have included the model matrix that the SASA team used to compare low-to-medium cost PM monitoring models. You can also do a broad online search for the monitor type you are interested in using keywords like "outdoor mobile $PM_{2.5}$ sensor" or "outdoor stationary PM_{10} sensor". Narrow down your options based on the most important criteria, such as:

- Reasonable price
- Developed for outdoor use
- High R_2
- Vendor Website Data Transmission and Viewing (See Step 6)

***TIP:** In 2018 low cost monitors typically ranged from $150 to $300 per unit, mid cost monitors ranged from about $1,000 to $2,000.*

New air monitors are often tested against existing, high-quality air monitors (i.e., Federal Reference Monitors or FRM), to indicate their accuracy. R^2 is a statistical term that indicates how well a model performs in comparison to the reference monitor. R^2 values run from 0 to 1. The higher the number the more accurate the data from a monitor.

***Tip:** Look for an R^2 of 0.9 or higher.*

If you cannot identify a monitoring model for your desired pollutant and monitor type that satisfies the four criteria, you may need to reconsider either your goal, your Air Quality Question(s), or both and make adjustments. Perhaps a different monitor type is needed, or you will need to scale down the number of monitors you purchase to accommodate a higher price and stay within budget.

Once you have identified one or more monitoring models that meet your basic needs, consider additional criteria that are important to usability in selecting the model you want to purchase:

SASA team discussing information on monitor model

"You don't need to understand everything if your community group has a team with tech-savvy people who are able to go through all the information. You can also ask for help. Reach out to the manufacturers themselves to ask 'what do these specific terms mean'." **- LVEJO**

Additional Vetting Criteria	Impact on Usability
Power Source	Battery requires recharging in an office, AC requires using a power cord and access to an outdoor outlet.
Size and Portability	Larger monitors are harder to hold or mount.
Maintenance	Maintenance can be time consuming.
Calibration	Calibration is time consuming and may require special care. Most low-cost monitors should not require calibration.
Vendor Technical Support	Vendor support makes troubleshooting easier. Some vendors have a dedicated support staff or person to help, others do not.
Data Transmission (See Step 8)	Some monitors use Wi-Fi, others use cellular connections and others need a dedicated smartphone to communicate data.

Lessons Learned from the SASA Team: Vendor Technical Support

Vendor support was important for our project. Call the vendor. Describe your project and potential timeline and ask a few key questions to further assess monitoring models:

- What version is the model and did you do user testing? A road-tested monitor can allow for higher reliability and ease of use.
- Are you planning any updates to the model in the next year? Updates affect whether you can get replacements if a model breaks or if associated smartphone apps or online data viewers will change during monitoring.
- How do we report issues? What is the typical response time? Answers can assess how responsive the vendor is. Expect to do some troubleshooting with your model and working with a responsive vendor helps.

Also, talk to other users. Search online to see if other projects or groups have used this model. If possible, get in touch with those users to ask how the model worked for them.

See **Resources** for a template to help you examine and compare monitoring models.

Data Transmission and Viewing

It is very important when assessing monitoring models to have a team member with technical knowledge to review how data can be viewed, accessed, and downloaded and how data is transmitted.

Data Viewing, Access, and Downloading		
Feature	**Online Data Viewer - Easier**	**No Online Data Viewer - Harder**
Data Download	Usually download data by clicking a link or two on vendor's website. Available for mobile and stationary monitor types.	May have to manually download data by attaching monitor to laptop with a cable (awkward for stationary monitoring) or use vendor CD to access/setup software on laptop to download data from the cloud.
Data Viewing	Vendor website may include colorful graphs and charts making it easier to understand the data.	Must create your own graphs or other visualizations. However, allows you to be able to tailor your graphs.
Immediate Access to Data	Can often view data in "real time". Allows you to notice if data is not being generated/monitor is malfunctioning.	**Significant** - Cannot download data continuously so ability to view data is dependent on when periodic data downloads occur. Not able to remotely immediately verify monitor is functioning correctly.

Lessons Learned from the SASA Team: Vendor Website

Select a monitoring model with a vendor website. The SASA team used monitor models that came with vendor websites and models that did not. We found it time consuming and challenging to download and visualize data without a vendor website. We also do not recommend using monitors that require direct download to a laptop.
See Chapter 7.

How data is transmitted to the vendor's website or the cloud is also important to consider and can vary by monitor type.

Data Transmission to Vendor Website or to Cloud	
Method	**Considerations**
Wi-Fi	Stationary monitors will need to have access to Wi-Fi through host password or through purchasing hotspots for Wi-Fi access. Mobile monitors will need to have access to Wi-Fi at office. May also need use of a smartphone for mobile monitoring.
Cellular	Will need local public service (typically available in urban areas and larger towns) or to buy service if needed.
Computer	Will need a laptop to connect to monitors/ do site visits.

The data management process is addressed further in **Chapter 4** and **Chapter 7.**

Health and Safety Plan

You can ensure the health and safety of your volunteers who will be doing air monitoring by developing a Health and Safety Plan. See **Resources** for the SASA Health and Safety Plan. Designate your main point of contact for volunteers as the Safety Coordinator. The Safety Coordinator is responsible for ensuring that volunteers are informed about how to address various safety concerns that may occur while conducting air monitoring and collecting air quality data. The specific information to include will vary depending on whether you have selected Mobile or Stationary monitoring. Consider Including:

- Contact information for the Safety Coordinator
- Advisement on planning for weather conditions and a cancelation plan for inclement of extreme weather
- A system for reporting and handling incidents such as injury, verbal or physical harassment, stolen or damaged equipment, and what to do if injured
- Advisement on handling situations where a community member or the police approach and ask questions
- A reminder to always put personal safety first and guidance for doing this
- Information on traffic safety
- Volunteers' rights regarding monitoring in public spaces

To increase volunteer safety, also consider:

- Creating a laminated card that has official information about the project that volunteers can share if approached.
- Providing safety vests for volunteers to help people easily identify that this is an official project.
- Having a buddy system so volunteers walk in pairs for mobile monitoring if routes have safety concerns. Just in case, provide volunteers with a smartphone to call for help or videotape an incident.

SETF volunteers wearing safety vests ready to begin monitoring.

"We had safety meetings before volunteers went out to monitor in the summer. We talked about what to do in the event that they got hot. A health clinic allowed their doors to be open in case someone got overheated, and the church provided water and allowed them to come in to cool off if it got hot out there. The health clinic and the church were also ok with people coming in to use the bathroom. We sent volunteers out in pairs because we didn't want anyone to try to count diesel trucks and air monitor at the same time. We talked about safety issues a lot, but we didn't really engage the police. If anyone had any problems or an emergency, the volunteers knew to call the office." **- PCR**

"I think our volunteers on the ground did not encounter any experiences where they felt their safety was in question, but at times people expressed concern walking around with devices and backpacks. They all were very happy to have the cards that said this is who I am and what I am doing and why I have devices strapped across my chest." **- AGSL**

Air Monitoring Plan

You are now ready to put together all of the pieces from steps 1 to 6 into a formal Air Monitoring Plan. The Air Monitoring Plan documents your air monitoring decisions and will:

- Help your team to coordinate and run air monitoring in an organized and efficient way.
- Allow you to tie your observations from the air quality data you produce (See **Chapter 7**) to your Areas of Concern so that you can make sense of the data, answer your Air Quality Question, and achieve your goal.

An example of some typical plan elements is provided below. See **Resources** for more detailed templates you can use to create your own plan for either stationary or mobile monitoring types.

Sampling Location for Stationary Monitoring / Route for Mobile Monitoring	Monitoring Days or Months	Time Period	Monitor Type	Monitor Model	Pollutants Measured	Rationale
Location: 123 Main Ave (Latitude: Longitude)	*May - Aug, Dec - Feb*	*24-7*	*Stationary*	*Purple Air*	*$PM_{2.5}$ PM_{10}*	*Near metal recycler*
Route: Starting at James and 1st street, walk south to James and 8th street, then walk back	*Mon. & Wed.*	*Flexible based on volunteer availability*	*Mobile*	*Terrier*	*NO*	*Along high traffic street*
Route: Starting at 3rd and Main Ave, walk north to elementary school	*Sept- Dec (school semester)*	*7:30 a.m. - 9:00 a.m.*	*Mobile*	*AirBeam*	*$PM_{2.5}$*	*Along route to school*

When your Air Monitoring Plan is complete, review it with your team. Does it include the information needed to meet your broader Goal and to answer your specific Air Quality Question(s)? If not, make the necessary adjustments by adding columns for additional information you feel is important.

Map of a mobile monitoring route in the South Loop neighborhood of Chicago
Brian Cassella / Chicago Tribune

Purchasing Monitors

We recommend that you keep things simple and purchase just one model for your project, as additional models can double the work needed for training, troubleshooting, and interpreting data.

The number of monitors you need should be informed by your Air Monitoring Plan's number of locations for stationary monitoring or number of routes for mobile monitoring. Consider revising your plan if, based on your budget, you cannot purchase enough monitors to cover all of the routes or locations in your plan. Based on our experience, it's best to plan ahead for units breaking or being out of commission at some point during the project. We recommend purchasing one to two extra units, and an extra smartphone if that is needed for mobile monitoring.

> *"Keep it simple. You don't need a buffet of monitors"*
>
> - **SETF**

CHAPTER 3: HOW WILL YOU COMMUNICATE ABOUT IT?

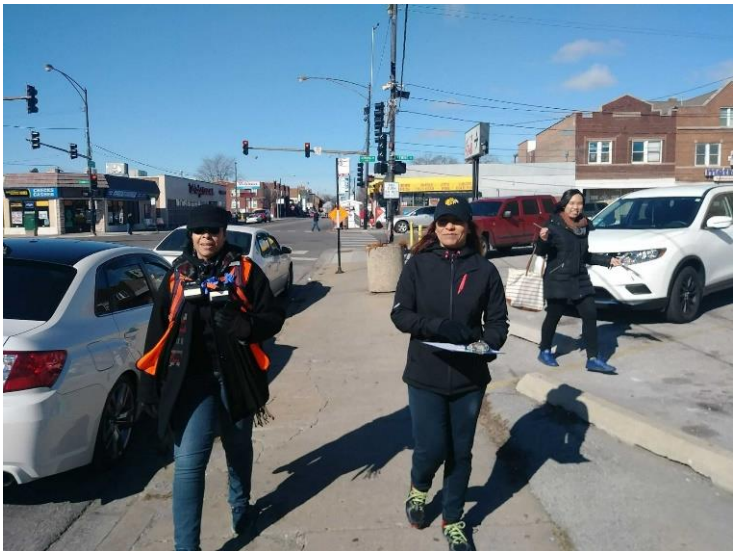
<u>Chapter 3 Overview</u>: To gain support and resources for your project, it is important to identify and effectively communicate with people and organizations in the community that have an interest in the project.

Step 1. Identify Key Stakeholders
Step 2. Plan Communication Activities and Materials
Step 3. Engage Special Stakeholder Groups
Step 4. Document Your Communication Plan

Step 1. Identify Key Stakeholders

A Stakeholder is any individual or organization who has an interest in your project, can be affected by project decisions (has a "stake" in the project) and/or who can have influence over your project planning or execution. Identifying these stakeholders and meeting with them about the project will help build support within the community, spread the word about the project, and potentially make connections with people who are able to help by donating supplies or their time for the project. Build on your past relationships and connections in the community to consider who is important to your project and what role they might play, for example:

- **Residents:** May want to give input on Areas of Concern, volunteer to monitor or host a stationary monitor, or participate in planning the project.
- **Local Business Owners:** May want to host monitors, assist with outreach, or offer financial support.
- **Local Elected Officials:** (e.g. Alderman, city council member or county board)
  May have a political interest in the project outcome, participate in advocacy, or be influenced to advocate.
- **Local Police Department:** May be interested in your project for public safety reasons.
- **Heads of Other Community Organizations:** May have goals that align with your project and interest in the outcome. May be willing to assist or advise on your project.



Some residents may be interested in volunteering for your project. SETF volunteers air monitoring on Chicago's Southeast Side

To identify or narrow down key stakeholder groups that may be relevant to the project, consider the following questions for each:

- What is important to this group or person?
- Why would this group or person want to be involved in the project?
- What can this group or person bring to the project?
- Who is the best point of contact on your team for this group?

Tip: *Buy-in and support from community stakeholders can be critical to the success of the project.*

"Our advisory committee was created because the Alliance itself isn't really a formal organization. It's a very loose and informal organization that has historically come together for different projects, so we didn't at the time have a team in place to bounce ideas off of, such as how is this going to work? What are our goals? How are we going to recruit people? Where should we focus? I know who is interested in the community, so I reached out to individuals and groups, like a "moms and tots" group, telling them that this is happening. One volunteer who served on the advisory committee was an environmental scientist. Another person turned out to be someone who is very interested in environmental issues, but also has asthma, so they had a very personal interest in this. A third person was just a general environmental enthusiast. It turned out that scheduling that group to meet was extremely difficult, so we had to meet in three different places. Our conversations helped us refine our goals and what to think about going forward. I was really grateful that people were able to share their insights and feelings. It was really helpful." **– AGSL**

Step 2. Plan Communication Activities and Materials

Activities

Consider how your project team will engage the stakeholder groups you identified in Step 1. You can use a variety of approaches or activities depending on the types of stakeholders and their interest and potential role in the project. You can set up an advisory group, organize a field trip to your community, conduct a series of small group meetings or individual one-one-one meetings, conduct a survey, or host a workshop, a public community meeting, or a potluck event. Consider the following when deciding on what kind of stakeholder approach works for your various stakeholders:

- **Formality**: Will you need an agenda and want to create detailed meeting minutes or is interactive discussion with more candid feedback more suitable?
- **Access**: Do you want the engagement activity to be available to many stakeholders or do you only want a select group to have an opportunity to participate?
- **Transparency**: Do you want the engagement activity to be held behind closed doors to keep input confidential or should it be open to the public with discussion points widely shared?
- **Depth of Feedback:** Are you interested in uncovering general concerns or problem solving for a specific issue?
- **Cost**: What resources (time and supplies) do you have available to engage stakeholders?

Think through the timing of your stakeholder engagement and communication activities so that they occur during the best time for your project. (See Timeline in **Chapter 1**). The table below provides a few examples of outreach activities, including those that the SASA project team implemented throughout the project.

Activity	Purpose	Stakeholder Group
Kick Off Meeting	Launch project, initiate volunteer recruitment	Residents, volunteers
Advisory Committee Meetings	Receive oversight, expert advice and connections to additional resources during project planning and implementation, share project learning	Community leaders, federal agency staff (e.g., USEPA, air quality health professionals, monitor vendors, academics)
Community Meetings	Solicit feedback on Areas of Concern, update community about the project	Residents, local elected officials
One on One Private Meetings	Solicit specific, detailed feedback during project planning	Local elected officials, police
Field Trips	Build support for the project in the community at the beginning	Residents, local elected officials
Media Engagement (e.g., newspaper articles)	Build support for the project in the community throughout the project, notify and identify more stakeholders	Residents, local elected officials, other community leaders, media
Social Media (e.g., Facebook, Twitter)	Promote dialogue and regular contact with stakeholders, build presence in the community	Residents, volunteers, local elected officials, other community leaders

Materials

Everything you communicate should be clear and appropriate for the audience you are trying to reach. A few examples of materials for communicating with stakeholders include:

"One of our volunteers was walking down one of the main streets in the neighborhood, and he was doing it for the whole month. The second week people started asking him questions because they saw him at the same time of day, walking the same area, and they were like what are you doing? It was a chance for volunteers to be empowered and become leaders, and to talk to other folks around. He said 'we're LVEJO, we do XYZ, if you want to learn more contact them.' That was really nice to see community members take that leadership."- **LVEJO**

LVEJO volunteer interns presenting to the Little Village community their observations from the data collected by one of the air monitors.

Communication Materials	Format	Timing
Social Media Posts: Share informal project updates with community in real time	Quick phrases, sentences, photos	Daily to once a week
Flyer: Announce events	Brief - approximately 1-page, limited text, color images	As needed for scheduled events
Brochure: Provide broad overview of project long term	Brief - 1 to 2 pages, color images	Created and printed once, early in the project, for meetings and other community events; can be posted online; share with media as needed
Report: Share an in-depth review of project goals and project findings about air quality	Lengthy & detailed - many pages	Likely toward the end of the project; can be posted online; distributed at meetings; shared with media

Step 3. Engage Special Stakeholder Groups - Volunteers and the External Media

Volunteers

Identify Groups of Prospective Volunteers

Your project will rely on a committed group of volunteers to actually conduct air monitoring to collect air quality data, so it is important to consider early on what groups you can engage. The goals of your air quality monitoring project will probably influence who you recruit to volunteer and how you will do it. You may draw from one particular group or engage multiple types of volunteer groups in your project. For example:

During a day when volunteers were not available to monitor, LVEJO staff conducted air monitoring on a residential street that experiences frequent traffic from large diesel trucks.

- **Local school science program teachers and students:** More structured, a larger group, but may have safety and scheduling restrictions
- **Local college students:** A larger group that could have a special interest in your project and bring special skills, may have scheduling restrictions
- **Community organization members or past volunteers:** Mission aligned and a passionate group, may be a limited number
- **Interns:** Mission aligned, may only be available for a short period of time like a semester or summer
- **Community residents:** Have a stake in your project, may take more legwork to recruit new volunteers through cold calls, door to door, social media, and community meetings

Recruit Volunteers and Get Commitment

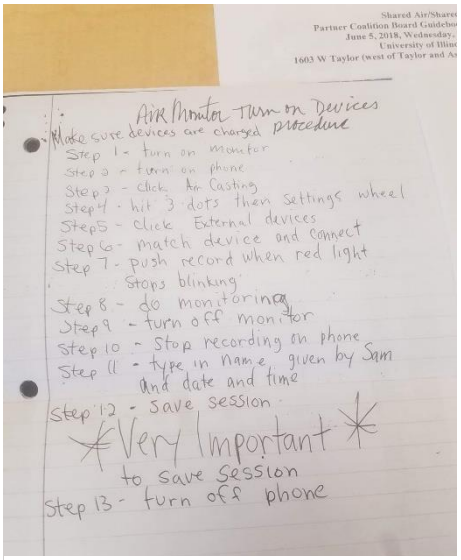
When recruiting volunteers, be clear about their role - how much time they will need to dedicate and when, what you will provide them (e.g., equipment, data forms, water bottles, etc.), where they will need to be, how they will stay safe per the Health and Safety Plan (See **Chapter 2**), and if there are any other responsibilities they will have. Some of this information can be captured in a brochure that you can create specifically for volunteers.

"We basically found volunteers (18 to 60 years old) through word of mouth. We have people we can rely on, so we called our volunteer base and asked them if they were interested in this volunteer program. We marketed and let people know in our community that we were conducting air monitoring by using our social media pages, like our Facebook page. We reached out to the library for volunteers and they told us we could put up fliers there. The daycare lady, she let us put fliers up in there because she's got the parents picking up kids. The laundromats, and there are four, we did all the laundromats and spoke with people in there. We did the stores - the internet store, convenience store, and the lumberyard." - **PCR**

Create Training Materials

To train volunteers on how to actually conduct air monitoring, you will need to develop training materials. Shorter materials with brief bulleted information with screenshots and other visuals are better. To see example training materials from the SASA project, go to **Resources**. Consider the following when creating training materials for volunteers:

- Review the materials provided by vendors. The materials provided by some vendors may be too lengthy or jargon heavy for training volunteers.
- Consider writing materials yourself that use bulleted information and pictures.
- Include information about troubleshooting or what to do and who to contact if equipment stops working.
- Make materials for volunteers easy to carry or fit on a handout for volunteers hosting a monitor at their home or business.


Air Monitor Turn on Devices procedure
Make sure devices are charged
Step 1 - turn on monitor
Step 2 - turn on phone
Step 3 - click Air Casting
Step 4 - hit 3 dots then Settings wheel
Step 5 - click External devices
Step 6 - match device and connect
Step 7 - push record when red light stops blinking
Step 8 - do monitoring
Step 9 - turn off monitor
Step 10 - Stop recording on phone
Step 11 - type in name given by Sam and date and time
Step 12 - save session
Very Important
to save session
Step 13 - turn off phone

Directions created by SETF volunteer for using an air monitor.

SETF staff running an air monitoring training session for volunteers.

"Assess your volunteers and their tech abilities so you know how to present the information. We purposely brought in people who we knew wouldn't be tech savvy - who were difficult. We did this so that we could write the instructional materials specific to the users. One of our volunteers dummied down the monitor directions to steps 1, 2, and 3, instead of the way the initial instructions were written down, which were clearly written by someone who had some education in it. The revised directions were easier to follow and were like: 1. Do this, 2. Do this - the monitor is purple, the button is on the right side." **- SETF**

AGSL checking in with volunteers. Brian Cassella/Chicago Tribune

Keep in Touch:

To keep your volunteers trained and engaged in the project, ongoing communication will be needed. Conduct regular, brief check-ins to make sure the volunteers know the monitoring schedule, can report problems with equipment, share lessons learned with each other, stay safe, and stay informed. Depending on volunteer schedules and preferred modes of communication, consider keeping in touch through email, texts, or in-person.

"I used to go out and check on everyone and find out what's going on in this area, and then go to the next area. I wanted to see if everybody was OK." **- PCR**

The External Media

Newspapers, radio, or television are tools that can help generate support from public officials and shape local opinion especially if advocacy is your goal. Draft and pitch some opinion pieces to the local newspaper. An op-ed timed with the launch of the project or that coincides with another key project milestone can generate additional media attention and give you an opportunity to explain more fully the scope of the project compared to a brief interview or newspaper article snippet. An op-ed from a community stakeholder can be even more powerful - all the more reason to identify key stakeholders and figure out ways to engage them early on in your project. Other tips for engaging the external media include:

- Start building relationships with reporters, editors, local officials or their staff early on. You want to make sure they know about the project and have some background information about the issue.
- Identify local newspapers and reporters who might be interested in covering the project and highlighting it in their publication.
- Create a brief description of the project and photos to send to them.
- Prepare talking points about the project for potential interviews. Focus on why people should care about the project and then talk about your goal and the Air Quality Question you are trying to answer.

"To get people involved, I don't think we reached out to media outlets. We shared the project a couple of times on our Facebook page. We have a pretty strong, big base already, so it was more about asking some of those people that we already knew 'hey, would you be able to help us with this project.' I don't think we reached out to the media until later." - **LVEJO**

Step 4. Document Your Communication Plan

The template below can be used to create your communication plan. See **Resources** for a full blank template.

Date	*Stakeholder Engagement Activity*	*Main Objectives*	*Participants to Involve*	*Materials*	*Point Person*
8/22/18	*Kick off meeting*	*Gather key stakeholders to inform of project launch, ask for input on plan*	*Residents, elected officials, and other identified stakeholders*	*Flyer, social media posts to advertise meeting, project brochure to distribute at the meeting*	*Head of our organization*

SECTION 2:

DURING AIR MONITORING

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CHAPTER 4: RUNNING AIR MONITORING IN THE OFFICE

Chapter 4 Overview: To stay organized in the office during monitoring, you will need to use tracking forms, keep equipment in the office organized, and manage data.

Step 1: Logs and Forms
Step 2: Office Equipment and Supplies
Step 3: Data

*Some tasks are labeled by monitor type (**Stationary** or **Mobile**) to allow you to easily skip over guidance that is not relevant to your project.*

Step 1. Logs and Forms

Organizing and tracking information helps ensure that details you will need to reference while running your monitoring project are available when you need them. The level of documentation necessary depends on both your project goal and the reliability of the data it requires (See **Chapter 1**) as well as the amount of equipment you are managing. However, when tracking information, do what makes the most sense for your team. Two key questions will help determine what documentation you need. Be both intentional and realistic by asking:

- What information will we need to run our project well?
- How much time do we have to devote to documentation and management?

Information to Track

The following information is helpful to track for the different monitoring types.

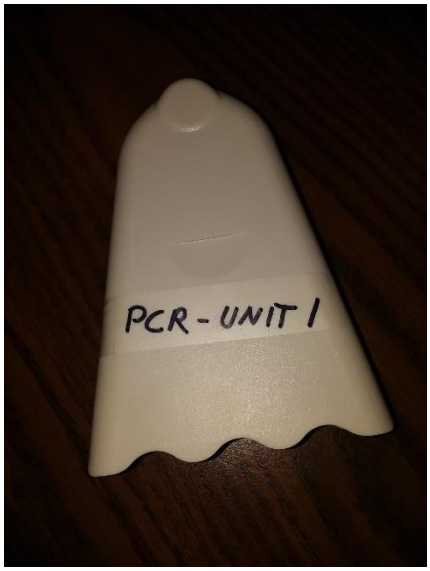
Both Stationary and Mobile Monitoring:

- **Monitor Serial #s and Unit #s:** Log serial #s for all monitoring units and label them (using tape and a waterproof marker) with a standard, simple naming convention (e.g., “Unit 1, Unit 2”) You will likely need this information to report any issues to the vendor and it will be helpful for you when you do inventory checks.

- **Monitor Problems:** Log monitor problems or malfunctions by monitor serial #s or unit #. Keeping a log will help you to resolve issues with monitors more quickly since you will have all the information you need readily available for the vendor. A log can also help document fixes for common malfunctions and can help identify units that have ongoing issues.

- **Calibration Results:** Some mid-cost monitors (i.e., $1,500 to $2,000) may require occasional calibration to ensure a monitor is working correctly. If you use this type of monitor, consider documenting the results of calibration, when the calibration was done and by whom so that you can ensure that calibration was done correctly and prove that your monitor was working well.

- **Data Quality Assurance/Quality Control (QA/QC):** See Step 3 on page 50



PCR AirBeam mobile monitor labeled using a waterproof marker

Stationary Monitoring

Purple Air stationary monitor (white device) mounted approximately 5' above the ground (in breathing zone) on fence near LVEJO office entryway 8' from the street.

- **Monitor Location**: Document in your Air Monitoring Plan (See **Chapter 2**) the location of each unit using latitude/longitude, street numbers, street intersections, or landmarks as needed. You will likely need this information to register monitors and report issues, and it can be obtained from the GPS on a smartphone while you are mounting the stationary monitor.

- **Location Description:** Consider including more specific information about monitor placement (e.g., 'placed 5 and a half feet above the ground' or 'located eight feet from the street') to show how close a monitor was placed to pollution sources (like a busy street) or that it was placed at the average height of an adult to tie results to what people could be breathing in.

Mobile Monitoring

- **Observation Log for Pollution Sources Observed**: Consider asking volunteers to track how often they see pollution sources near them, like trucks or smoke stacks, as they monitor. This can be helpful for interpreting your data. An example template that you can use is provided in **Resources.**

- **Monitor Sign Out Information:** Log unit # and volunteer name. This can help with keeping track of your monitors if loaned out. See Mobile Inventory Checks under Step 2 for more information.

"Folks in the community were learning about their own community too. I had a volunteer who lived on one of the biggest main streets in the neighborhood and they walked their block. I told her don't run, also don't walk super slow, take your time, but also observe what's going on around you. She told me that was the first time that she and the other volunteers did that - looked around and really paid attention to what was going on versus just getting from Point A to Point B. It was more intentional. They started noticing that there are a lot of trucks that pass by their house every single day, and as you keep going East or South there are even more trucks. It was interesting for them to make those connections or observations that they probably just weren't really paying attention to before because they were just busy thinking about where they have to get to. Occasionally, they will text me now and say 'there are so many trucks today. I don't know what's going on.' I'm pretty sure it's just a regular day, but once you start noticing it, you just can't stop." - **LVEJO**

Format for Tracking

Record keeping can happen using different formats. Consider which format works best for you:

- **Hardcopy or Paper Forms:** may make it easier to capture information on site visits to mount monitors or while on mobile runs and does not rely on access to a computer.

- **Electronic Forms (e.g. using Microsoft Word or Excel):** can help with organization, reduce the need to manage paper, and reduce the need for data transfer later on.

While mobile monitoring, AGSL volunteer on left recording on observation log nearby pollution sources in the South Loop identified by volunteer on right. Brian Cassella/Chicago Tribune.

Step 2. Office Equipment & Supplies

Purchase Additional Equipment & Supplies

In addition to purchasing monitors, you will also need to buy and keep track of other equipment and supplies needed for the project. These may include smartphones (to operate a mobile monitor through your vendor's app if needed), backpacks to carry supplies, power strips to plug in mobile monitors at night, extension cords, zip ties, clip boards, and many other supplies. **Resources** includes a list of supplies and additional equipment (costs in 2018 dollars) used by the SASA team.

TIP: *Most air monitoring supplies can be purchased in either a hardware or home store, an office supply store, or through an online vendor that will deliver everything right to your door.*

Setup Monitors

To ensure that the monitors you purchased are working correctly, set them up in the office first:

- Plug in/power up your monitors in your office prior to the start of the project to make sure that each unit is working and, depending on the power source, is holding a charge.
- Set up smartphones and install and test a smartphone app if the vendor requires this for your monitor model.
- Register your monitor through an app or online platform if required by your vendor.
- Install special data viewing software if your monitor model does not come with a vendor website (SASA does not recommend using such a monitor) that allows you to view the new data being generated each day. Install and test the software on your computer using the vendor's instructions before starting monitoring.
- Make sure your team knows how to view data on the vendor's website.
- Conduct inventory checks.

"We don't have a brick and mortar headquarters. There is a business in the South Loop though that's very community-focused and they have some extra space. We approached them about sharing their space so we could store things, charge equipment, and have our volunteers meet there. This worked out great because the business was a coffee shop, which was very nice. The ownership of the coffee shop changed over the course of the project, so our relationship changed a little bit but, overall, we were able to use the same room both times though we had to pay a little bit more. The first time around, we gave an honorarium, but the second time around we had to pay real rent to use it, but it worked out. And it worked great. If the coffee shop had not worked out, I would've approached schools and churches." **– AGSL**

Mobile Monitoring

Keeping track of your monitors, smart phones (if needed) and supplies during mobile monitoring is critical. If your organization has an office, you can keep all the equipment there. Alternately, you can check out monitors to volunteers as needed.

If you are keeping the equipment in the office:

- Make sure to plug in and charge monitors overnight using a power strip if needed.
- Provide a backpack to volunteers to carry any supplies, forms, and maps needed while monitoring so that these stay organized and together.

AirBeam mobile monitor and companion Smartphone removed from packaging and plugged in for initial charging.

If your organization does not have an office or if your monitoring routes are not conveniently located to your office:

- Consider having volunteers borrow/sign out monitor units for the duration of monitoring. This works best if you have consistent volunteers.
- Keep a log of signed out monitors including monitor unit #, date signed out, and by whom.

*"A lot of monitoring that we did was on the west side of the neighborhood and our office is pretty much on the east side, so it was difficult for some folks to come here all of the time for just equipment. When people needed to share equipment, we made sure that it worked with their schedules - like if someone was going to work, they would drop it off in another person's mailbox. It worked well. I asked folks if they thought it was a nuisance and they said it worked fine. It was on their way to either school or work or wherever they had to go, and it was nice that they didn't have to come all the way over here just to pick up equipment."- **LVEJO***

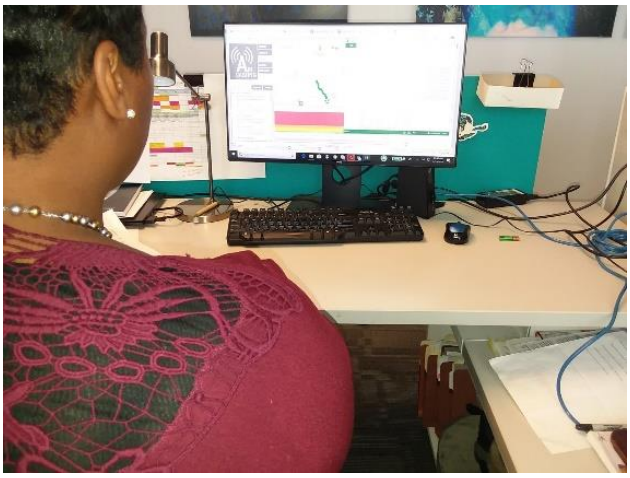
*"We assigned volunteers certain equipment and every time they would come each volunteer would use their same equipment. They would have to take out equipment by signature and then bring it back." - **PCR***

Stationary Monitoring

Keeping track of additional supplies for stationary monitoring like zip ties for mounting, mounting brackets, and screw drivers is also important. The SASA team purchased big plastic bins to protect monitors during transportation and to keep all the supplies tidy. Store bins at your office or in another secure location as appropriate.

Conduct Online Monitor Checks

If the monitor model you chose has a web-based data viewer (recommended by the SASA team), bookmark the site on your computer's browser and check it daily to make sure that new data is regularly coming in. This will help to confirm that each monitor is running correctly. For mobile monitoring, a monitor check can also help ensure that your volunteers are completing mobile routes on schedule and correctly following the route that they were assigned (if the vendor's website maps routes that have been completed).



Checking an air monitor vendor's website to make sure that a mobile route is being recorded correctly.

Troubleshoot with Vendors

Identify the best method of communication (e.g., calls vs. emails) that works for both you and your vendor and remember to be persistent. Vendors for many of the newer, low-cost monitors are often just one or two-people shops. The vendor may be very busy at times, so you may need to be a "squeaky wheel" and reach out more than once to get a response.

***TIP:** When troubleshooting, good record keeping can help you to report and resolve issues more quickly as vendors will need reports associated with serial numbers and want specific information about monitors.*

Step 3. Manage Data

Set Monitor Reading Rate

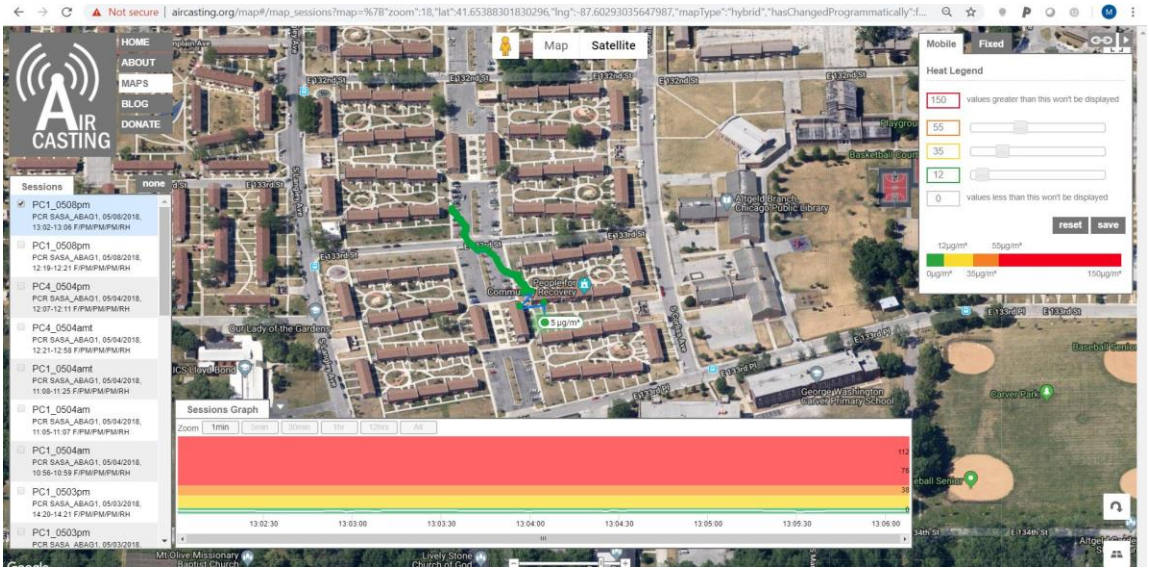
Even if your project uses only one air monitor to collect air quality data for one location or route over several days, it will generate a large amount of data. The reason for this is because some monitors are set by vendors to take a reading once a second.

***TIP**: Check your monitor's owner's information on vendor website to learn how to change the reading rate if needed.*

Many air monitors can be reset to collect air quality readings at different intervals (i.e., once a minute or every few minutes). Once a second will produce a very large amount of data while once a minute produces a more manageable amount of data.

Download Data

Assuming that the monitor model you are using has a vendor website from which to view your data, the vendor will be storing your data in its own server in the cloud. While you can continue to view your data on the vendor's website, over time it can become difficult to view older data or you may not have continued access to your data if the vendor should later go out of business. If you later need to prove or document the conclusions that you draw from your air quality data (See **Chapter 7**), you will want to have the original data stored in a place that is safe, backed up, and easy for you to access.



Downloading Mobile air monitoring data from vendor's website to your computer.

Set up a process for downloading and saving your data based on how the monitor communicates and the technical skills on your team. Possible options include:

- Manually download your monitor's data to your computer's hard drive or your organization's server at the end of each day by using the links and capability provided by the vendor website.
- Connect to the vendor's application programming interface (API) to allow the vendor's website to automatically communicate with your server. (This option requires software programming expertise.)

Safely Store Data

Consider purchasing an external hard drive to back up your computer or purchase storage space on a cloud server to safely and securely backup your data. Personal laptop and desktop computers have a limited amount of storage space on their hard drive (about 250 GB is typical). This should be more than enough storage for limited mobile monitoring. However, if you are using several stationary monitors for

extended periods of time (i.e., months) saving all the data to your computer's hard drive may significantly slow your computer. Consider purchasing additional storage space on a cloud server.

Review Data for Potential Problems

All air monitoring models (even very expensive professional models that cost upwards of $10,000) can sometimes experience "glitches" or temporary problems when taking air quality readings.

Quality Assurance Quality Control ("QA/QC") is a process used by data analysts to ensure their data set is high quality and credible. QA/QC involves technical processes to find "false" readings, like those caused by technical glitches, and remove them from the dataset. Leaving false readings in can sometimes cause problems with your data analysis. For example, the two most common problems with air quality data are:

- A long span of zero readings minute after minute that can cause your 24-hour average reading or your route average reading to be lower than it should be. This could occur because of monitor malfunction, such as the monitor temporarily losing power.

- A series of unusually high readings that don't make sense to you and could suggest that there is a concern with your air quality when there isn't. This could cause your 24-hour average reading or your route readings to be much higher than seems reasonable. It may occur if dust particles get trapped in the monitor's intake valve, causing repeated high false readings or if the monitor malfunctions (e.g., overheats).

Lessons Learned from the SASA Team: Basic QA/QC

The QA/QC process can be complex, and if done manually, can become time consuming if not practiced every day that you monitor. The SASA team recommends that you manually perform a basic QA/QC of your data each day.

1. At the end of the day using the monitors (once you have downloaded the data to your computer), visually scroll through the data and look for sections of the data showing repeating zeros for many minutes or extremely high readings for a short period of time (i.e., five minutes) that you cannot explain.

2. Keep a log either on paper or electronically to notate potential problems that you see with the data and, if possible, mark that data in some way (i.e., shade that data a particular color).

3. When you see data that you think may be "false," record in a log the date this data was collected and the monitor type and number in the log.

4. Do not delete any data. Enlist the aid of technical support or an air quality data statistician (See **Chapter 7**) to determine how to manage these potential problems with your data.

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CHAPTER 5: RUNNING AIR MONITORING IN THE FIELD

<u>Chapter 5 Overview</u>: This chapter explores the steps needed to convert all of your planning into action and to keep things running smoothly while monitoring out in the community.

Step 1: Create a Schedule for Monitoring
Step 2: Train Volunteers
Step 3: Set up Monitors

*Some tasks are labeled by monitor type (**<u>Stationary</u>** or **<u>Mobile</u>**) to allow you to easily skip over guidance that is not relevant to your project.*

Step 1. Create a Schedule for Monitoring

Communication and coordination between the project team and volunteers needs to be smooth and each volunteer should know what is expected of them, such as where they need to be and when. Use your Air Monitoring Plan (See **Chapter 2, Step 6**) and input from volunteers to create a working schedule or calendar to keep you on task but keep it simple and only include the information you need to stay organized. Types of information to consider include:

- Dates volunteer health and safety training will occur
- Dates volunteer monitoring training will occur and for which volunteers
- Days and times each mobile route will be run
- Dates you will begin and end stationary monitoring
- Volunteers who will carry monitors on mobile routes
- Volunteers who will mount stationary monitors and when
- Contact information for volunteers and backup volunteers

"We recommend that the volunteers receive a schedule of their monitoring times. We tried to have everyone air monitor at the same time, but I don't know if that always happened. Volunteers' personal schedules sometimes made it hard to work out the schedule." **– SETF**

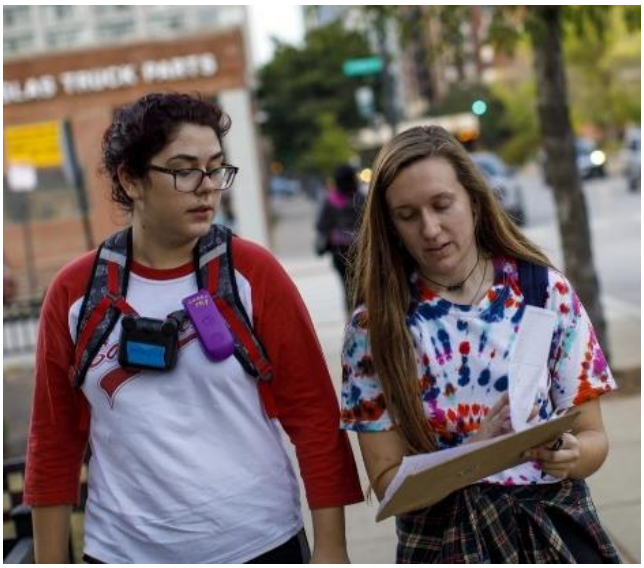
Calendar Format	Considerations
Digital	Electronic calendar via Google or Microsoft Outlook can allow you to add notes and provide easy access to other program participants.
Paper	Paper calendar can travel with you when meeting with volunteers outside the office.
Combining with Air Monitoring Plan	Keep everything in one place by adding scheduling information to your air monitoring plan by adding more columns.

"The system for tracking the volunteers is super important. I had to set up my system on Google Drive because that way everyone had access to it and everyone was able to see, but I also had pages of handwritten notes. Just make sure that whatever format you use works for specific community group members in their own ways." - **LVEJO**

Be prepared to adapt if things change. Build in time cushions and buffers because activities can sometimes take longer than you think; weather doesn't always allow things to go according to the initial schedule, monitors can break and take time to fix or replace, and scheduling conflicts may arise that prevent monitoring on an assigned day. Additional scheduling considerations by monitoring type are:

Mobile Monitoring

- Increase efficiency by keeping the same volunteers on the same routes throughout the monitoring period. This will also add consistency to the data collection process and allow a volunteer to get to know the area.
- Provide flexibility for volunteers to switch routes or times to allow those that have less predictable schedules to participate.
- Make sure volunteers are comfortable with routes and know if/where there may be unsafe areas or times to monitor.
- Pair volunteers into teams, as needed, to increase their safety and to make monitoring more enjoyable.



AGSL volunteers mobile monitoring in the South Loop neighborhood. Brian Cassella/Chicago Tribune

"We tried our best to be respectful and mindful that some volunteers were students, some of them were parents or caregivers, and some of them work night shifts and wanted to do air monitoring in the morning. We tried our best to work with them by also letting them know if for whatever reason they couldn't air monitor one day that's fine." **- LVEJO**

Stationary Monitoring

- Schedule time with potential hosts (volunteers, other community residents or businesses) 4 to 6 weeks ahead of your monitoring start time to explain the project and their role (e.g., time commitment, use of their power, use of their Wi-Fi connectivity, etc.). This could be done via a phone call or a group meeting but should occur early to work through expectations and get commitments.
- Schedule a day to visit the host and install the monitor about 2 weeks prior to the beginning of the monitoring period.
- Schedule a backup day for the installation in case something comes up, weather is bad, or you need to return to finish up the installation.

A template for a schedule is included in the **Resources** chapter of the guidebook.

Step 2. Train Volunteers

To prepare to train volunteers, think about who the members of your volunteer group are and how you can best ensure that training is effective. Best practices for volunteer training include reviewing needed information with them more than once, providing any essential information in brief handouts volunteers can take with them, and avoiding a straight lecture style of training. Instead use more hands-on training where they handle equipment themselves.

SASA technical team working with SETF community organizers to prepare for volunteer training on air monitoring.

Health and Safety Training

Schedule a time to go over the Health and Safety manual (See **Chapter 2, Step 6**) with your volunteers. They need to know what to do (or not to do) to be safe and what is being provided to help keep them safe, such as:

- Make sure volunteers know the dates and locations for the health and safety training.
- Provide a paper copy of the plan to each volunteer ahead of time and go over the plan during the training.
- Keep paper copies in the office for volunteers to review as needed.
- Emphasize areas that you think are most important, like not monitoring during a thunderstorm or what to do in the case of theft or if someone feels threatened.
- Make sure everyone has the provided supplies, such as water bottles, palm cards, etc.
- Leave ample time for questions.

"If somebody comes up to you and steals your phone or the equipment, don't go chasing after it. With both the mobile monitors and the stationary ones, I told them the same thing - if someone steals it, if you wake up and the monitor is not on your fence, just let me know. I'm not going to charge you, it's not your responsibility, you're just helping me host this monitor. For folks who were walking, we figured out with volunteers what worked best. Depending on their comfort level, some had phones out while they were walking and that was up to them. If they wanted to put it away for safety reasons that was OK too. We reassured them that if anything gets stolen, don't worry about it. Equipment is just a material thing versus someone's life." **- LVEJO**

"The vests were very helpful because they made us look more official. If you're walking around the community, people want to know what is going on, and so they may give you strange looks or have some type of idea that you may work for the city or are doing a survey. One of our volunteers got stopped by the police. He was walking through the alley with a backpack on, holding a piece of equipment, and they thought he looked suspicious. If the vest had said "Air Project" or "Clean Air," the police might not have hassled him so much." **– SETF**

Monitoring Training

Volunteers need to be comfortable with all aspects of operating the monitors and any related equipment like smart phones. Training and test runs make a huge difference in terms of volunteers being able to collect good air quality data and have a positive experience overall. Helpful tips to ensure this include:

- Order equipment well in advance to schedule training ahead of the monitoring period.
- Allow ample time for training. Volunteers learn at different paces.
- Provide each volunteer with a monitor or at most have only two volunteers sharing a monitor during the training, if possible.
- Go over any equipment or supplies that will be used beyond just the monitors (e.g., mounting equipment for stationary monitors, smartphones, backpacks, mobile monitoring observation logs.)
- Include hands-on practice and/or a trial run so volunteers can get practice using the monitors and feel comfortable.
- Prepare training materials that are brief and clear, have lots of visuals, and avoid technical jargon. Manuals provided by the vendors may be hard to follow. See example monitor training materials in **Resources** and **Chapter 6.**
- Prepare training materials in the languages spoken by volunteers, as needed.
- Be prepared to conduct refresher trainings as your monitoring progresses.

SETF volunteer receiving hands-on training with air monitor and smartphone.

> *"Factor in a dry run. Our volunteers never did a dry run. They just did the training and then we sent them out to monitor. So many crazy things went wrong the first day because they had no real experience with actually being out there monitoring."*
>
> **- SETF**

Step 3. Set up Monitors

Mobile Monitoring

Set up of mobile monitors can be handled mostly in the office (See **Chapter 4, Step 2**) However, before sending out volunteers with monitors to walk your neighborhood:

- If possible, attach monitors to the straps of a backup or a lanyard so that volunteers may conduct monitoring hands free and so that the monitor is located close to the volunteer's breathing zone.
- Turn on monitors only at the designated beginning of the route and turn monitors off as soon as the route is completed.

LVEJO staff person demonstrating how to position mobile monitors on backpack strap so that hands stay free.

> *"Overall they did real well, and they were really excited about doing it."* **– PCR**

> *"Make sure people actually know how to turn the monitors on when they are out in the field. At first the trainer would turn on the monitors at the office (not realizing that was a mistake) and then volunteers would travel to their site with the monitors on. They were monitoring the air on the way to the site as opposed to going to the site and air monitoring there."* **– SETF**

> *"Not everybody checked to see if their smart phones and monitors were actually recording data while they were walking. Some people were very alert to this and when the devices weren't working they would stop to reset the device to make sure they were working. Other people weren't alert to this. They walked for 40 minutes but didn't record anything."*- **AGSL**

Stationary Monitoring

Prep for Installation

You will need to secure commitments from hosts to install monitors on their property. Review the monitoring locations in your Air Monitoring Plan and consider the project team's network within the community. Keep the following things in mind as you work to secure the host locations:

- Identify who on the team has an existing relationship with a resident or business owner.
- Make sure the person who is recruiting hosts can explain what the project is, what they are committing to, for how long, and why. A project flier can be helpful along with a few short and clear talking points previously agreed upon by the team.
- Visit each potential site to make sure it is secure (not prone to theft) and the host understands their responsibilities - see below.
- Create a short and simple form the host can read and sign that outlines what they are committing to.
- Ensure electrical outlets are available if the monitor is not battery powered. Access from the host to either an outside outlet or an indoor outlet via an extension cord through a window could be necessary.
- Ensure the host allows access to their Wi-Fi network. Most stationary monitors need to connect to a local Wi-Fi network or cellular service to communicate. If Wi-Fi is not available from a host, consider purchasing a hotspot that you will plug into an outlet and place near your monitor in a waterproof container.
- Ensure permission from the host to access the monitors if they are not working properly.
- Clarify that hosts are not liable if a monitor is stolen.
- If the budget allows, offer hosts a small stipend, (e.g., $25, for their participation and use of their power and Wi-Fi).

Two Aeroqual mid-cost air monitors for monitoring Nitrogen Dioxide from vehicle tailpipes mounted by AGSL on parkway fencing near storefront in the South Loop neighborhood. Brian Cassella/Chicago Tribune

"Some equipment may draw the attention of neighbors. Help to relax the residents by stating 'there is no camera and this equipment only monitors pollution and air.'" **- SETF**

"It's not easy to install stationary monitors. You need to make a big effort ahead of time. Unless the whole community is in on the project, it's harder to get people willing to just set up air monitors in their backyards. Also, give people plenty of time when you have to ask for permission to place equipment on their property and make sure they know what is required of them. Be sure to speak with someone with the right authority when asking to place stationary equipment. We had people tell us 'no' when we went to actually install the monitor after they said 'yeah, sure.' That's what happened at the restaurant. We spoke to the waitress who said it was cool, but she didn't have the authority." **- SETF**

***TIP**: A hotspot is a device about the size of your palm and can be purchased from most cell phone vendors for about $100 with a charge of $40/month for service.*

Install Monitors

After you have confirmed each site is appropriate and received permission from the hosts:

- Make sure that you set up the monitor well in advance (about two weeks) of when you want to begin monitoring to make sure that you have time to work out any "bugs" with power connections, communication (Wi-Fi or cellular), or mounting equipment.
- Bring the training materials and some tools you might need during installation. It's best to work in a team of two to have the installation go smoothly (one person to hold the monitor and the other person to position and tighten mounting equipment).
- Try to mount the monitor at about 5 feet off the ground to mimic the average person's breathing zone.
- Plug in your monitors when ready to begin air monitoring.

SASA partners from LVEJO, SETF, and Delta installing a MetOne air monitor 5' above the ground (breathing zone) to monitor $PM_{2.5}$.

*"We didn't know that the owner of the local convenience store, where we had a Purple Air mounted, shut down the power at night – he did it out of habit. When we found out, we told the owner that 'when you do that it messes up our monitoring because you shut down our monitors.' He didn't know, so he apologized and after that he didn't turn off the power anymore. He unplugged everything else in the store, but he kept us plugged in."***- PCR**

Lessons Learned from the SASA Team: Businesses as Hosts

The SASA team was hoping to utilize connections with the business community and install stationary monitors in areas where there is retail and lots of foot traffic. However, we found that local business owners were reluctant to commit their Wi-Fi connections. Local businesses were concerned that having a monitor mounted on their building would create too many questions from customers.

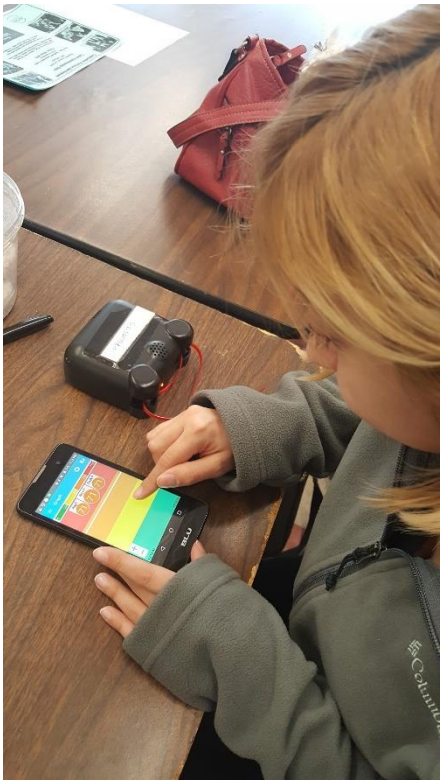
Troubleshoot with Volunteers

Be available to troubleshoot equipment problems with volunteers and provide assistance during monitoring. This might involve going to the site where stationary monitors are installed or coming on a scheduled route with the volunteer team to fix any problems along the way. It might also be useful to join the volunteer team conducting monitoring from time to time to ensure that data is being collected according to how they have been trained.

"The second time we went out to monitor the service was dropping and the phones were acting crazy. It was frustrating and a big problem for a while." **- PCR**

"Our volunteers definitely had a range of skills. I think LVEJO though was probably one of the only community groups that had younger [college aged] volunteers who were more able to troubleshoot some of the problems with the smart phones. Also, whenever they would mess up when using the monitors, we knew it was just because we were learning it new together. They didn't shy away from figuring out problems with the monitors or smart phones on their own. It was really nice to see community members taking it on themselves to figure out problems instead of being like 'the phone isn't working, I'm not going to go out and do it.'"

-LVEJO



SETF volunteer troubleshooting problem with AirBeam and smartphone.

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CHAPTER 6: COMMUNICATING DURING MONITORING

Chapter 6 Overview: As your team begins air monitoring, it's time to also implement the communication plan that you developed as you were preparing to launch the project (see Chapter 3).

Step 1. Review and Adjust the Communication Plan
Step 2. Create Materials
Step 3. Implement the Plan

Step 1. Review and Adjust the Communication Plan

In **Chapter 3** we discussed the importance of identifying community stakeholders to involve and communicate with throughout your project as well as planned activities to engage your stakeholders. It is time now for you to review your communication plan, make any needed adjustments and execute your plan. Adjustments may be needed for a variety of reasons (e.g., perceptions about air quality in the community have changed, another organization interested in the project was identified, or the volunteer group that will be engaged is different from expected).

*"Since LVEJO's volunteers were a little bit younger than the volunteers for the other communities, texting worked perfectly. I was able to communicate with the volunteers pretty much at all times during the day. Being flexible was important (I told them that if it was an emergency to give me a call,) but so was setting boundaries for the organizer and community members, for example, to be respectful of not texting too late." - **LVEJO***

Step 2. Create Materials

General

- Make a list of all the materials you will need - flyers, brochures, talking points, etc.
- Prepare your materials using basic graphic and software tools such as Microsoft PowerPoint and Google Docs.
- Make sure materials are easily identified as relating to your project, for example:
    - Include project name, contact info, organization logo, and similar fonts and colors.
    - Convey the most important information you want to share with the stakeholders.

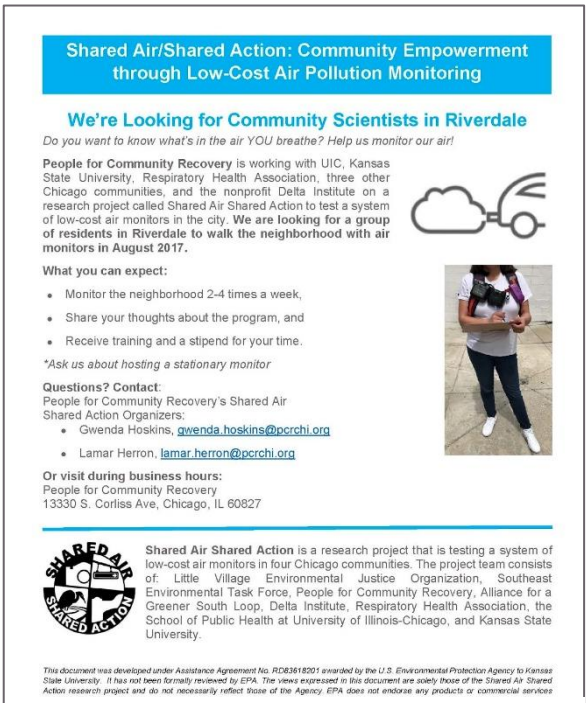
LVEJO flyer created for recruiting volunteers.

For Volunteers:

- Make sure flyers have training times and locations, a brief description of what a volunteer's role in the project would be, as well as basic information about the project.

For Social Media

- Create posts for social media to reach volunteers, to schedule trainings, and share basic information about monitoring activities.
- Make a list of social media handles of the stakeholders/organizations who already have social media presence (and appropriate hashtags) and tag them when sharing pictures or brief updates about the project to have a broader reach within the community.
- Draft a list of tweets/posts so you will be ready to engage with community residents at moment's notice.



PCR flyer created in collaboration with Delta and LVEJO for recruiting volunteers.

> *"During monitoring, I felt like communication was on an as-needed basis. If any reassurance was needed people reached out. We have a pretty active community on social media" -* **AGSL**

For the Media:

- Review your project's talking points and tailor them to media outreach.
- Use the materials you have already created to invite media to community meetings or to join volunteers during monitoring.

AGSL volunteers air monitoring in Chicago's South Loop neighborhood.
Brian Cassella/Chicago Tribune

> *"In terms of the media, we look at our campaign or our project and see if and when we want to start releasing information, for example, in the next 6 months or 3 months. We also look at what that could mean for other community members and other communities. What does it mean to overshare your project? Is that really a good idea? You also have to think about your other goals. If you have a goal to advocate for a new elected official, you probably don't want to tell them you're doing air monitoring if he or she doesn't support environmental issues. It is important to just think about some of these things. Yeah, media attention is great, but it could also hurt your project. We just don't share stuff until we are ready."* **- LVEJO**

Step 3. Implement the Plan

You can now begin to schedule your planned meetings, trainings, and other events. If possible, identify other events or planned activities in the community and use those opportunities to your advantage. For example, if there is a town hall meeting planned, ask if you can get a spot on the agenda to provide an overview of the project. Also, if your monitoring activities happen around Earth Day, it's a good opportunity to share something about your project on social media to remind residents about the project.

LVEJO staff discussing air monitoring project at public meeting.

Finally, you will want to track the implementation of your plan. The SASA team recommends you track your outreach and communication activities in an organized way. This will allow you to see if you reached the stakeholders that are important to your project and document any desired next steps that arise after meetings and events.

The SASA community organizers held at least 19 activities to inform the community about the project - through workshops, board meeting presentations, and one-on-one community outreach. There were nine events to recruit volunteers, six volunteer trainings, and four meetings were held to update community members about progress. Each organization used the approaches that fit their individual community as demonstrated below:

- LVEJO held a community potluck and publicized using fliers and social media to get volunteers and give an overview of the project.

> *"We had maybe two meetings during the monitoring period and I always had food and snacks. For the first year, we also had a lot of general LVEJO events (like weekly potlucks at our community garden in the summer or our annual holiday party) where we invited people by e-mail or text to learn about the project."* - **LVEJO**

- AGSL held multiple meetings early on in the project with an advisory team they formed to help with project planning.

> *"We invited ourselves to community organization meetings to be on their agenda. You can go to a community organization who has a standing community meeting and ask 'can we be on your agenda for 10 minutes to explain what we will be doing and why?'"* **– AGSL**

- PCR held multiple community engagement days and publicized through flyers, emails, and social media to recruit participants.

> *"We had activities at the local community center and here at the office three or four times. We let people know about the air monitoring program and we tried to get volunteers to be a part of it. We told people what was going on in the neighborhood and why we were doing it. We thanked the volunteers and gave them a stipend for participating."* **- PCR**

- SETF held a workshop and presentation publicized using social media and flyers to engage the community about the SASA project. They also informed their local police department.

> *"Even if you notified the local police department earlier, still have a backup plan for communicating to individual officers about the project in case the message does not filter down through the police department."* **- SETF**

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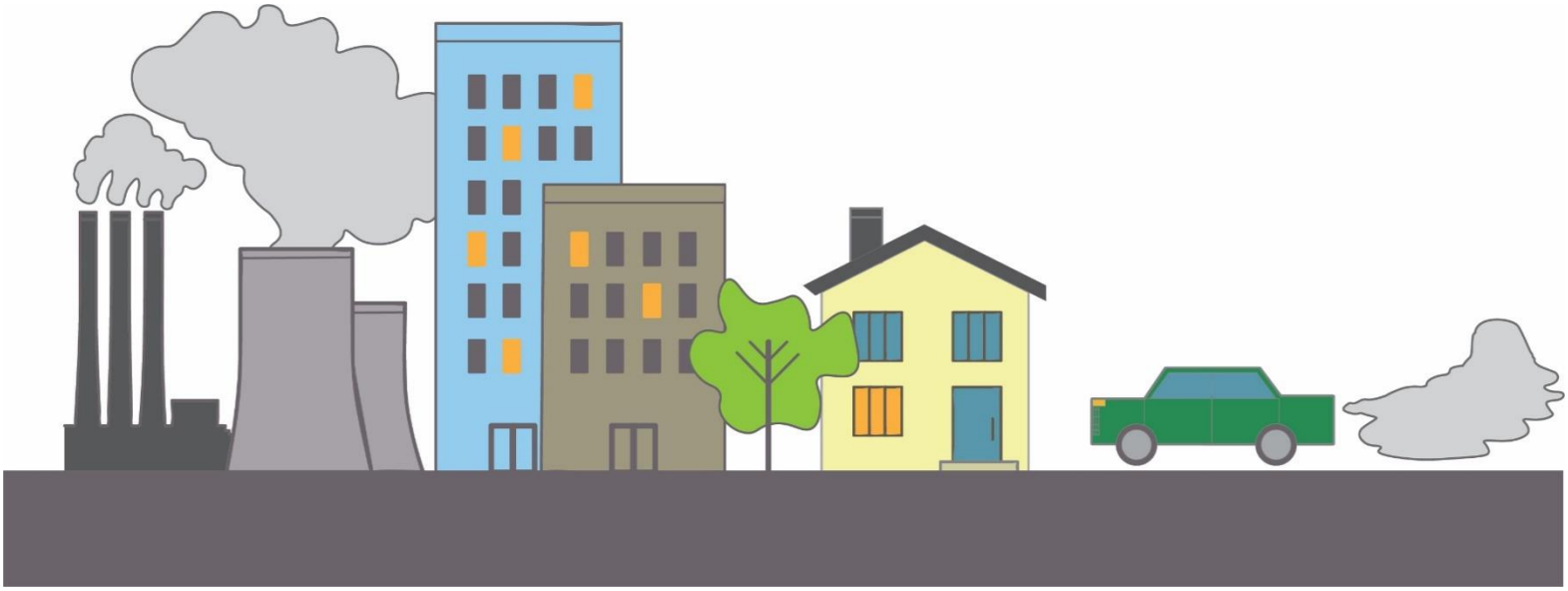
SECTION 3:

AFTER AIR MONITORING



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CHAPTER 7: ANALYZING DATA

Chapter 7 Overview: This chapter walks you through by goal type how to analyze the data you have collected and build an understanding of what the data tells you about your community's air quality - what your story is.

Step 1: Perform Light Data Review
Step 2: Conduct Data Analysis

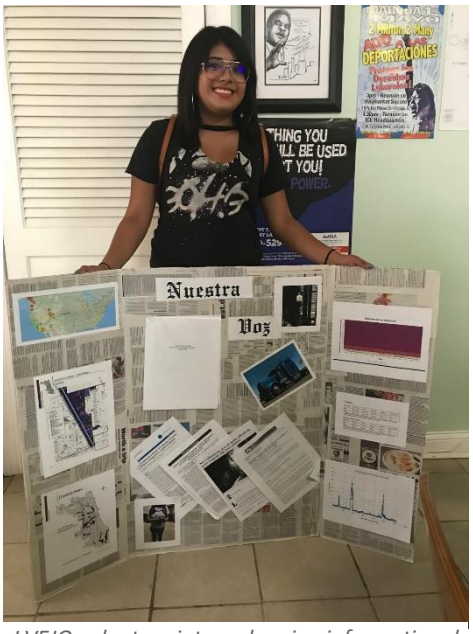
Step 1: Perform Light Data Review

Goal Types:

Capacity Building and Engagement | **Research** | **Advocacy**

Strategy: Understand the Data on Your Own

In **Chapter 1, Step 1,** the SASA team recommends that having someone on your project team with some technical ability will be helpful to make sense of the data after it is collected. If your project goal is *Capacity Building and Engagement*, (and as a first step for other goals) your technical person can obtain most of what you may need from the air quality data that you have collected by recording on a daily basis the information that the vendor website shows from your data. Using the approach outlined below, your technical person will be able to develop a comparative picture of the air quality at the various locations or routes that you monitored. This will tell you how the air quality changes from location to location, from day to day, and at different times of the day, and will be the key for you to understand potential air quality issues in your community and the beginnings of your air quality story.

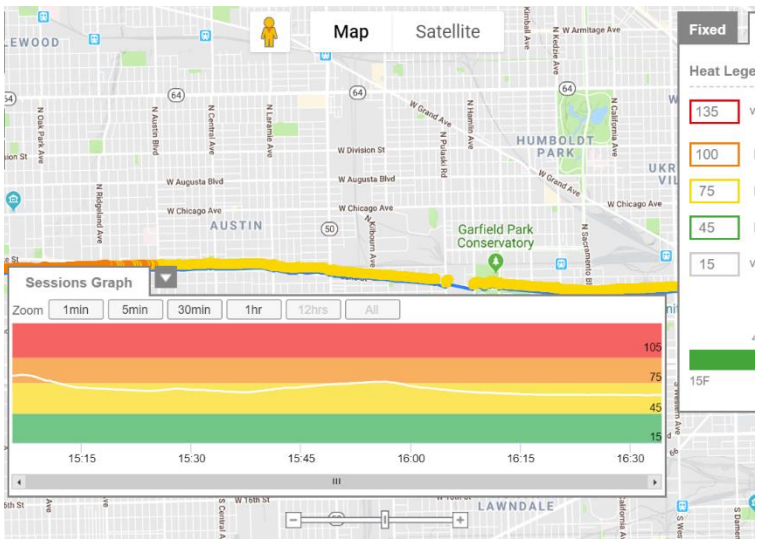


LVEJO volunteer intern showing informational display created to inform the Little Village community about the air monitoring project.

"LVEJO had a group of student volunteers that didn't do air monitoring but instead looked at the data and analyzed it. They focused on one monitor that was in front of an elementary school and looked at what happened on a summer day that showed really high levels. They really dug into the time of day too looking at air quality when kids were walking or outside for recess. They started making connections on their own. They looked at the data and tried to pull a story from it. That was really neat. There is going to be a lot of data, but you don't necessarily have to feel overwhelmed. More data is actually better. You also don't have to be a data analyst to kind of get an understanding or an idea of what the data says. The students that worked on analyzing our data were all high school students (except for one), and being able to pull a story from the data was super significant and empowering for community members. Focus on one monitor and start there." **- LVEJO**

Setup to Understand Your Data - Easy Data Approach

A. Use a monitor model with an online vendor website where you can view your data through charts, tables, or graphs on the website. (See **Chapter 2, Step 6**).
B. Follow this guide's "Easy Data Approach" using provided templates and directions (see **Resources**) at the end of each day that you conduct air monitoring and for each monitor that you use that day. One template is provided for mobile monitoring and one for stationary monitoring data.
C. Print out the template for your monitor type to use for the Easy Data Approach of tracking and forming your own daily observations and conclusions regarding air quality.
D. Use a separate template for each route or location you are monitoring.
E. Set aside approximately five minutes per monitor per day to do the Easy Data Approach.
F. Keep accurate and consistent records.



Example of data viewer on vendor website.

***TIP**: It may be helpful for your technical person to enlist the support of someone in your organization with administrative skills (See **Chapter 1, Step 1**) to assist with the Easy Data Approach.*

"Share the data with volunteers at the end of the session or the week so that people can connect with the data that was collected." - ***SETF***

"I didn't have check ins per say with volunteers on the readings, but they would let me know 'hey, I saw elevated levels on this corner' or 'every time I walk through this corner, I started feeling a burning sensation in my nose.' We were trying to figure out what was in the air." - ***LVEJO***

As you record your observations for each day, you may find that your conclusion for a given day becomes relative to your conclusions for other days and may need to be altered. For example, on your second day of monitoring, a day where the average AQI is yellow and readings were mostly yellow but with some orange you may conclude the air quality as KIND OF POOR. However, on subsequent days if your air readings and average are mostly in the orange you may want to go back and adjust your conclusion of air quality on Day 2 from KIND OF POOR to NEITHER GOOD NOR BAD and revise your conclusion for the orange days to be KIND OF POOR.

To assist you in drawing conclusions, the official USEPA Air Quality Index (AQI) for translating the colors is below. See **Resources** for a more detailed USEPA interpretation of what the AQI colors mean in terms of your community's air quality.

AQI Color	Interpretation
Purple	Very Unhealthy
Red	Unhealthy
Orange	Unhealthy for Sensitive Groups
Yellow	Moderate: Unhealthy for Very Sensitive Groups i.e. children with asthma
Green	Good

Preparing and Visualizing Data

If your monitor does *not* have data viewer capability or the data viewer does not use EPA's Air Quality Index, you will need to download the data and graph and analyze the data on your own using software that comes with your monitor (i.e., on a CD.) See **Chapter 4, Step 3** for guidance on downloading your data to your computer.

Stationary Monitoring – 24-hour average concentrations.

Mobile Monitoring - Route average concentrations

You can analyze the data by computing each day. Compare averages to EPA's AQI Index to translate average concentrations to colors. Visit **Resources** for more information on the AQI and conversion.

The SASA team recommends that the person in your organization with technical expertise use an electronic tool such as a spreadsheet program, for example, to do calculations and make charts, graphs, and tables from the data. If you do not currently subscribe to an electronic tool like this, three readily available low-cost tools that you may be able to subscribe to are:

- Microsoft Excel - Subscriptions cost about $100/year
- Tableau - Subscriptions cost from *free* to $12/month to $70/month (depending on features you want) and can help you better visualize your data in Excel.
- Google Sheets - *Free* spreadsheet tool after you set up a *free* Gmail account. Has similar but a little less functionality than Excel.

***TIP**: An Average balances high readings against low readings to approximate the concentration across an entire time period.*

***TIP**: 24-Hour Average Concentration = Sum of all concentration readings (usually shown by vendors in units of ug/m3) in a 24-hour period divided by the total number of readings.*

TIP: Route Average Concentration = Sum of all concentration readings from a route during a run of that route divided by the total number of readings.

Step 2: Conduct Data Analysis

Goal Type:

Research

Strategy: Get Support for Your Conclusions (Do a deeper dive!)

Until data analysis is complete**,** sharing results may be difficult. Set expectations during initial outreach around when results will be shared.

If the goal of your project is *Research*, to better answer your specific Air Quality Question (see **Chapter 2, Step 4**) your analysis from Step 1 may need to become more reliable and credible by using more professional methods.

Air quality data holds a great deal of information. To uncover more refined information that the data may hold, and to lend increased support to your analysis from The Easy Data Approach, you may need to do a "deeper dive." However, this takes more time and will benefit from partnering with someone who has expertise in understanding and analyzing air quality data, if someone like this is not already a part of your team.

The SASA team recommends that you reach out to a technical professional who has some experience with air quality data or even just is familiar with analyzing large amounts of numerical data of any kind:

- Meet with your team to review your Air Quality Question and determine how much of your question was or was not answered by the Easy Data Approach. Share this assessment with the technical professional that you meet with.

- Reach out to your partners and contacts to find someone in your community who would be willing to sit down with you (often for no cost) to review your analysis and perhaps do a small amount of analysis on their own.

Having this assistance can bolster your data analysis and give you greater confidence in your interpretation of what the data means to better achieve your goal.

***TIP**: A local technical professional could be a science teacher at your neighborhood high school, a professor at a community college or university, or someone who performs data analysis for a local health care association.*

Goal Type:

Advocacy

Strategy: Analyze Data For Advocacy Action

Until data analysis is complete**,** sharing results may be difficult. Set expectations during initial outreach around when results will be shared.

If the goal of your project is *Advocacy*, then the SASA Team recommends that in addition to performing the Easy Data Approach, you consider hiring an air quality data statistician to conduct a detailed technical analysis of your data.

You will use your conclusions to convince decision makers to take some kind of action, so your conclusions need to have a high degree of credibility and have the ability to stand up under scrutiny - possibly *intense* scrutiny. You will share and discuss the conclusions from your data to support your advocacy work around air quality with a number of stakeholders including but not limited to:

> *"We wanted to make the community aware of what is going on. They really need to know what they are breathing in and who is putting out pollutants because there are so many people who have died of different diseases."* **- PCR**

LVEJO community member protesting for clean air for her community

- local elected officials
- scientists
- state environmental authority (e.g., state environmental protection agency)
- a company in your neighborhood who is a polluter

Getting Started

The SASA Team advises you to hire an *air quality data statistician* whose analysis can be verified by others and may be viewed as more advanced, objective, and credible. This will allow you to have a greater degree of confidence in your air quality story and will increase the strength of your advocacy.

***TIP**: An air quality data statistician is an expert in the analysis, preparation, and interpretation of air quality statistics - facts created from a study of a large quantity of numerical data.*

Lessons Learned from the SASA Team: Hiring an Air Quality Statistician

The more complex your air monitoring plan is and the more data you collect, the more expensive hiring a consultant may be. Since community groups on the SASA team had an Advocacy goal, we hired a data statistician to analyze the team's data. In 2018 the cost was about $11,000 to analyze each community's data. Each SASA community organization collected data on five different pollutants using five different types of air monitors over the course of four to five weeks. This effort created a very large amount of data from different types of monitors. The need to analyze a lot of data in different ways resulted in a high cost for the analysis.

***TIP**: It is reasonable to estimate that if your project uses only one type of air monitor that collects data for only one type of pollutant, the cost for an analysis should be considerably less than $10,000 - possibly about $2,000 to $3,000.*

Having Your Data Analysis Completed by a Data Statistician

Before reaching out to different statisticians to request a proposal for the work, decide on what is important to you (e.g., goals, opportunities to provide input, format, timeline). Some ideas include:

- The goal of the statistician's work could be to tell you how your air quality compares from monitoring location to location; at which locations air quality is the best or the worst; how air quality changes from day to day or at different times of the day at certain monitoring locations; and/or how air quality at the different locations feels like it "fits" or doesn't "fit" your Areas of Concern (See **Chapter 1**).

- Air quality data readings could be compared to the USEPA AQI colors to interpret high and low readings or the statistician could recommend a different way.

- The report can and should use graphs, tables, and photos, and should explain what the information in these graphics is saying about the air quality.

- The report should be written in layman's terms if possible. This means that technical terms are translated and large sections of dense, running narrative are avoided unless absolutely necessary and that the report is written to a "newspaper level".

- The statistician should walk you through (verbally describe) the first draft of the report and any subsequent revised versions of the report, and you (the client) should have two to three opportunities or rounds to review, provide comments on, and request revisions to the report draft.

- The report should include a paragraph or two outlining the qualifications of the statistician.

- The report should clearly state assumptions or limitations (i.e.., any areas where the statistician did not have enough data or could only draw inconclusive results) and explain how these are significant to conclusions.

- You should negotiate with the statistician on the timeline for completing the analysis and drafting the report.

CHAPTER 8: SHARING YOUR RESULTS

<u>Chapter 8 Overview:</u> Sharing the collected data with your community is an important last step in your air monitoring project. There are multiple ways to share your data and considerations to keep in mind:

- *Sharing data for community building and engagement*
- *Sharing data for research*
- *Sharing data for advocacy*

Whatever your goals for air monitoring are (community building and engagement, research, or advocacy), when sharing your data be sure to be clear about your original goals. This will help you keep the conversation about your data on what is important to you and your community. For example, if your project's goal was community building and engagement, producing research quality data wasn't a priority for you. One way that questions about your data quality can be addressed is by reminding your audience about the goal of engaging the community. Also, remember that air monitoring projects are currently on the front end of science and there are still many unanswered questions. As technology and knowledge about air monitoring continue to grow, so will data quality and opportunities to advance this research.

> *"That was the hardest part to sell to the community that we don't have solid answers. We came up with more questions because this whole thing was a research project. Asking more questions only gives us more opportunities to further our work." SETF*

Sharing Results for Community Building and Engagement

SASA team members used several different ways to communicate about their data and findings. Below are suggestions from their experiences.

- Multiple meetings may be needed to fully explain your data and engage a community. Air pollution and monitoring is a complex process. One meeting with your community may not allow for enough time to provide background learning on air quality, explain your project, and share findings in meaningful ways. Consider a series of educational meetings that build on each other and engage your community and allows time for discussion about next steps in the project.

- Getting community members up to speed on your project work, and air quality in general, can be a challenge. Props or handouts such as quick reference guides will be useful in helping your community members learn and absorb your information. Examples include handouts on "what is particulate matter," Air Quality Index (AQI) color coding basics, or an "Air Pollution Primer."

Lessons Learned from the SASA Team:
Don't rely solely on the AQI, trust your lived experiences. While green may be considered "safe" for some, it could trigger someone else's asthma.

- Using social media, such as Twitter or Facebook, is helpful in getting your community involved, keeping them aware of important news and project information. It also encourages connections with other community organizations and agencies doing similar work. You might even find someone via social media who has an interest in volunteering on your project or the technical knowledge to assist with data analysis.

- Consider targeted marketing towards members of the community that are connected to sensitive populations, such as the elderly, people with health conditions, or parents with young children.

- Look for multiple ways to share your data, such as quick presentations at other meetings, specially-focused community meetings, workshops, or projects at local schools.

"It was a college level class that was looking at [the data]…I included a paragraph about each community and the organizations and different accomplishments that happened in those communities throughout the years. It was good for them to see what are some of the things that community members deal with, why air monitoring was a thing that people wanted to do, and why collecting data ourselves is important. That was my goal in developing the workshop and those three goals were met through it. It wasn't so much about understanding literally what the data says and if you have a healthy community or not, but more what does EJ mean, what does an EJ community look like, how do graphs and data go together…how all these different issues are interconnected." - **LVEJO**

Sharing Results for Research

Some SASA team members are continuing their air monitoring long term. If your team intends to monitor regularly and continuously, consider keeping stationary monitors up semi-permanently.

- Some SASA community organizations are doing this to monitor for specific threats to their neighborhoods, such as coal plants, petroleum coke piles, industrial corridors, semi-truck routes, etc.

- Conducting this type of air monitoring requires you to be very intentional about where you monitor. Be selective about the best places to station monitors, particularly if your community is interested in collecting data for specific locations (i.e., for bike lane or bus stop placement). Also, consider the best times of day for monitoring in your particular neighborhood, paying attention to things such as when truck or bus traffic is heaviest.

- For long-term monitoring, availability of Wi-Fi and electricity can be a challenge. For some communities, these items are not an everyday issue. For other communities, these resources are not readily available or they may lack trust in the community organization's intentions or the technology itself. Consider planning ahead to secure additional funding to cover Wi-Fi and electricity costs for property owners who are not able to be responsible for those expenses.

- The science of low-cost air monitoring is still somewhat new; therefore, communities may run into challenges analyzing data produced during air monitoring. While some organizations may choose to take a more hands-off approach to helping community members understand air monitoring data, the SASA team recommends utilizing a technical partner who is knowledgeable about air quality and experienced in interpreting air monitoring data. It is important to be realistic on the front end about what you're getting into related to data processing because it can be very difficult even with assistance from a technical partner.

> *"The data collection is easy. The analysis and the action on the data is really, really hard."*
> **-AGSL**

Low-Cost Air Monitors: What SASA Learned About their Reliability

Community residents were able to successfully perform air monitoring utilizing low-cost monitors while following general air sampling procedures, which highlights the importance of hands-on training of community residents before beginning air monitoring activities and tasks. All low-cost sensors tested during this project showed very high accuracy based on analysis of data collected in an eight-week sensor performance assessment study conducted at Illinois EPA's Northbrook Air Monitoring Station. When comparing concentration measurements obtained by low-cost sensors with those of their respective USEPA Federal Reference Monitors (FRMs) or Federal Equivalent Monitors (FEM), some low-cost sensors had a better performance than others.

Among the mobile air monitors utilized in the study, the AirBeam monitor that measures particulate matter concentrations in the breathing-zone performed better than the Terrier monitor that measures a multitude of gaseous pollutants in the breathing-zone (i.e., Carbon Monoxide, Nitric Oxide, and Carbon Dioxide). The Terrier was not used in the winter sampling effort, partly due to this reason. Among low-cost monitors that measure particulate matter (PM), the PurpleAir and Met One monitors performed similarly against the USEPA's FEM and FRM for $PM_{2.5}$; however, the Purple Air performed slightly better than Met One for PM_{10}. Among low-cost monitors that measure gaseous pollutants, the Terrier demonstrated a wide range of accuracy depending on the gaseous pollutant measured and, in general, performed poorly compared to other monitors tested. The performance of the AeroQual S500 against the

USEPA's RFM can only be evaluated for ozone due to the absence of a nitrogen dioxide FRM monitor at the site and was found to have moderate correlation. In general, we found low-cost monitor performance was strongly influenced by temperature and humidity.

In conclusion, residents successfully used low-cost monitors for local air quality data collection, and it is feasible to employ low-cost monitors for local air quality assessment and in support of citizen science projects. The low-cost monitors used in the study are sufficiently accurate and can be used to obtain air pollutant concentrations at various locations in a community to assess relative air quality. Our scientific knowledge on the quality of the data collected by the monitors, the absolute values recorded by the monitors, and their meaning and significance as compared to USEPA's FRMs/FEMs is still evolving. Therefore, the data recorded by low-cost monitors should not be used for compliance assessments by the federal National Ambient Quality (NAAQS). However, they are very useful tools for determining locations within communities that have higher concentrations that warrant further evaluation using regulatory monitoring tools and methods and/or for public education, outreach, and advocacy efforts.

Sharing Results for Advocacy

Low-cost air monitors can be used as an organizing tool. Some SASA community organizations are using them in this way. Below are some things to note for sharing results for advocacy:

- To use air monitoring for advocacy purposes be very clear about your messaging throughout your project.

- It's important to set expectations for community members when undertaking this process. Data from low-cost monitors may not be a catalyst for immediate change, but it may be enough to advocate to USEPA to put a federally qualified monitor in the community.

"An Air Beam will not necessarily shut down an industry. What it will do, hopefully, is trigger your local regulatory institution to have to come out and investigate." - **LVEJO**

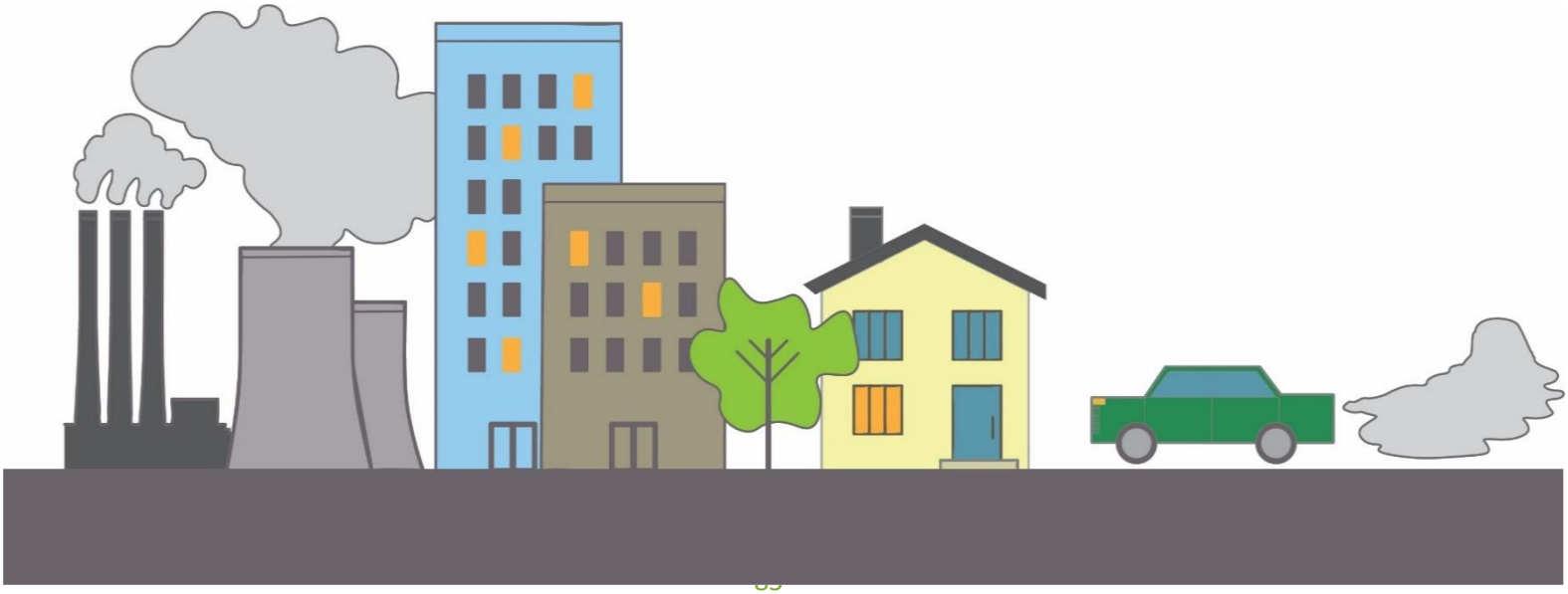
"We'll be able to wave our flag around saying this is an issue, come check out what we're waving our flag about. It gives us backbone." - ***SETF***

- Consider partnering with other local or regional community organizations who share similar goals when developing an air monitoring program for advocacy. Communities working together as a collective group are often able to gain more traction with advocacy.

- Long-term monitoring can also be used as an organizing/advocacy tool. It can become a way to engage the community regularly.

SECTION 4:

RESOURCES



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Using EPA's Air Quality Index

EPA's Air Quality Index (AQI) is used to report daily air quality across the U.S. and provides a standard and recognized method for interpreting air quality data. AQI is used to interpret ground-level ozone, particulate matter, carbon monoxide, nitrogen dioxide, and sulfur dioxide data. The index breaks air quality into six different categories, includes who should be concerned at each level, and recommends actions based on health risks. To learn more visit: https://www.epa.gov/pmcourse/patient-exposure-and-air-quality-index

Air Quality Index	Who Needs to be Concerned?	What Should I Do?
Good 0-50	It's a great day to be active outside.	
Moderate 51-100	Some people who may be unusually sensitive to particle pollution.	**Unusually sensitive people:** *Consider reducing* prolonged or heavy exertion. Watch for symptoms such as coughing or shortness of breath. These are signs to take it easier. **Everyone else:** It's a good day to be active outside.
Unhealthy for Sensitive Groups 101-150	Sensitive groups include **people with heart or lung disease, older adults, children and teenagers.**	**Sensitive groups:** *Reduce* prolonged or heavy exertion. It's OK to be active outside, but take more breaks and do less intense activities. Watch for symptoms such as coughing or shortness of breath. **People with asthma** should follow their asthma action plans and keep quick relief medicine handy. **If you have heart disease:** Symptoms such as palpitations, shortness of breath, or unusual fatigue may indicate a serious problem. If you have any of these, contact your heath care provider.
Unhealthy 151 to 200	**Everyone**	**Sensitive groups:** *Avoid* prolonged or heavy exertion. Move activities indoors or reschedule to a time when the air quality is better. **Everyone else:** *Reduce* prolonged or heavy exertion. Take more breaks during all outdoor activities.
Very Unhealthy 201-300	**Everyone**	**Sensitive groups:** *Avoid all* physical activity outdoors. Move activities indoors or reschedule to a time when air quality is better. **Everyone else:** *Avoid* prolonged or heavy exertion. Consider moving activities indoors or rescheduling to a time when air quality is better.
Hazardous 301-500	**Everyone**	**Everyone**: *Avoid all* physical activity outdoors. **Sensitive groups:** Remain indoors and keep activity levels low. Follow tips for keeping particle levels low indoors.

If your project chose to use a data viewer that reports air quality using AQI, you can use the chart above to help interpret the results.

If your project did not choose equipment with a data viewer or if your data viewer does not use AQI, you will need to:

1. Calculate a 24-Hour Average of your data (likely in ug/me or micrograms per meters cubed) for stationary monitoring or a Route Average for mobile monitoring. See Chapter 7 of the Guidebook for tips on how to do this.
2. Convert the average that you compute from ug/m3 to AQI. Click on the Concentration to AQI converter: https://cfpub.epa.gov/airnow/index.cfm?action=airnow.calculator

Please note that the AQI is designed for comparison to 24-hour averages *only.* However, you can get a general sense for how to interpret your route average by also looking at the AQI.

Monitor Vetting Template

	Exampl
Model Name	Purple
Model	
Pollutants	PM1, PM2.5,
TIER I - BASIC	
Use Type - Indoor Air or Outdoor	Outdo
Cos	$180 + $20 shipping. If buy in bulk 2 monitors cost is week lead time on
Data	Visualize results on-line via websit
R	AQ Spec testing shows R2 of .87
TIER II -	
Power Source (i.e. Battery or	Plug in to AC outlet (no
Size and	Light and small - about the size hand, not portable, intended mounted on wall or post - draws from bottom so can zip tie to
Maintenan	No maintenance
Calibratio	No calibration
Vendor Technical	Direct access to owner via e-phone. Owner readily available helpfu
Data Transmission (i.e WiFi or Smartphone	Wireless transmission of data to via cellular. Can also download from website in minutes to a that can be imported to EXCEL or applicatio

Shared Air Shared Action Health & Safety Plan
Signature Page

To be completed by Safety Coordinator Date of Training:
Dates of Monitoring: Location of Training: Safety Coordinator Name: Safety Coordinator Signature:

To be completed by training participant
I, _____, have reviewed and understand the Health and Safety Plan and was trained by the Safety Coordinator to follow its guidelines.
Date: Participant's Printed Name: Participant Signature:

Please, review the Health and Safety Plan, then complete the participant section of this page, and return it to the Safety Coordinator.

Health & Safety Plan

INTRODUCTION

This Health & Safety Plan (HASP) describes the potential safety and health hazards that may be associated with participants conducting either stationary or mobile air monitoring for the 2017 Shared Air Shared Action monitoring activities. The HASP also identifies control measures to protect participants who are performing air monitoring as well as protocols to address health and safety related incidents including guidance on roles and responsibilities. The HASP contains 6 sections:

1. *Roles and Responsibilities*
2. *The HASP Administration*
3. *General Personal Safety*
4. *Environmental Hazards*
5. *Reporting Incidents*
6. *Community-Specific Information*

Selected safety information from this document, including safety locations and Safety Coordinator contact information, from this document is included in the Field Guide.

1. ROLES AND RESPONSIBILITIES

Participants and Volunteers

Individuals that participate in data collection (participants) or any other aspect of the project will be responsible for attending safety trainings, reviewing and signing the HASP, and reporting any incidents that occur according to the protocol described in the HASP. The guidelines for the types of incidents and reporting are described in Sections 3, 4 and 5. Participant safety is a priority. Participants doing mobile monitoring will work in pairs whenever possible. If an incident occurs, the partners should seek safety first then contact the Safety Coordinator. Participants do not need to continue monitoring after an incident. Both participants should discuss the incident with the Safety Coordinator and determine next steps, which may include an adjustment in the participant's monitoring activity or role in the project.

Safety Coordinator

There will be a designated Safety Coordinator for each community participating in the project. The Safety Coordinator will be responsible for conducting safety trainings (setting up and running meetings), managing records related to the HASP (keeping a copy of the HASP and providing copies to participants, storing copies of signed Signature Pages and completed Incident Report Forms, etc.), and serving as the point person for all safety-related questions. The Safety Coordinator will also be responsible for alerting participants to any delays or cancellations of monitoring activities in case of severe weather or other incidents that may impact safety. The Safety Coordinator may also conduct outreach to community law enforcement and elected officials to alert them of project activities. Finally, the Safety Coordinator will be responsible for selecting a designated safety location(s) for the project and ensuring that the participants know their locations. The Safety Coordinator role will be filled by the community organizer leading the project implementation, unless otherwise specified in Section 6: Community-Specific Information.

The contact information for each Safety Coordinator is listed in Section 6: Community-Specific Information.

2. THE HASP ADMINISTRATION

Prior to the launch of data monitoring activities, the Safety Coordinator will host a Safety Training meeting to review this document with participants. The training will highlight key issues for participants involved in both stationary and mobile monitoring and the appropriate actions that should be taken to prevent or address safety issues as they arise. Participants must sign the Signature Page in this plan, and return it to the Safety Coordinator, who will also sign. The Safety Coordinator will provide participants a copy of that signed page. The Safety Coordinator may also conduct a brief safety overview before each in-the-field monitoring event which can be done in person, via email, or via text message communication.

Any safety-related incidents should be reported to the Safety Coordinator. Incidents are not expected to occur, but while in a typical, public neighborhood environment the following may occur: accidents that may lead to physical injury, harassment, and equipment damage/loss/theft. The incidents must be reported and documented in cases that involved professional medical assistance, law enforcement, or equipment loss/damage.

If an incident occurs, participants should:

- first seek the necessary professional assistance,
- then notify the Safety Coordinator as soon as possible.

Details about what kinds of incidents require reporting are provided in **Section 5:**

Reporting Incidents.

The Safety Coordinator will document the incident using the Incident Report Form and may work with participants to make adjustments in the project (monitoring routes, sharing equipment, etc.) to enhance the safety of participants and address concerns as a result of the incident.

FOR SAFETY COORDINATORS: The documentation of incidents should occur in writing, and records should be kept with the Safety Coordinator's copy of the HASP. In order to document incidents, the Safety Coordinator will complete the Incident Report Form and communicate with the participant(s) involved either in person, by phone, or email to record the details of the incident. The report will contain information about the incident and what steps were taken to address it. The participant(s) involved should review and sign the Incident Report Form.

3. GENERAL PERSONAL SAFETY

General awareness

It is important to be prepared before starting the mobile monitoring activities. Participants should be familiar with the **route** and the **designated safety location** before the first monitoring day. Information specific to each community can be found in **Section 6: Community-Specific Information**. They should wear attire that's weather appropriate and can enhance safety by making them more visible (orange safety vest and project T-shirt may be provided by the Safety Coordinator). While on a route, they should be aware of their surroundings, and always stop and look around before taking notes.

If hosting a stationary monitor on their property, participants should pay attention to pedestrian activity around the monitor and whether the equipment is attracting any unwanted attention, especially if it's placed in a visible location. Participants should let the Safety Coordinator know if any concerning behavior is observed to determine if the monitor should be relocated.

Traffic safety

Participants should follow all basic traffic rules when participating in the project - crossing streets on green lights at designated crosswalks, looking both ways before crossing the street, etc.

Know your rights

Since participants will be conducting monitoring activities outside, participants will be visible within the community. This creates a great opportunity for community members to learn about the issues of air quality and the project, however, it may also create a situation where participants (with equipment and clipboards in hand) might cause confusion or suspicion among residents or law enforcement.

In the event that someone approaches and asks about the project activities, participants should present the Official Project Description (provided with the Health and Safety Plan and Field Guide during the safety training).

Remember:

- All the monitoring routes are planned to occur on sidewalks, which are public right-of-ways and participants have the right to conduct monitoring activities there.
- Participants should stay on the sidewalks during monitoring and be respectful of residents who live nearby.
- If there is an escalation during an interaction with other residents, participants should keep distance to give themselves time and space to react and respond appropriately.

Avoiding uncomfortable or unsafe routes

If participants are uncomfortable with the assigned route, the times of monitoring, or have other safety concerns, they should notify the Safety Coordinator to work out an alternative assignment.

If participants feel that safety is at risk at any point or experience harassment of any kind during the monitoring activities, they should quickly go to the designated safety location, and contact the Safety Coordinator.

4. ENVIRONMENTAL HAZARDS

Weather conditions may impact monitoring activities. It may be very hot in the summer, very cold and snowy in the winter, or very windy or stormy at any time of year. Here are a few ways to ensure safety of participants during the mobile air monitoring:

Be aware of weather forecasts

It's important to pay attention to weather forecasts prior to heading out for the air monitoring assignment. Participants should check the weather forecast on the day of monitoring activities and shortly prior to starting the route. This will give participants a good idea what to expect and how to prepare. Participants should contact the Safety Coordinator with any questions or concerns or if there may be severe weather.

Be prepared for weather conditions

Participants should dress appropriately to ensure feeling comfortable during air quality monitoring activities regardless of season. If not feeling well due to hot or cold weather conditions, participants should stop monitoring and seek a heating location (in cold weather) or a cooling location (in hot weather) as appropriate. **Most park district facilities and libraries are designated as heating and cooling centers.** Participants should seek medical attention if necessary and notify the Safety Coordinator. Below are recommendations for typical environmental hazards.

During very cold weather:

- Proper dress: Layers provide good protection against very cold weather. The type of fabric worn makes a difference. Cotton loses its insulation value when it becomes wet. Wool, silk and most synthetics, on the other hand, retain their insulation even when wet.
- The following are recommendations for working in cold environments from the Occupational Safety and Health Administration (OSHA):
    - Layers of loose-fitting clothing provide good insulation.
    - An insulated jacket (an outer wind and rain protection layer that allows some ventilation to prevent overheating).
    - An insulated hat or hood to help keep whole body warmer. Hats reduce the amount of body heat that escapes from the head.
    - Insulated gloves to protect the hands.
    - Wear insulated and waterproof boots (or other weather appropriate footwear).
    - If needed, use a knit mask to cover the face and mouth.
- Heat packs can warm hands. They are lightweight and very easy to keep in pockets and can be requested from the Safety Coordinator.
- Take breaks in a heated area, if necessary.
- On icy/slippery surfaces, take short steps and walk at a slower pace to keep from slipping or falling.
- Frostbite is a risk when weather is wet and very cold. Thoroughly cover all extremities to reduce the risk of frostbite.

During very hot weather

- It is important to stay hydrated. Participants should carry water and plan to bring extra water when expecting high temperatures.
- High humidity makes heat worse. Plan to walk more slowly when the humidity and temperature are high.
- If feeling weak or faint from heat exhaustion, participants should look for an airconditioned place to cool down and to hydrate.

During stormy weather

- Lightning is a real danger. If participants hear thunder, they should be prepared to take cover. If lightning is visible, participants should take cover inside until 30 minutes after the last bolt.
- Strong winds can break off tree limbs. If the route includes large trees, confirm with the Safety Coordinator an alternate plan if high winds are forecast.

Be aware of places to take cover

It is possible that a strong storm will begin suddenly/unexpectedly. Prior to beginning the monitoring activities, participants should become familiar with places along the route (or close by) and where one can take cover, should bad weather develop during monitoring. Places to consider would be public spaces

like libraries, schools, or police stations. Stores/shops may be open and available. Participants should notify the Safety Coordinator if they had to take cover from extreme weather during the monitoring route. To ensure safety in the future, the Safety Coordinator should document it as an incident on the Incident Report Form and note any resulting gaps in data if they occurred.

In the case of very extreme weather

It is unsafe to conduct monitoring outside during extreme weather, such as thunderstorms, blizzards, or extremely hot or cold temperatures. The Safety Coordinator may alert participants to delay or cancel monitoring activities if very extreme weather is in the day's forecast. **Participants should confirm with their Safety Coordinator how they will be contacted.** For example, participants should have their cell phones handy if the Safety Coordinator will call or text them.

FOR SAFETY COORDINATORS:
Safety Coordinators need to develop a system of communicating with the project participants that will allow them to alert participants when to delay or cancel activities due to environmental hazards. This could be done via email, text or phone notifications, whatever is most effective for the community organization. The Safety Coordinator will be responsible for maintaining up to date contact information list and explaining the notification protocol to the participants.

Occupational Safety and Health Administration (OSHA) has guidelines for what are considered safe working conditions for work outside. While they take into account many different factors, many of which don't directly apply in this project, OSHA* guidelines were used to determine reasonable cut off temperatures for hot and cold weather to participate in this project.

* https://www.osha.gov/SLTC/emergencypreparedness/guides/cold.html

5. REPORTING INCIDENTS – PHYSICAL INJURY OR THEFT

This section describes what to do in the event of an incident. An incident may include any of the following – accidents that may lead to physical injury, harassment, and/or equipment loss, damage, or theft. Incident response/reporting protocol is outlined below. If possible, participants should photo document any equipment damage or incidents.

LEVEL 0

Physical injury that doesn't require professional medical attention and the participant is comfortable completing the monitoring route - upon completion of the route, return to the community organization's office or the **designated project hub location**, utilize the First Aid Kit for bandages or other basic supplies; let the Safety Coordinator know about the incident, but an incident report is not required.

LEVEL I

Verbal (non-physical) harassment – participants should remain calm, present the official project description, introduce themselves, and request person's name. If harassment continues or participants feel uncomfortable, they should move at a safe pace to the designated safety location. When safe, participants should notify the Safety

Coordinator as soon as possible. The Safety Coordinator may amend the monitoring route or participants' role to reduce the risk of the incident happening again. The Safety Coordinator should fill out an Incident Report Form (see form attached at the end of the document), have the participant sign it, and keep it on file.

Equipment damage or loss - this may occur in conjunction with a harassment incident or accidentally, resulting in a monitor or a mobile device doesn't function as it should or is missing or lost. Participants should notify the Safety Coordinator as soon as possible and photo document the situation, if possible. The Safety Coordinator should fill out an Incident Report Form, have the participant sign off on it, and keep it on file. The Safety Coordinator should provide the participant with functioning equipment or replace missing equipment, if appropriate.

LEVEL II

Equipment theft – participants should remain calm and should not fight; give equipment over; and try to focus on details of the person(s) involved (i.e. eye color, hair color, height, build, age) for the police report. Go to the designated safety location, call 911 and notify the Safety Coordinator as soon as possible. (Please note that most of the equipment has GPS system built-in). If possible, photo document the situation.

Equipment may be damaged or stolen from a stationary location, in which case participant should notify the Safety Coordinator as well. The Safety Coordinator should fill out an Incident Report Form, have the participant sign it and keep it on file. The Safety Coordinator will be responsible for communicating with law enforcement after the initial call.

LEVEL III

Physical harassment/assault - participants should go immediately to the designated safety location, call 911 and notify the Safety Coordinator as soon as possible. FOCUS

ON DETAILS OF THE SUSPECT FOR POLICE REPORT, IF POSSIBLE. The Safety

Coordinator should fill out an Incident Report Form, have the participant sign it and keep it on file. The Safety Coordinator will be responsible for communicating with law enforcement after the initial call. In coordination with participant, the Safety Coordinator may amend the monitoring route or role for participant as appropriate to reduce the risk of incident happening again.

Physical injury that needs medical assistance - participants should first seek medical help by calling 911 or going to the nearest hospital/medical facility (**Section 6: Community-Specific Information**), then should notify the Safety Coordinator as soon as possible. The Safety Coordinator should fill out an Incident Report Form, have the participant sign it and keep it on file.

FOR SAFETY COORDINATORS:

Prior to the beginning of the project, **determine appropriate locations to serve as designated safety locations** - there may be one per route or a limited number of centrally located spots each corresponding to a set of routes. The Safety Coordinator should go over the designated safety locations and office or **designated project hub location** during the training and ensure that participants know where to go in case of an incident.

Mobile Air Monitoring Plan: Monitoring Routes

Route Location # (e.g. Route 1, Route 2)	Route Description (e.g. start location, direction walked, turns, end location)	Rationale for Route Selection (e.g. close to children, elderly, through industrial area)	Monitoring Model and Unit #	Pollutant(s) Measured (e.g. PM10)	Sampling Day(s) (M,T,W,Th,F)	Sampling Time Period (e.g. 0:00 am-0:00 pm)	Additional Notes

Stationary Air Monitoring Plan: 24/7 Monitoring Locations

Site Location (e.g., site 1, site 2)	Description of Monitor Location (e.g., in back yard, close to street)	Latitude	Longitude	Rationale for Site Selection (e.g., close to children, elderly, heavy traffic)	Monitoring Model and Unit #	Pollutant(s) Measured (e.g., PM 2.5)	Date Installed	Date Uninstalled	Height Installed (Inches from ground to inlet)	Installer's Initials	Notes

Example Mobile Monitoring Training Sheet

Guide to Updated AirCasting App and AirBeam2

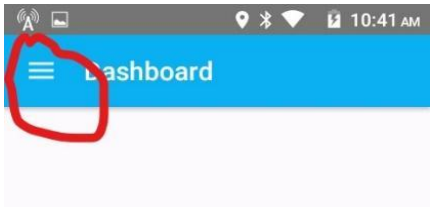
Step 1) Phone Settings

- Go to Setting on your phone.
- Make sure Wi-Fi is on and you are connected.
- Make sure Bluetooth is also on.

Step 2) Download the new AirCasting app from the Google Playstore on-line. In PlayStore, type AirCasting into the Search box to locate the AirCasting app.

Step 3) Turn on your AirBeam2 by pressing the square button on the long end. After a pause a red light and then a green light should appear.

Step 4) Check Settings on AirCasting app



- Open the AirCasting App
- Under the menu button next to Dashboard (top left) select Settings.
- Make sure 'Contribute to CrowdMap' is checked at the top.
- Make sure 'Show route trace' is selected at the bottom
- Make sure 'Sync only through Wi-Fi' is checked.
- Press the back button (left facing arrow at bottom of phone) to back out of Settings and back into the main AirCasting menu.

Step 5) Pairing the device.

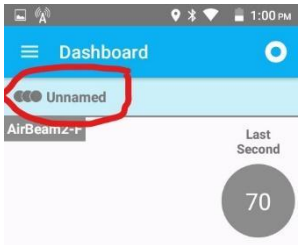
- Press the 'Connect external devices' button on the bottom right. Select 'Pair New Device.'
- Select your AirBeam2 under Available Devices Write down the serial # for your records. Select Pair Device.
- Press the back button (left facing arrow at bottom of phone). Under Available Devices select 'connect' for your AirBeam2.

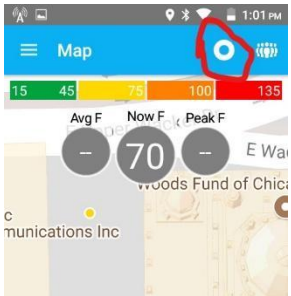
Step 6) Log into your account.

- Press the menu button next to 'Dashboard' on top left.
- Select "Create Profile or Log In" button.
- Profile Options will appear. Select Create Profile.*
- Type in the email, profile name and password on the next screen.
    - Email: Your email
    - Profile name: (# = Profile Number 1, 2, 3 etc.)
        - LVEJO SASA_ABLV#
        - SETF SASA_ABSE#
        - PCR SASA_ABAG#
        - Alliance SASA_ ABSL#
    - Password: sharedairsharedaction
- Hit Submit

**You will only need to create the profile once.*

Step 7) Record session.





- Select 'Configure AirBeam2' on main button next to Dashboard.
- Select 'Connect' next to your device.
- A Screen that says 'Session Type' will appear. Select Mobile. The Dashboard should now show your data.
- Select Unnamed session at top, Select Map. Make sure your location is correct. If incorrect, hit "Center Map" to refresh your location.
- Hit record (circle button at top right)
- Type in session name (ex: LV1_041418AM, SE1_041418AM, AG1_041418AM, SL_041418AM) and hit Start Session.
- Session name format is: 2 letter community designator, route number, date and AM or PM.
- When finished recording, hit circle button again to stop session. Session should automatically upload to Aircasting if connected to Wi-Fi.

Step 8) Viewing Data

- Hit Menu button. Select Sessions. Pick a Session.
- Select Add to Dashboard. Go back to Dashboard.
- Select a stream, Select Graph or Map to explore data.

Communication Plan Template

Date	*Stakeholder meeting/ activity*	*Main Objectives*	*Participants Involved*	*Materials*

MOBILE MONITORING OBSERVATION LOG

CODES FOR SOURCES (use in table below in PM Generating Source column):

Truck = T
Car = C
Bus = B
Train = TR
Cigarette/Cigar Smoke = CS
Construction Dust = CD
Barbecue = BBQ
Lawn Mower = LM)
Industry Source = IS (i.e. stack emissions)
Any Other Smoke = OS
Any other air pollution source = O

Important Note: If you see any particulate matter or dust generating activity within about 100ft of your location, please enter applicable code(s) for the "PM Generating Source" below as accurately as possible. **Accurate documentation of the time of the PM generating source is very important.**

Route #	Date	Time	PM Generating Source Code (Enter the Codes shown above)	Initials	Comments/Notes

List of supplies likely needed for air monitoring with approximate 2018 costs

Air Monitoring Supplies List	Mobile	Stationary	Unit Cost
Smart phone	X		$50
Power strip	X		$25
USB connectors for power strips	X		$10
Bag of #64 rubber bands	X	X	$4
Plastic freezer bags, gallon	X	X	$5
Plastic freezer bags, quart	X	X	$4
Pack of zip ties, 8”		X	$7
Pack of zip ties, 14”		X	$7
Duct tape		X	$5
Clear plastic packing tape	X	X	$5
Electrical tape		X	$6
Black sharpie	X	X	$2
Backpack	X		$30
Flathead screwdriver	X	X	$4
Flathead power screwdriver	X	X	$15
25’ measuring tape		X	$7
Plastic cord connector		X	$4
40 ft extension cord		X	$10
20 ft extension cord		X	$7
Clipboard	X		$3
Plastic tubs for equipment storage	X	X	$9
Bubble wrap	X	X	$6
Case of handwarmers, 100 pairs	X		$85
Case of toe warmers, 100 pairs	X		$85
Hot spots with 1-month service each		X	$100
Plastic containers for hotspot housing		X	$5
Total			*$500*

Volunteer Schedule for Mobile Monitoring

Volunteer Name	d/m/y													
	Mon		*Tues*		*Wed*		*Thurs*		*Fri*		*Sat*		*Sun*	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
John	Route # 1													
Gabrielle	Route # 2													
TOTAL														

Coordinator's Cell: _____

When uploading session use this naming format:_____

SHIFT HOURS:
AM:
PM:

Quick Reminders on Equipment Set Up and Use:

Easy Data Approach

Select the specific mobile route or stationary location/site that you want to view. Data viewing varies for each vendor's website, so you may need to play around with the website a little to learn about the various features available.

1. Record the day and date you are exploring for the specific route (mobile monitoring) or location (stationary monitoring.)

2. Record the a) start and end times for route or b) amount of time monitor ran (usually 24 hrs.) during the given day for location.

3. Record the 24-hour average reading (location) or route average reading (route) if provided by vendor.

4. Record the AQI color associated with that reading. *See Resources section for what the AQI colors mean in terms of your community's air quality.*

5. Review the graph of your data for the last 24 hours for a location or for the entire route that day. Estimate how much of the line graph *during that time period* is in the Green, Yellow, Orange, Red, Purple or Maroon Areas.

6. Notate times of day at location or parts of the route where air quality seems to be the worst or the best as denoted by the AQI colors.

7. Look at what you wrote down in columns 4 through 6 as well as the reason (from your air monitoring plan) that you wrote at the top of the template for why you wanted to collect data on this particular route or at this particular location. Consider what this information says to you:
    a. *Do your best to draw a conclusion about whether you feel that the air quality at this location or route was GOOD, PRETTY GOOD, NEITHER GOOD NOR BAD, KIND OF POOR or POOR Notate why.*
    b. Decide if this assessment matches what you thought the air quality would be like. Write down your observations.

8. Look for trends as you continue to fill out the template, e.g. consistent times of the day or route with poor readings. You could do this at the end of each week, if you will be monitoring for a long time, or at the end of the project, if you are only monitoring for a brief period.

The Resources section has blank mobile and stationary templates to record your data. There are also *example entries.* The numbers in the directions above match the column numbers in the templates.

EASY DATA APPROACH – MOBILE MONITORING

Monitor Type _____ *Example: GoldenMonitor*

Route # and Description in My Air Monitoring Plan _____ *Example: Route 2 - Johnson Street from Adams to 1700 West*

Reason in My Air Monitoring Plan for Monitoring at this Route/Location _____ *Example: Heavy Diesel Trucks use this route in early morning*

Maroon 300-500 ug/m3 = Hazardous
Purple 201 to 300 ug/m3 = Very Unhealthy
Red 151 to 200 ug/m3 = Unhealthy
Orange = 101 to 150 ug/m3 = Unhealthy for Sensitive Groups
Yellow = 51 to 100 ug/m3 = Moderate: unhealthy for very sensitive groups
Green = 0 to 50 ug/m3 = Good

1	2	3	4	5	6	7
Day/Date Example:	Start & End Time	Average Route Reading	Average Route Color	Amount of Time graph was in AQI colors (Check all boxes that are applicable):	Were any sources of pollution observed when readings were not in the Green range e.g. truck traffic, fire, barbeque? (Check Mobile Observation Log.)	Thinking about the information in columns 4, 5 and 6, pick conclusion about the overall air quality recorded for this route on this day. Note why. Does the Air Quality that you selected make sense to you given why you wanted to collect data on this route?
Wed 7/1/2023	7:00 AM to 7:45 AM	NA	Orange	Maroon ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Orange ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Purple ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Yellow ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Red ☐ Much of the Time Green ☐ Much of the Time	☐ YES (notate below) ☐ NO It looks like some truck traffic was noted when route was in the Red.	☐ GOOD ☐ PRETTY GOOD ☐ NEITHER GOOD NOR POOR ☐ KIND OF POOR ☐ POOR We were in the Red much of the time but the green balanced things out some.

				☐ Some of the Time ☐ Little of the Time Note: If answer is none of the time, do not check a box	☐ Some of the Time ☐ Little of the Time	☐ YES (notate below) ☐ NO It makes sense that air quality was Red a lot since trucks are on this route.
				Maroon ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Purple ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Red ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time	Orange ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Yellow ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Green ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time	☐ YES (notate below) ☐ NO	☐ GOOD ☐ PRETTY GOOD ☐ NEITHER GOOD NOR POOR ☐ KIND OF POOR ☐ POOR ☐ YES (notate below) ☐ NO
				Maroon ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Purple ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Red ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time	Orange ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Yellow ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Green ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time	☐ YES (notate below) ☐ NO	☐ GOOD ☐ PRETTY GOOD ☐ NEITHER GOOD NOR POOR ☐ KIND OF POOR ☐ POOR ☐ YES (notate below) ☐ NO

EASY DATA APPROACH – STATIONARY MONITORING

Monitor Type _____ *Example: SuperMonitor*

Site # and Description in My Air Monitoring Plan_____ *Example: 50 Feet south of the Metal Recycling Operation*

Reason in My Air Monitoring Plan for Monitoring at this Route/Location _____ *Example: Metal Recycler emits a lot of dust into the air.*

Maroon 300-500 ug/m3 = Hazardous
Purple 201 to 300 ug/m3 = Very Unhealthy
Red 151 to 200 ug/m3 = Unhealthy
Orange = 101 to 150 ug/m3 = Unhealthy for Sensitive Groups
Yellow = 51 to 100 ug/m3 = Moderate: unhealthy for very sensitive groups i.e. children with asthma
Green = 0 to 50 ug/m3 = Good

1	2	3	4	5	6	7
Day/Date (Review Data from Midnight to Midnight) Example:	Time Sampled (Typically 24 hrs. unless monitor malfunctions)	Average 24-Hour Data Reading	Average AQI Color for day.	Amount of Time graph was in AQI colors (Check all boxes that are applicable):	Are there any *particular times of the day* where certain colors at this location are notable?	Thinking about the information in columns 4, 5 and 6, estimate the overall air quality recorded for this route on this day. Does the Air Quality that you selected make sense to you given why you monitored this location?
Wed 7/1/2023	24 hrs.	60 ug/m3	Yellow	Maroon ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Purple ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Red ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Orange ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Yellow ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Green ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time	☐ YES (notate below) ☐ NO 12PM to 4PM ☐ _____ 4PM to 8PM ☐ _____ 8PM to 12 AM ☐ _____ 12AM to 4AM ☐ _____ 4AM to 8AM ☐ Red 8AM to 12PM ☐ _____	☐ GOOD ☐ PRETTY GOOD ☐ NEITHER GOOD NOR POOR ☐ KIND OF POOR ☐ POOR ☐ YES (notate below) ☐ NO It makes sense that part of the day air quality was Red, but I didn't think this happened at night.

				Maroon ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Purple ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Red ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Orange ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Yellow ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Green ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time	☐ YES (notate below) ☐ NO 12PM to 4PM ☐ _____ 4PM to 8PM ☐ _____ 8PM to 12 AM ☐ _____ 12AM to 4AM ☐ _____ 4AM to 8AM ☐ _____ 8AM to 12PM ☐ _____	☐ GOOD ☐ PRETTY GOOD ☐ NEITHER GOOD NOR POOR ☐ KIND OF POOR ☐ POOR ☐ YES (notate below) ☐ NO
				Maroon ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Purple ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Red ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Orange ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Yellow ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time Green ☐ Much of the Time ☐ Some of the Time ☐ Little of the Time	☐ YES (notate below) ☐ NO 12PM to 4PM ☐ _____ 4PM to 8PM ☐ _____ 8PM to 12 AM ☐ _____ 12AM to 4AM ☐ _____ 4AM to 8AM ☐ _____ 8AM to 12PM ☐ _____	☐ GOOD ☐ PRETTY GOOD ☐ NEITHER GOOD NOR POOR ☐ KIND OF POOR ☐ POOR ☐ YES (notate below) ☐ NO