



Board Agenda Item

TO: Air Pollution Control District Board

FROM: Aeron Arlin Genet, Air Pollution Control Officer 

CONTACT: Desmond Ho, Air Quality Specialist, (805) 961-8873

SUBJECT: Low-Cost Sensors Update

RECOMMENDATION:

Consider recommendations as follows:

1. Receive and file an update on the use and status of low-cost air quality sensors in Santa Barbara County;
2. Approve the attached amended Agreement for Low-Cost Air Quality Sensor; and
3. Delegate authority to the Air Pollution Control Officer to make minor updates to the Agreement subject to concurrence by District Counsel, Risk Management and Auditor Controller.

BACKGROUND:

Low-cost air quality sensors are increasing in popularity as a tool for community members and agencies across the country to better understand their local air quality conditions, especially with increasing wildfire frequency. Low-cost sensors were initially used by the District as part of our teacher grant program. Sensors were loaned out to teachers to provide students with an opportunity to study air quality. Projects included a study on whether indoor air quality was negatively affected by laser printers, and the development of a curriculum using sensors to study air quality trends and data interpretation.

Your Board approved an Agreement for Low-Cost Air Quality Sensor (sensor agreement) in December 2018. Since then the District has partnered with school districts and other community partners, and to date has installed 38 low-cost air quality sensors throughout the County. This deployment process yielded some insights and lessons learned.

[Aeron Arlin Genet](#), Air Pollution Control Officer

Two brands of sensors were evaluated due to their demonstrated accuracy in laboratory tests. One is manufactured by PurpleAir, and the other by Clarity. The PurpleAir sensor is a small wall-mounted sensor that measures particulate matter, costs approximately \$250 per unit, and requires access to a power source as well as WiFi for data transmission. The Clarity sensor measures particulate matter and nitrogen dioxide and costs \$1,000 per unit per year. The Clarity sensor uses its own cellular network and is solar powered. The District evaluated these sensors by co-locating them with our established monitoring stations in Goleta and Santa Maria. The PurpleAir sensor was selected for more widespread deployment in the community as it had superior performance to the Clarity sensor and at a lower cost.

U.S. Environmental Protection Agency (EPA) has developed regional correction factors designed to improve the accuracy of PurpleAir sensor measurements. In April 2020, EPA released a beta version of their web-based Fire and Smoke Map that incorporates the corrected PurpleAir sensor data. This tool is available at fire.airnow.gov and shows the PurpleAir sensors, temporary monitors such as portable Beta Attenuation Monitors (E-BAMs), and our permanent monitoring stations.

While the sensors provide informative data, they do not meet federal, state, or local regulatory requirements for air quality monitoring, air quality warnings, or enforcement. Therefore, the District does not intend to use any sensor data for any enforcement or regulatory purposes. However, the inclusion of low-cost sensor data on the EPA Fire and Smoke Map has proven to be very helpful during wildfire events, such as those experienced in the late summer and fall of 2020. The sensor data helps fill in gaps and provides additional real-time information for the community to consider when conditions are changing rapidly.

DISCUSSION:

Sensor Deployment

Approximately 68 PurpleAir sensors are currently operated in Santa Barbara County; of those, 38 are owned and operated by the District. A complete map of District-installed sensors is provided in Attachment A. These sensors were deployed over an 18-month period. Challenges to deployment included some of the requirements in the sensor agreement (e.g., parties' responsibility to replace the device if it is vandalized), WiFi issues, and ongoing maintenance.

The PurpleAir sensors require a 2.4 GHz WiFi network to transmit data, and some of the community partners either did not have that frequency enabled or subsequently turned off that frequency to reduce the strain on their networks. This has caused many sensors to go offline and has required staff to visit sites to troubleshoot problems and reconnect the sensors to WiFi. Staff have contacted all community partners about this issue and are working with partners that have not re-enabled that frequency.

Staff have also observed sensors reading erratic numbers and has determined that they can become clogged with particulates and require cleaning. Some community partners have onsite maintenance staff who perform this repair, but in some cases the cleaning is ineffective, and the sensor must be replaced. While District staff are monitoring the [PurpleAir website](https://purpleair.com) to ensure that sensors are functioning, some of the sensors have been operating for two years and sensor longevity is not yet well understood. The District may need to replace sensors as they age.

Amended Agreement

The original sensor agreement was adopted by your Board in December 2018. Since that Board meeting, staff's experience using the agreement has informed the following proposed changes to the agreement language that has been reviewed by District Counsel, Risk Management, and Auditor Controller. An amended version is provided as Attachment B, and the amendments are summarized below.

- Liability clause: One community partner chose not to enter into an agreement due to the monetary liability clause. The amended sensor agreement does not include the liability clause. Staff will continue to work with each site host to identify safe and secure locations for the sensors.
- Duration of agreement: The six-month duration of the original agreement has been removed and replaced with a statement that the agreement will remain in place until either party terminates with a 30-day notice. This change was made in order to reduce the administrative burden of renewing and signing the agreement by both parties.

Future Deployment and Use of Low-Cost Sensors

The District will continue to use the PurpleAir sensors, as they provide communities with neighborhood-specific air quality trends, especially during wildfire events. The PurpleAir sensors can also serve as back-up information if our permanent monitoring stations or E-BAM portable monitor data are not available due to a power outage or other event.

The District will continue to work with schools, public organizations, and other community partners to expand the use of low-cost sensors, especially in areas where monitoring stations are not located, or where localized conditions may exist.

Staff recommends that your Board approve the updated sensor agreement included as Attachment B. The proposed amendments will help to expand and improve the network of low-cost sensors in Santa Barbara County. As the District continues to gain experience deploying these sensors, additional updates to the agreement may be necessary. Therefore, staff recommends that your Board delegate authority to the Air Pollution Control Officer to make minor updates to the sensor agreement subject to concurrence by District Counsel, Risk Management, and Auditor Controller.

FISCAL IMPACT:

In addition to the 38 PurpleAir sensors currently deployed, the District has three units from the California Air Resources Board for installation in areas affected by wildfire and three additional District-owned units. To ensure that the District has enough sensors available for interested community partners and to replace aging units, the District plans to purchase 20 additional units. Funds for the purchase of additional units were included in the Fiscal Year 2020-2021 budget approved by your Board.

ATTACHMENTS:

- A. Map of PurpleAir Sensors Deployed
- B. Amended Agreement for Low-Cost Air Quality Sensor

ATTACHMENT A

Map of PurpleAir Sensors Deployed

January 21, 2021

Santa Barbara County Air Pollution Control District
Board of Directors

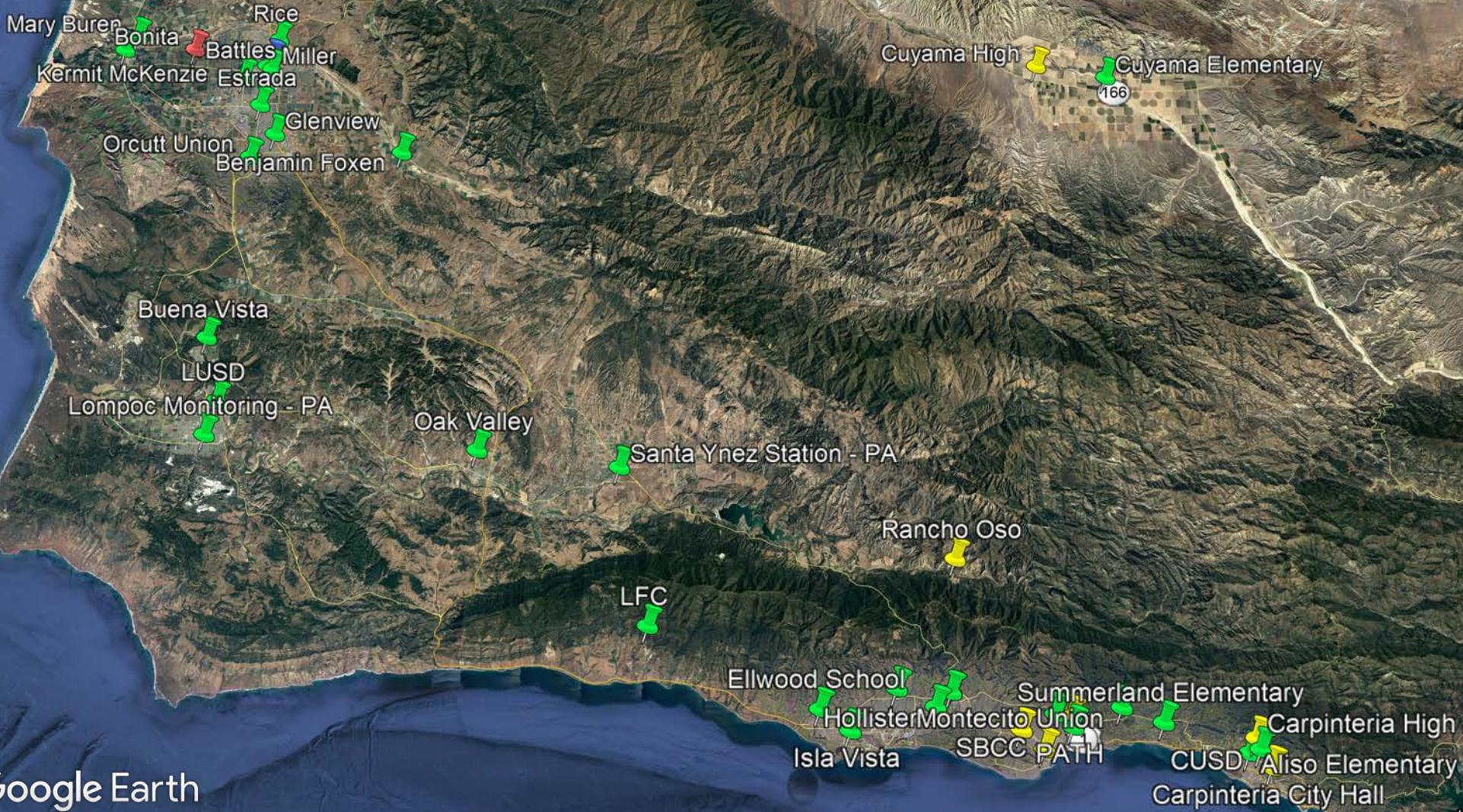
260 San Antonio Road, Suite A
Santa Barbara, California 93110

PurpleAir Sensors Map

January 5, 2021

Legend

- Indoor
- Offline
- Offline due to WiFi
- Online



Google Earth

Image Landsat / Copernicus

© 2020 Google

Data MBARI

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

20 mi



ATTACHMENT B

Amended Agreement for Low-Cost Air Quality Sensor

January 21, 2021

**Santa Barbara County Air Pollution Control District
Board of Directors**

**260 San Antonio Road, Suite A
Santa Barbara, California 93110**

Agreement for Low-Cost Air Quality Sensor

- Loaning DISTRICT-owned sensor(s) Technical guidance from DISTRICT

This Agreement is between the Santa Barbara County Air Pollution Control District (DISTRICT) and _____ (COMMUNITY PARTNER) and is effective from the date of full execution by both parties.

AGREEMENT

WHEREBY, THE PARTIES AGREE AS FOLLOWS:

1. This Agreement shall remain in place until either party terminates for convenience upon providing 30-day written notice to the contact listed in item (7) below, via e-mail or U.S. mail. Once notice of termination is received, DISTRICT will remove the SENSOR from COMMUNITY PARTNER’S location within __ days.
2. DISTRICT agrees to provide [#]___ air quality sensor(s) (“SENSOR”) to COMMUNITY PARTNER. COMMUNITY PARTNER shall install the SENSOR on COMMUNITY PARTNER’S property at a DISTRICT-approved mounting location.
3. COMMUNITY PARTNER agrees to the following:
 - a. Provide an outdoor-accessible 110 AC outlet for power within 15 feet of the mounting location of the SENSOR(s);
 - b. Provide WiFi internet access for the SENSOR;
 - c. Take reasonable efforts to maintain and monitor the site to make sure that the location remains conducive to operating conditions;
 - d. To not alter, modify, or tamper with the SENSOR(s) or use the SENSOR(s) for any unauthorized purpose;
 - e. Provide a contact person and phone number for issues regarding the SENSOR(s);
 - f. Allow DISTRICT staff to take photographs of installed SENSOR(s); and
 - g. Provide reasonable access to DISTRICT staff to the mounting location for installation and routine maintenance and inspection of the SENSOR(s).

4. COMMUNITY PARTNER acknowledges that the SENSOR does not meet federal, state, or local regulatory requirements for air quality monitoring, air quality warnings, or enforcement and that DISTRICT will not use any SENSOR data for any enforcement or regulatory purposes. Learn more about understanding and interpreting data from low-cost air quality sensors at www.ourair.org/sensors.
5. Both parties acknowledge that the location of the SENSOR and its data will be public and the data will be published on the internet. The name of SENSOR, as visible on the PurpleAir online map, will include the term "SBCAPCD Info."
6. As consideration for receipt of this loaned equipment and technical assistance, COMMUNITY PARTNER agrees to waive any and all claims for damage to its personal or real property and/or damage to the equipment or injury to your organization's personnel. COMMUNITY PARTNER also agrees to hold DISTRICT harmless from any and all liability, claims or expenses whatsoever arising from the transportation, use or storage of said equipment, including injury to third persons. COMMUNITY PARTNER accepts the loaned equipment "as is" and will contact the DISTRICT to arrange the return of the SENSOR at the end of the Agreement.
7. Contact information: either party may update the information below by providing written or e-mail notice to the other party.

COMMUNITY PARTNER

Email: _____

Phone: _____

DISTRICT

Santa Barbara County Air Pollution Control District
260 N. San Antonio Road Suite A
Santa Barbara, CA 93110
Attn: Low-Cost Sensors Group

Email: sensors@sbcapcd.org

Phone: (805) 961-8800

COMMUNITY PARTNER

Signature: _____

Print Name: _____

Date: _____

APPROVED:

Date: _____

By: _____

Aeron Arlin Genet, Air Pollution Control Officer

Agreement for Low-Cost Air Quality Sensor
Effective Date – To Be Determined

This “Agreement for Low Cost Air Quality Sensor” is by and between various community partners (to be determined) and the Santa Barbara County Air Pollution Control District.

APPROVED AS TO FORM:

MICHAEL C. GHIZZONI
Santa Barbara County Counsel

Rachel Van Mullem
By [Rachel Van Mullem \(Jan 14, 2021 13:27 PST\)](#)
District Counsel

APPROVED AS TO FORM:

RAY AROMATORIO
Risk Manager

By *Ray Aromatorio*
Risk Manager

APPROVED AS TO FORM:

BETSY M. SCHAFFER, CPA
Auditor-Controller

By *C. Schaffer*
Deputy