



Valero Benicia Refinery Coker Unit Particulate Release

Benicia, CA

Preliminary Air Sampling and Analysis Plan (SAP)

Version 1.1

Prepared on Behalf of:

Valero

Prepared By:

CTEH, LLC

5120 Northshore Drive

Little Rock, AR 72118

501-801-8500

March 14, 2019

	Name/Organization	Signature	Date Signed
Prepared by:	Pablo Sanchez Soria, PhD, CIH, Project Toxicologist		3/13/2019
Reviewed by:	Andrew Henault, Project Manager		
Approved by:			
Approved by:			
Approved by:			

Air Monitoring and Sampling Strategy

The strategy is to utilize three broadly defined monitoring plans: 1) Worker Activity; 2) Community; 3) Site Assessment. Worker Activity Monitoring will generally take place in the presence of workers performing/supporting remediation operations. The readings will generally be taken at a height consistent with that of the workers breathing zone and in close proximity to workers without interfering or obstructing their remediation tasks. Community Monitoring may take place in those residential and commercial locations immediately surrounding the Valero Benicia Refinery. Unlike Worker Activity Monitoring and Community Monitoring, Site Assessment does not necessarily represent ambient air monitoring near breathing zone level. Site Assessment may involve a variety of different monitoring tasks intended to provide information that may help to delineate the nature and extent of the release (e.g. fence line monitoring, worst case determination, container head space, ground level, etc.).

Free-roaming handheld real-time air monitoring may be conducted in a variety of areas based on levels of activity, proximity to the release, and site conditions. Fixed-location handheld real-time locations may be established in the Community in order to provide concentration averages that may be observed and analyzed over time in distinct geographic locations in the community.

Discrete air samples may be collected in all monitoring areas and sent to an off-site laboratory for chemical analysis. These analytical air sampling techniques may be used to provide air quality data beyond the scope of real-time instruments. When necessary, discrete air samples may be collected on individual workers (personal sampling) to provide exposure data over the course of a work shift for more direct comparison to occupational exposure values.

CTEH Site-Specific Action Levels

CTEH site-specific action levels may be employed in all air monitoring plans to provide information for corrective action to limit potential exposures. These values do not replace occupational or community exposure standards or guidelines, but are intended to represent a concentration limit that triggers a course of action to better address worker and public safety. Action level exceedances will be communicated to Site Management and the CTEH Project Technical Director by the CTEH Project Manager (PM). Work practice may be assessed and then altered if necessary.

Plan 1: Work Area Monitoring

Analytes and Parameters

Objective: Report air levels before they reach those requiring respiratory protection

Analyte	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Particulate Matter (PM ₁₀) ^{&}	0.351 mg/m ³ sustained for 15 minutes	Report reading to Project Manager/PTD	Wildfire Smoke Guidelines – Unhealthy level for 1-3 hr avg.	AM510/DustTrac	0.001 mg/m ³	Range: 1 – 5,000 ppm	NA
Particulate Matter (PM _{2.5}) ^{*&}	0.351 mg/m ³ sustained for 15 minutes	Report reading to Project Manager/PTD	Wildfire Smoke Guidelines – Unhealthy level for 1-3 hr avg.	AM510/DustTrac	0.001 mg/m ³	Range: 1 – 5,000 ppm	NA
Carbon Monoxide	25 ppm sustained for 15 minutes	Report reading to Project Manager/PTD	ACGIH TLV-TWA	MultiRAE sensor	1 ppm	Range: 1 – 500 ppm	NA
				Horiba VIA-510	0%	Range: 0 – 100%	NA
Sulfur Dioxide	0.25 ppm sustained for 5 minutes	Report reading to Project Manager/PTD	ACGIH TLV-STEL	MultiRAE sensor	0.1 ppm	Range 0 - 20 ppm	NA
Nitrogen Dioxide	0.2 ppm	Report reading to Project Manager/PTD	ACGIH TLV-TWA	MultiRAE sensor	0.1 ppm	Range: 0 -20 ppm	NA
				Gastec tube #9L	0.1 ppm	Range: 0.5 – 125 ppm	NA

*PM_{2.5} is especially prone to interference from high humidity. In cases of high humidity, PM_{2.5} readings may be discontinued temporarily.

& Based on EPA Recommended Values (Attachment A)

Plan 2: Community Monitoring

Analytes and Parameters

Objective: Report air levels before they reach those causing nuisance or health issues

Analyte	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Particulate Matter (PM ₁₀) ^{&}	0.138 mg/m ³ sustained for 15 minutes	Report reading to Project Manager/PTD	Wildfire Smoke Guidelines – Unhealthy for Sensitive Groups level for 1-3 hr avg.	AM510/DustTrac	0.001 mg/m ³	Range: 1 – 5,000 ppm	NA

Particulate Matter (PM _{2.5})* &	0.138 mg/m ³ sustained for 15 minutes	Report reading to Project Manager/PTD	Wildfire Smoke Guidelines – Unhealthy for Sensitive Groups level for 1-3 hr avg.	AMS10/DustTrac	0.001 mg/m ³	Range: 1 – 5,000 ppm	NA
Carbon Monoxide	25 ppm sustained for 15 minutes	Report reading to Project Manager/PTD	1/3 of the CO PAC 1 value	MultiRAE sensor	1 ppm	Range: 1 – 500 ppm	NA
Sulfur Dioxide	Detection	Report reading to Project Manager/PTD	SO ₂ PAC 1 value of 0.2 ppm	MultiRAE sensor	0.1 ppm	Range 0 - 20 ppm	NA
Nitrogen Dioxide	Detection	Report reading to Project Manager/PTD	NO ₂ PAC 1 value of 0.5 ppm	MultiRAE sensor	0.1 ppm	Range: 0 -20 ppm	NA
				Gastec tube #9L	0.1 ppm	Range: 0.5 – 125 ppm	NA

*PM_{2.5} is especially prone to interference from high humidity. In cases of high humidity, PM_{2.5} readings may be discontinued temporarily.

& Based on EPA Recommended Values (Attachment A)

Plan 3: Site Assessment

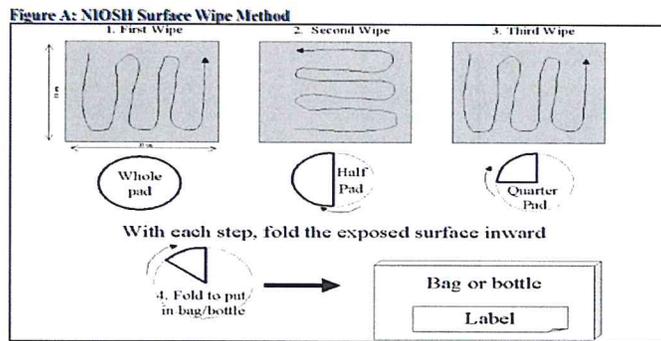
Analytes and Parameters

Objective: Characterize the nature and extent of release or environment

Analyte	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Particulate Matter (PM ₁₀)	Detection	Report reading to Project Manager/PTD	Inform PM/PTD of potential issues	AMS10/DustTrac	0.001 mg/m ³	Range: 1 – 5,000 ppm	NA
Particulate Matter (PM _{2.5})	Detection	Report reading to Project Manager/PTD	Inform PM/PTD of potential issues	AMS10/DustTrac	0.001 mg/m ³	Range: 1 – 5,000 ppm	NA
Carbon Monoxide	Detection	Report reading to Project Manager/PTD	Inform PM/PTD of potential issues	MultiRAE sensor	1 ppm	Range: 1 – 500 ppm	NA
Sulfur Dioxide	Detection	Report reading to Project Manager/PTD	Inform PM/PTD of potential issues	MultiRAE sensor	0.1 ppm	Range 0 - 20 ppm	NA
Nitrogen Dioxide	Detection	Report reading to Project Manager/PTD	Inform PM/PTD of potential issues	MultiRAE sensor	0.1 ppm	Range: 0 -20 ppm	NA
				Gastec tube #9L	0.1 ppm	Range: 0.5 – 125 ppm	NA

*PM_{2.5} is especially prone to interference from high humidity. In cases of high humidity, PM_{2.5} readings may be discontinued temporarily.

Analytical Methods			
Analyte	Media/Can	Method	Notes
Metals (Air)	37 mm or 25 mm MCE	Mod. NIOSH 7303 ICP/MS	Sample at 4 Liters per minute for 8 hours to collect enough volume to allow detections below the Intermediate MRL for Nickel.
Metals (wipe)	MCE wipes	NIOSH 7303	Sample a 10 cm x 10 cm (100 cm ²) non-porous non-metallic horizontal surface area using the MCE filters from sampling cassettes using gloves. Follow sampling illustrated on Figure A, below.
	Pre-moist wipes (lead wipes)	NIOSH 9102	
pH	pH strips	Colorimetric detection	pH strips will be used to evaluate surface pH using deionized water.



General Information on Procedures (Assessment Techniques) Used

Procedure	Description
Guardian Network	A Guardian network may be established with AreaRAEs equipped with electrochemical sensors at locations around the work zone perimeter. The AreaRAEs will be telemetering instantaneous data at 15-second intervals to a computer console. MultiRAE Pros may also be used in the network. The data will be visible in real-time at the computer console and will be monitored 24 hours per day by CTEH personnel.

Procedure	Description
Real-Time Handheld Survey	CTEH staff members may utilize handheld instruments (e.g. MultiRAE Plus; ppbRAE, Gastec colorimetric detector tubes, etc.) to measure airborne chemical concentrations. CTEH will use these handheld instruments primarily to monitor the ambient air quality at breathing zone level. Additionally, measurements may be made at grade level, as well as in elevated workspaces, as indicated by chemical properties or site conditions. CTEH may also use these techniques to verify detections observed by the AreaRAE network.
Fixed Real-Time Monitoring locations	Multiple Community locations may be identified and monitored at the same location approximately once per hour using handheld instruments. This allows the use of statistical analysis more effectively than with a random approach.
Analytical sampling	Analytical sampling may be used to validate the fixed and handheld real-time monitoring data, or to provide data beyond the scope of the real-time instruments. Analytical samples may be collected as whole air samples in evacuated canisters or on specific collection media, and sent to an off-site laboratory for further chemical analysis.
Particulate Monitoring Network	A network of data-logging particulate monitors may be set up and positioned around the Community.

Quality Assurance/Quality Control Procedures

Method	Procedure
Real-Time	Real-time instruments may be calibrated in excess of the manufacturer's recommendations. At a minimum whenever indicated by site conditions or instrument readings. Co-located sampling for analytical analysis may be conducted, if necessary, to assess accuracy and precision in the field. Lot numbers and expiration dates may be recorded with use of Gastec colorimetric tubes.
Analytical	Chain of custody documents may be completed for each sample. Level IV data validation may be performed on the first sample group analyzed. Level II data validation may be performed on 20% of all samples. Level IV data validation may be performed on 10% of all samples.
Reporting	Daily data summaries may be provided for informational purposes using data that have not undergone complete QA/QC. Comprehensive reports of real-time and/or analytical data may be generated following QA/QC and may be delivered 60 days following receipt of validated results, if applicable.

Glossary

Term	Definition
Sustained	Instrument reading above the action level continuously for the listed time period.
Excursion Limit	Whenever a reading exceeds an ACGIH® TLV by 5 times (if the chemical does not have a STEL- or Ceiling-based action level), exit the area and notify the PM
Breathing zone	The area within an approximate 10-inch radius of an individual's nose and mouth.
Ambient Air	That portion of the atmosphere (indoor or outdoor) to which workers and the general public have access.

Change from version 1.0 to 1.1

In the section titled: Added PM_{2.5} as a target analyte, and added reference materials for context of action level significance.

	Name/Organization	Signature	Date Signed
Prepared by:	Pablo Sanchez Soria		3/14/2018
Review by:			
Approved by:			
Approved by:			
Approved by:			
Approved by:			

Change from version 1.1 to 1.2

In the section titled:

	Name/Organization	Signature	Date Signed
Prepared by:			
Review by:			
Approved by:			
Approved by:			
Approved by:			
Approved by:			

Attachment A

Table 3. Recommended Actions for Public Health Officials ^{2,3}

AQI Category (AQI Values)	PM2.5 or PM10 Levels (ug/m ³)			Visibility - Arid Conditions (miles)	Recommended Actions
	1-3hr avg	8 hr avg	24 hr avg ¹		
Good (0 to 50)	0 – 38	0 – 22	0 – 12	≥11	<ul style="list-style-type: none"> • If smoke event forecast, implement communication plan
Moderate (51 to 100)	39 – 88	23 – 50	12.1 – 35.4	6 – 10	<ul style="list-style-type: none"> • Issue public service announcements (PSAs) advising public about health effects and symptoms and ways to reduce exposure • Distribute information about exposure avoidance
Unhealthy for Sensitive Groups (101 to 150)	89 – 138	51 – 79	35.5– 55.4	3 – 5	<ul style="list-style-type: none"> • If smoke event projected to be prolonged, evaluate and notify possible sites for cleaner air shelters • If smoke event projected to be prolonged, prepare evacuation plans
Unhealthy (151 to 200)	139 – 351	80 – 200	55.5 – 150.4	1.5 – 2.75	<ul style="list-style-type: none"> • Consider “Smoke Day” for schools (i.e., no school that day), possibly based on school environment and travel considerations • Consider canceling public events, based on public health and travel considerations
Very Unhealthy (201 to 300)	352 – 526	201 – 300	150.5 – 250.4	1 – 1.25	<ul style="list-style-type: none"> • Consider closing some or all schools (Newer schools with a central air cleaning filter may be more protective than older, leakier homes. See “Closures”, below.) • Cancel outdoor events (e.g., concerts and competitive sports)
Hazardous (> 300)	> 526	> 300	> 250.5-500	< 1	<ul style="list-style-type: none"> • Close schools • Cancel outdoor events (e.g., concerts and competitive sports) • Consider closing workplaces not essential to public health • If PM level is projected to remain high for a prolonged time, consider evacuation of sensitive populations

¹Revised 24 hour average breakpoints from the **Revised Air Quality Standards for Particle Pollution and Updates to the Air Quality Index**, US Environmental Protection Agency, December 14, 2012. Available at <http://www.epa.gov/airquality/particlepollution/actions.html#dec12>.

²These 1- and 8-hr PM2.5 levels are estimated using the 24-hr breakpoints of the PM2.5 Air Quality Index included in the February 7, 2007 issue paper (http://www.epa.gov/airnow/aqi_issue_paper_020707.pdf) by dividing the 24-hr concentrations by the following ratios: 8-hr ratio is 0.7, 1-hr ratio is 0.4. Visibility is based on 1-hr values. If only PM10 measurements are available during smoky conditions, it can be assumed that the PM10 is composed primarily of fine particles (PM2.5), and that therefore the AQI and associated cautionary statements and advisories for PM2.5 may be used. This assumption is reflected in the column headings for Table 3.

³ Washington and Montana have developed more precautionary breakpoints, which can be found at: <http://www.deq.mt.gov/FireUpdates/BreakpointsRevised.asp> and <http://www.ecy.wa.gov/programs/air/pdfs/WAQA.pdf>

- **EPA Regional Offices** and the multi-agency **Wildland Fire Air Quality Response Program** may have monitors that can be deployed to smoky areas in some cases. The Wildland Fire Air Quality Response Program maintains a website (www.wildlandfiresmoke.net) with tools to help analyze the data from such emergency monitors and operational smoke model runs for use by ARAs, public health, and air quality personnel.
- **Federal and state land management agencies** – These agencies generally have the lead in responding to wildfires. In some states and during some large fires, these agencies and/or air quality agencies may hold daily air quality conference calls to coordinate messages and efforts, such as the placement of monitoring equipment. Participating in these internal calls can be valuable for public health agencies – both for sharing air quality information and coordinating protective messages. If an ARA has been assigned to an incident, that person also can be an additional source of information to help ensure consistent communication. If you are not sure whether an ARA has been assigned to a particular incident, check with your state or local air agency, check the www.wildlandfiresmoke.net website, or check the incident website for the fire found at inciweb.nwcg.gov.

In addition, during large wildfires, land management agencies’ incident management teams frequently host public meetings, where smoke and appropriate responses may be discussed. These meetings can be a good forum for providing messages about smoke and public health.

- **U.S. EPA regional offices and federal land management agencies** – Federal agencies can help provide information to tribes if a fire is on, or smoke is affecting, lands in Indian country. Federal agencies have a trust responsibility to tribes and have established contacts who can help deliver information on wildfire smoke and health.

Table 2. Health Effects and Cautionary Statements.

Category (see Table 3)	Health Effects	Cautionary Statements ¹	Other Protective Actions
Good	None expected	None	None
Moderate	Possible aggravation of heart or lung disease	Unusually sensitive individuals should consider limiting prolonged or heavy exertion. <ul style="list-style-type: none"> • People with heart or lung disease should pay attention to symptoms. • If you have symptoms of lung or heart disease, including repeated coughing, shortness of breath or difficulty breathing, wheezing, chest tightness or pain, palpitations, nausea, unusual fatigue or lightheadedness, contact your health care provider. 	<ul style="list-style-type: none"> • If symptomatic, reduce exposure to particles by following advice in box below.

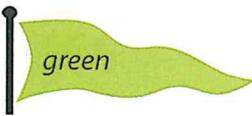
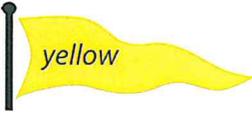
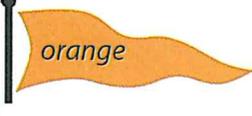
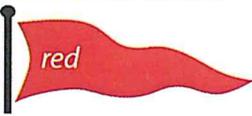
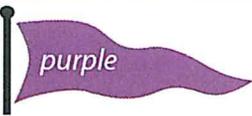
Category (see Table 3)	Health Effects	Cautionary Statements ¹	Other Protective Actions
Unhealthy for Sensitive Groups	Increasing likelihood of respiratory or cardiac symptoms in sensitive individuals, aggravation of heart or lung disease, and premature mortality in persons with cardiopulmonary disease and the elderly.	<p><i>Sensitive Groups:</i></p> <p>People with heart or lung disease, the elderly, children, and pregnant women should limit prolonged or heavy exertion.</p> <ul style="list-style-type: none"> • Limit time spent outdoors. • Avoid physical exertion. • People with asthma should follow asthma management plan. • If you have symptoms of lung or heart disease that may be related to excess smoke exposure, including repeated coughing, shortness of breath or difficulty breathing, wheezing, chest tightness or pain, heart palpitations, nausea, unusual fatigue or lightheadedness, contact your health care provider. 	<ul style="list-style-type: none"> • Keep doors and windows closed, seal large gaps as much as possible. • Avoid using exhaust fans (kitchen, bathrooms, clothes dryer, and utility room). • Keep the garage-to-home door closed. • If cooling is needed, turn air conditioning to re-circulate mode in home and car, or use ceiling fans or portable fans (but do not use whole house fans that suck outdoor air into the home). • If a home has a central heating and/or air conditioning system, install higher efficiency filters if they can be accommodated by the system. If a filter upgrade has been performed (e.g., filters rated at MERV 8 or higher), the system's circulating fan can be temporarily set to operate continuously to obtain maximum particle removal by the central air system's filter, although this will increase energy use and costs. • Operate portable air cleaners to reduce indoor particle levels.
			<ul style="list-style-type: none"> • Avoid indoor sources of pollutants, including tobacco smoke, heating with wood stoves and kerosene heaters, frying or broiling foods, burning candles or incense, vacuuming, and using paints, solvents, cleaning products, and adhesives. • Keep at least 5-day supply of medication available. • Have supply of non-perishable groceries that do not require cooking.

Category (see Table 3)	Health Effects	Cautionary Statements ¹	Other Protective Actions
Unhealthy	Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.	<p><i>Sensitive Groups:</i> should avoid prolonged or heavy exertion</p> <p><i>Everyone:</i> should limit prolonged or heavy exertion</p> <ul style="list-style-type: none"> • Limit time spent outdoors. • If you have symptoms of lung or heart disease that may be related to excess smoke exposure, including repeated coughing, shortness of breath or difficulty breathing, wheezing, chest tightness or pain, palpitations, nausea or unusual fatigue or lightheadedness, contact your health care provider. 	<p><i>Sensitive Groups:</i></p> <p>Stay in a “clean room” at home (where there are no indoor smoke or particle sources, and use a non-ozone producing air cleaner).</p> <ul style="list-style-type: none"> • Go to a “cleaner air” shelter (see Appendix D) or possibly out of area <p><i>Everyone:</i> Follow advice for sensitive groups in box above.</p> <ul style="list-style-type: none"> • Identify potential “cleaner air” shelters in the community (see Appendix D).
Very Unhealthy	Significant aggravation of heart or lung disease, premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in general population.	<p><i>Everyone:</i> should avoid prolonged or heavy exertion</p> <p>Stay indoors, avoid exertion</p>	<p><i>Everyone:</i> If symptomatic, evacuate to cleaner air shelter or leave area, if safe to do so.</p>
Hazardous	Serious aggravation of heart or lung disease, premature mortality in persons with cardiopulmonary disease and the elderly; serious risk of respiratory effects in general population.	<p><i>Everyone:</i> should avoid any outdoor activity.</p>	<p><i>Everyone:</i> If symptomatic, evacuate to cleaner air shelter or leave area, if safe to do so.</p>

¹ Higher advisory levels automatically incorporate all of guidance offered at lower levels.

Air Quality and Outdoor Activity Guidance for Schools

Regular physical activity — at least 60 minutes each day — promotes health and fitness. The table below shows when and how to modify outdoor physical activity based on the Air Quality Index. This guidance can help protect the health of all children, including teenagers, who are more sensitive than adults to air pollution. Check the air quality daily at www.airnow.gov.

Air Quality Index	Outdoor Activity Guidance
 <p>green</p> <p>GOOD</p>	Great day to be active outside!
 <p>yellow</p> <p>MODERATE</p>	<p>Good day to be active outside!</p> <p>Students who are unusually sensitive to air pollution could have symptoms.*</p>
 <p>orange</p> <p>UNHEALTHY FOR SENSITIVE GROUPS</p>	<p>It's OK to be active outside, especially for short activities such as recess and physical education (PE).</p> <p>For longer activities such as athletic practice, take more breaks and do less intense activities.</p> <p>Watch for symptoms and take action as needed.*</p> <p>Students with asthma should follow their asthma action plans and keep their quick-relief medicine handy.</p>
 <p>red</p> <p>UNHEALTHY</p>	<p>For all outdoor activities, take more breaks and do less intense activities.</p> <p>Consider moving longer or more intense activities indoors or rescheduling them to another day or time.</p> <p>Watch for symptoms and take action as needed.*</p> <p>Students with asthma should follow their asthma action plans and keep their quick-relief medicine handy.</p>
 <p>purple</p> <p>VERY UNHEALTHY</p>	Move all activities indoors or reschedule them to another day.

* Watch for Symptoms

Air pollution can make asthma symptoms worse and trigger attacks. Symptoms of asthma include coughing, wheezing, difficulty breathing, and chest tightness. Even students who do not have asthma could experience these symptoms.

If symptoms occur:

The student might need to take a break, do a less intense activity, stop all activity, go indoors, or use quick-relief medicine as prescribed. If symptoms don't improve, get medical help.

Go for 60!

CDC recommends that children get 60 or more minutes of physical activity each day. www.cdc.gov/healthyyouth/physicalactivity/guidelines.htm

Plan Ahead for Ozone

There is less ozone in the morning. On days when ozone is expected to be at unhealthy levels, plan outdoor activities in the morning.

Questions and Answers

How long can students stay outside when the air quality is unhealthy?

There is no exact amount of time. The worse the air quality, the more important it is to take breaks, do less intense activities, and watch for symptoms. Remember that students with asthma will be more sensitive to unhealthy air.

Why should students take breaks and do less intense activities when air quality is unhealthy?

Students breathe harder when they are active for a longer period of time or when they do more intense activities. More pollution enters the lungs when a person is breathing harder. It helps to:

- ✓ reduce the amount of time students are breathing hard (e.g., take breaks; rotate players frequently)
- ✓ reduce the intensity of activities so students are not breathing so hard (e.g., walk instead of run)

Are there times when air pollution is expected to be worse?

Ozone pollution is often worse on hot sunny days, especially during the afternoon and early evening. Plan outdoor activities in the morning, when air quality is better and it is not as hot.

Particle pollution can be high any time of day. Since vehicle exhaust contains particle pollution, limit activity near idling cars and buses and near busy roads, especially during rush hours. Also, limit outdoor activity when there is smoke in the air.

How can I find out the daily air quality?

Go to www.airnow.gov. Many cities have an Air Quality Index (AQI) *forecast* that tells you what the local air quality will be later today or tomorrow, and a *current* AQI that tells you what the local air quality is now. The AirNow website also tells you whether the pollutant of concern is ozone or particle pollution. Sign up for emails, download the free AirNow app, or install the free AirNow widget on your website. You can also find out how to participate (and register your school) in the School Flag Program (www.airnow.gov/schoolflag).

If students stay inside because of unhealthy outdoor air quality, can they still be active?

It depends on which pollutant is causing the problem:

Ozone pollution: If windows are closed, the amount of ozone should be much lower indoors, so it is OK to keep students moving.

Particle pollution: If the building has a forced air heating or cooling system that filters out particles then the amount of particle pollution should be lower indoors, and it is OK to keep students moving. It is important that the particle filtration system is installed properly and well maintained.

What physical activities can students do inside?

Encourage indoor activities that keep all students moving. Plan activities that include aerobic exercise as well as muscle and bone strengthening components (e.g., jumping, skipping, sit-ups, pushups). If a gymnasium or open space is accessible, promote activities that use equipment, such as cones, hula hoops, and sports balls. If restricted to the classroom, encourage students to come up with fun ways to get everyone moving (e.g., act out action words from a story). Teachers and recess supervisors can work with PE teachers to identify additional indoor activities.

What is an asthma action plan?

An asthma action plan is a written plan developed with a student's doctor for daily management of asthma. It includes medication plans, control of triggers, and how to recognize and manage worsening asthma symptoms. See www.cdc.gov/asthma/actionplan.html for a link to sample asthma action plans. When asthma is well managed and well controlled, students should be able to participate fully in all activities. For a booklet on "Asthma and Physical Activity in the School," see <http://www.nhlbi.nih.gov/health/resources/lung/asthma-physical-activity.htm>.