ConocoPhillips Canada	**WILDFIRE SMOKE EXPOSURE** ALL-A0A-00-000-HST-0007	**Retention Code:** *CG01 - CA* **Revised:** *May 2020*
Owner: *HSE Operations*	**Approved By:** *Manager, Health & Safety Operations*	**Review Frequency:** *Five years or less*

Document History

Date	Approved by	Change Summary
May 2020	David Reaich	• Usability Mapped – Issued for Use • Hazard assessment now required when Environment Canada's mitigative strategies cannot be implemented.

About the Procedure

Purpose

The purpose of this procedure is to protect worker health from exposure to wildfire smoke. The suggested actions will consider the concentration of the smoke in the work area, the general health of the affected worker and the type of work being performed.

1. Wildfire Smoke Hazards and Health Effects

Reasons that Wildfire Smoke is Harmful to Human Health

Wildfire smoke is harmful to human health because:

- Smoke produced by wildfires is a complex mixture of particulate matter (PM) suspended in air, plus irritating or toxic gases and vapors.
- Particulates may contain substances such as carbon, sulfur and nitrogen compounds, metals and organic chemicals.
- Small particles can lodge deep in the lungs.
- For people with pre-existing respiratory and cardiovascular disease, their health can be aggravated by exposure.
- Lung function can be temporarily reduced.
- It can cause pulmonary inflammation.
- Immune response can be impaired, reducing the body's ability to remove foreign materials from the lungs.

NOTE: Small airborne particles in the range of 2.5 microns (PM2.5) in size are the most hazardous to the lungs as they can travel deep into the air exchange region. The level of 2.5 micron sized particulate matter (PM 2.5) is typically used as a measure of hazardous "smoke" levels.

Although wildfire smoke is different from air pollution caused by traffic or industry, it's also harmful to human health.

Health Effects of Exposure to Wildfire Smoke

Health effects include, but are not limited to the following:

Exposure Level	Health Effects
Low Level	Itchy/stinging eyes; scratchy throat; headaches
Moderate Level	Cough; irritated sinuses
High Level	Shortness of breath; chest pain

Depending on sensitivity, individuals with asthma may experience worsening of symptoms regardless of exposure level.

2. Air Monitoring

Conducting Air Monitoring

Air quality monitoring must be conducted by trained and qualified personnel using a calibrated instrument capable of measuring particulate matter in the PM2.5 (micron) range, such as the 3M EVM7 IAQ monitor.

NOTE: Contact HSE to determine strategic monitoring locations and perform monitoring

Monitoring PM2.5 Particulate Levels

Monitor PM2.5 particulate levels when smoke conditions are present:

- When visibility is >14 km and the local monitoring station (when available) reports readings <20 μg/m3, perform monitoring twice a day.
- When local monitoring stations (if available) report readings >20 μg /m3, perform monitoring:
  - Every hour if the site reading is >40 μg /m3, or
  - If < 40 μg /m3, continue with current monitoring frequency until conditions change.
  - When visibility is <14 km, increase monitoring to every hour.

3. Action Levels

Short Term Actions

Smoke exposure may vary throughout the day depending on the activity of and proximity to the fire, wind speed and direction, humidity and heat. Short term actions may include:

- Are based on average exposure levels over the last 1-3 hours.

- May be discontinued when the conditions have changed and the exposure levels have decreased to a point where less action is needed.
- See below table for short term actions.

Air Quality Category	Messages to At-Risk Workers	Messages to All Other Workers	Visitors
Good **Visibility: 15 km** **PM2.5 0-40**	Normal activities	Normal activities	Normal activities. Monitor forecast - may consider limiting non-essential travel to site.
Moderate/Unhealthy for Sensitive Groups **Visibility 5 – 14 km** **PM2.5 41-175**	Limit time spent outdoors and prolonged strenuous outdoor activities.	Advise of potential health effects and symptoms related to smoke exposure.	Consider restricting non-essential travel to site.
Unhealthy **Visibility: 2.5 – 4 km** **PM2.5 176-300**	Avoid prolonged strenuous activities and stay indoors.	Reduce or reschedule prolonged strenuous activities outdoors. Consider canceling outdoor activities.	Restrict non-essential travel to site.
Very Unhealthy **Visibility: 1.5 – 2km** **PM2.5 301-500**	No strenuous activities and stay indoors.	Avoid prolonged strenuous activity and stay indoors if possible. Recommend use of half or full-face mask for prolonged outdoor work.	Restrict non-essential workers or non-essential travel to CPC field sites and consider evacuating any visitors already on sites that have a camp environment.
Hazardous **Visibility: < 1 km** **PM2.5 > 500**	No strenuous activities and stay indoors.	Avoid prolonged strenuous activity and stay indoors if possible. For prolonged outdoor work must use half or full face mask respirators for outdoor work.	Restrict non-essential workers or non-essential travel to CPC field sites and consider evacuating any visitors already on sites that have a camp environment.

Long-Term Actions

Determination of action levels for an individual should consider a worker's activities and work location. For example, a worker whose job is indoors may have significantly lower levels of exposure than workers in the outdoor settings.

To measure the worker's potential exposure levels:

- Determine the average exposure during the work hours based on the average of the readings for the work in outdoor settings.

- Assume working 12 hours outdoors if no indoor measurements are available.
- Determine the time weighted average (TWA) exposure over the hours worked. If the indoor measurements are known, determine the average exposure for the hours worked outdoors and the average for the time indoors.

  TWA for work = [(x hrs * Exp Ave Outdoor)/x hrs) + (y hrs * Exp Ave Indoor)/y hrs)]/work hrs

- Determine the average exposure levels in the off hours.
  - Determine the TWA exposure for hours off work
  - TWA for off work = (x hrs * Exp Ave Indoor)/off hrs
- Determine the 24 hour potential exposure
  - Determine the daily TWA
  - TWA for day = [(TWA work * work hrs) + (TWA off * off hrs)]/24hrs

Additional long-term actions:

Air Quality Category	Messages to At-Risk Workers	Messages to All Other Workers	Visitors
PM2.5 < 40 mg/m³ (average over 24 hours)	Normal activities	Normal activities	Normal activities. Monitor forecast - may consider limiting non-essential travel to site.
PM2.5 41-175 mg/m³ (average over 24 hours)	Limit time spent outdoors and strenuous outdoor activities	Normal Activities	Normal activities. May consider limiting non-essential travel to site
PM2.5 176-300 mg/m³ (average over 24 hours)	Consider evacuation, especially if symptomatic.	Reduce or reschedule strenuous activities outdoors. Consider canceling outdoor activities.	Consider restricting non-essential travel to site
PM2.5 301-500 mg/m³ (average over 24 hours)	Evacuate from site.	Avoid strenuous activity and stay indoors if possible. Recommend use of half or full face mask for outdoor work	Restrict non-essential travel to site

PM2.5 > 500 mg/m³ (average over 24 hours)	Evacuated	Unless there are mitigating factors, recommend evacuation of non-critical workers from site. Critical workers must use half or full face mask respirators for outdoor work. NOTE: recommended respirators will effectively protect the worker's health as long as the cartridges are changed as required.	Restrict non-essential travel to site and consider evacuating any visitors already onsite

4. Measures to Reduce Exposure

Measures to Reduce Exposure

Consider below measures to reduce exposure to wildfire smoke:

Measures	Description
Shelter in Place	• Identify clean air shelters before an event occurs, as part of Emergency Response Planning. • Stay indoors and, when possible, in tightly closed, air-conditioned buildings. • In non-air conditioned or very leaky buildings, air out the building when air quality improves (even temporarily) to reduce indoor air pollution. • Follow Environment Canada's health messages according to Health risk and Air Quality Health Index.
Modify or Reschedule Work Activities	• Follow Environment Canada's health messages according to Health risk and Air Quality Health Index • This may mean modifying or rescheduling work activities.
Air Conditioners	• When possible, use high efficiency particulate air (HEPA) filters on AC units to help reduce the amount of outside air pollution that gets indoors. • Replace filters after a smoke event. • Stock sufficient filters in air shelters and replace filters as needed.
Air Cleaners	• While air cleaners are effective for reducing indoor particulate levels, most are not effective at removing gases and odors, which are components of wildfire smoke.

	• The two basic types of air cleaners for particle removal are mechanical cleaners and electronic air cleaners. • Clean or replace filtering medium regularly – see manufacturer's specification.
Humidifiers	Depending on the environment, humidifiers and dehumidifiers may be used to: • Help reduce pollutants through condensation, absorption and other mechanisms. • Reduce stress on the respiratory system, by keeping the mucus membranes moist.

NOTE: The most effective way to protect yourself during wildfire emergencies is to stay indoors or limit your time outdoors when there is smoke in the air. This is especially important if you have heart or lung disease and are at higher risk for adverse health effects.

NOTE: Follow Environment Canada's guidance associated with the identified health risk level. If recommended mitigations cannot be implemented, a hazard assessment must be completed, and appropriate mitigations implemented prior to starting work.

F