AIR QUALITY POLICY FOR ORIENTEERING EVENTS

2026

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1.0 REASON FOR THIS POLICY

When air quality is compromised by contaminants in the air a person's health can be adversely affected. Smoke from forest fires and emissions from other sources can have a profound impact on air quality.

The Alberta Orienteering Association (AOA) recognizes the potential short- and long-term health effects of engaging in physical activity outdoors when the air quality is poor. The AOA is fully committed to reducing the risk posed to orienteers from poor air quality.

2.0 PURPOSE AND SCOPE

The purpose of this policy is to provide Alberta orienteering officials (coaches and event organizers) with guidelines that aim to reduce the health-related risk of poor air quality on people attending, helping at, and organizing orienteering events in Alberta.

3.0 SUMMARY OF THE POLICY

Due to the increasing frequency of poor air quality from forest fires, the AOA has developed a policy regarding orienteering during smoke incidents.

3.1 Decision making for orienteering events (C, B , and Canada Cup)

- **Decisions related to air quality will be made at the event site, at the start time of the event.**
- If possible, the $PM_{2.5}$ concentration ($\mu g/m^3$) will be measured at the event site using a portable monitor. This value will then be used to calculate the AQHI Plus value by dividing the concentration by ten, and rounding the result to the next highest integer.

  Decision makers can use other sources of real time air quality data if a monitor is not available. An on-line map that gives AQHI Plus values is Purple Air map AQHI Plus. While other real-time air quality maps exist, they usually give air quality measurements based on the USEPA Air Quality Index values, but actual $PM_{2.5}$ concentrations can sometimes be obtained (IQAir air quality map ; The World Air Quality Index Project: maps and more).
- **If the $PM_{2.5}$ concentration at the event site gives a calculated AQHI Plus value of 7 or greater, the event will be modified to remove all competitive elements, or if air quality shows an improving trend the start may be delayed provided the event can be completed during daylight.**
- **If the $PM_{2.5}$ concentration at the event site gives a calculated AQHI Plus value greater than 10 (10+) the event will be cancelled, or if air quality shows an improving trend the start may be delayed provided the event can be completed during daylight.**
- If, during an event, AQHI Plus value goes above 10, no further starts will be allowed. As well, any competitor observed, who is still on the course (e.g. passing through an arena), will be told that due to the extremely hazardous air quality, the event is now cancelled, and that they should report to the download station at the finish area. No results will be published.
- Events may also be cancelled, or postponed if poor air quality prevents organizers from setting up the event. In this case, notification must be posted on all relevant websites as soon as possible.
- For Canada Cup events cancellation or postponement decisions will be made by at least two of the following major officials: event director, controller, event advisor, jury member, course planner.

- For Canada Cup events where participants may have travelled long distances to the event, contingency plans may include rescheduling, or possibly alternate venues for the event.
- For local B and C events, the air quality decisions will be made by one, but preferably two, event officials.
- When poor air quality conditions seem likely, local event (C and B) organizers are encouraged to include possible rescheduling in their contingency planning.

3.2 Decision making for training events and youth programs

The program director or coach will follow the Coaching Association of Canada recommendations that at an AQHI Plus of 7 or greater, the exercise must be either moved indoors, rescheduled, or cancelled.

4.0 UNDERSTANDING AIR QUALITY MEASUREMENTS

The **Air Quality Health Index (AQHI)** is a scale used to measure air quality and its associated health risks. It is important for athletes and event organizers to understand and monitor the AQHI wherever data is available (mostly in urban centers). The AQHI is calculated from measured concentrations of nitrogen dioxide, ground-level ozone, and particulate matter smaller than 2.5 μ ($PM_{2.5}$).

However, the AQHI as developed by Health Canada and Environment Canada was based on medical outcomes due to "normal", usually urban, adverse air quality. It did not account for the relative increase in small particulate matter, especially that smaller than 2.5 μ ($PM_{2.5}$), due to forest fire smoke.

The **Air Quality Health Index Plus (AQHI Plus)** can be used to indicate potential adverse health impacts of wildfire smoke. This value is calculated by dividing the measured $PM_{2.5}$ concentration in $\mu g/m^3$ by ten and raising the result to the nearest integer.

Example calculations:

- The $PM_{2.5}$ concentration measured by the event director at the site is 24 $\mu g/m^3$. The AQHI Plus is calculated as 24/10 = 2.4, raised to the nearest integer = 3. Event is good to go.
- The $PM_{2.5}$ concentration measured by the event director at the site is 463 $\mu g/m^3$. The AQHI Plus is calculated as 463/10 = 46.3, raised to the nearest integer = 47. Event is cancelled (the AQHI Plus value is greater than 10).

There are many resources from which one can learn about air quality, the air quality health index (AQHI) and poor air quality as it impacts outdoor sports. Educational links can be found on the AOA website and in Appendix A.

The following table was developed by Environment Canada and Health Canada to advise what people should do given a specific value of the AQHI. The most important thing to remember from an orienteering official's perspective is that, according to Health Canada, **anyone participating in an outdoor sport is considered to be part of the at-risk population.**

Air quality can change rapidly and the AQHI or AQHI Plus can also be quite different depending on one's location – even adjoining neighborhoods can have differing values. This makes it difficult to determine "rules" regarding the management of orienteering events, and so in this policy, some discretion is being given to the orienteering officials in charge of an event.

Health Risk	Air Quality Health Index (AQHI)[a]	AQHI-Plus[b]	Health Message	
			At-Risk Population	General Population
Low Risk	**1 – 3**	**1 – 3**	**Enjoy** your usual outdoor activities.	**Ideal** air quality for outdoor activities.
Moderate Risk	**4 – 6**	**4 – 6**	**Consider** reducing or rescheduling strenuous activities outdoors if you are experiencing symptoms.	**No need to modify** your usual outdoor activities unless you experience symptoms such as coughing and throat irritation.
High Risk	**7 – 10**	**7 – 10**	**Reduce or reschedule** strenuous activities outdoors. Children and the elderly should also take it easy.	**Consider** reducing or rescheduling strenuous activities outdoors if you experience symptoms such as coughing and throat irritation.
Very High Risk	**10+** *means that the AQHI reading is greater than 10.*	**10+**	**Avoid** strenuous activities outdoors. Children and the elderly should also avoid outdoor physical exertion.	**Reduce or reschedule** strenuous activities outdoors, especially if you experience symptoms such as coughing and throat irritation.

[a] AQHI value as reported by Environment Canada

[b] Calculated by dividing the measured $PM_{2.5}$ concentration in µg/m^3 by ten and raising the value to the nearest integer.

5.0 RECOMMENDATIONS FOR ORIENTEERING EVENTS WITH REGARD TO AIR QUALITY

5.1 Factors that affect decisions regarding the impact of air quality on an orienteering event

- The type of event:
  - Training
  - Competition (C-, B-, or Canada Cup event)
  - Intensity of competition (e.g. sprint vs. long, or competitive vs. recreational);

- Ability to determine the local AQHI: While the WeatherCAN app provides the AQHI for cities, towns, and villages, an orienteering B- or Canada Cup event is not often close to one of these centers. More often, a $PM_{2.5}$ concentration close to the site will be available.
- Duration of the event: An orienteering event often runs through a whole day (or more): placement of controls, vetting, the competition window, which can be at least four hours long, and subsequent take-down. During this time the AQHI/AQHI Plus could vary; some competitors could race during an AQHI <4, while others could experience an AQHI >7. Officials and volunteers are often present for the whole day. A consideration is that air quality can deteriorate rapidly, but usually only improves slowly.
- Pre-event day activities: Air quality can be bad before an event, including during the time organizers and volunteers would be, for example, putting out controls. This pre-event setup often happens one or more days before the event.

5.2 Recommendations

5.2.1 Overarching recommendations

1. **Decisions regarding an orienteering event will be made based on the AQHI Plus value as calculated from the local $PM_{2.5}$ concentration at the start time of the event.**

Our recommendation is that clubs in Alberta purchase a monitor that can measure the $PM_{2.5}$ concentration at the event location. If a monitor is not available, the AQHI Plus value from the closest location should be used (Purple Air map AQHI Plus) or calculated from reported $PM_{2.5}$ concentrations.

Reasons for using local $PM_{2.5}$ concentrations:

- Concerns around orienteering event air quality occur mostly because of the potential health impact of wildfire smoke, which is heavily influenced by the concentration of $PM_{2.5}$.
- $PM_{2.5}$ concentrations can be easily measured at the event site.
- If a monitor is not available, $PM_{2.5}$ concentration measurements are often available closer to orienteering event sites and updated more often than the AQHI, which typically is only reported for major urban centers.
- By using the AQHI Plus, as calculated from $PM_{2.5}$ concentrations, orienteering event organizers can make more informed decisions based on local air quality conditions. However, AQHI values are still included in the policy as they are more familiar to the general public.

2. **An orienteering event will be cancelled if the AQHI Plus value is greater than 10.**

   If, during an event, the AQHI Plus exceeds a value of 10, no further starts will be allowed. As well, any competitor observed, who is still on the course (e.g. passing through an arena), will be told that due to the extremely hazardous air quality, the event is now cancelled, and that they should report to the download station at the finish area. No results will be published. Note that it is likely that the event was already modified (AQHI Plus was 7 or above; see below).

5.2.2 Recommendations for Training or Learn-to-Orienteer Events

Decisions regarding whether to modify or reschedule training or learning events will be based on the local $PM_{2.5}$ concentration, and will be made by the head coach or program leader. We recommend that the Coaching Association of Canada (CAC) /SIRC guidelines (CAC/SIRC guidelines on air quality and outdoor sports) be used.

AQHI Plus	$PM_{2.5}$ Concentration ($\mu g/m^3$)	Recommendation
1 – 3	30 or less	Carry on as usual.
4 – 6	31 - 60	Reduce intensity and/or duration of the event; • The coach or leader should be aware of any pre-existing medical conditions of the participants; • Monitor all participants.
7 – 10+	61 or greater	The exercise must be either moved indoors, rescheduled, or cancelled.

If the trainer or coach does not have access to $PM_{2.5}$ data, we recommend that they use the reported Environment Canada AQHI value, especially given that training, or learn-to-orienteer sessions often happen in or near urban centres.

5.2.3 Recommendations for C Events

The event organizer(s) will decide whether to modify or cancel a C-event based on the on-site AQHI Plus value as calculated from the measured $PM_{2.5}$ concentration, or closest available published $PM_{2.5}$ data at the start time of the event. As these are local club events, often held within the city, or a minimal distance away, the recommendations are:

AQHI Plus	$PM_{2.5}$ Concentration ($\mu g/m^3$)	Recommendation
1 – 3	30 or less	Carry on as usual.
4 – 6	31 - 60	At registration notify participants of the AQHI Plus value and advise caution.
7 – 10	61 - 100	At registration notify participants of the AQHI Plus value, advise caution, and notify that all competitive aspects of the event (e.g. club "points") are removed.
10+	> 100	The event is cancelled.

Clubs are advised to notify members of this policy at the start of the orienteering season, and provide links to AQHI Plus and $PM_{2.5}$ data sites so that participants can decide, for themselves, whether to travel to an event.

A possible option in the event of cancellation is to create a MapRun file and advise members they could run the course at their convenience.

5.2.4 Recommendations for B- and Canada Cup-events

For B- and Canada Cup events, a committee of at least two people (e.g. course planner, event director, controller, jury members) will decide on any changes to an orienteering event.

Decisions regarding the event will be made based on the AQHI Plus value as calculated from the on- or near-site measured $PM_{2.5}$ concentration at the start time of the event.

Ideally, the $PM_{2.5}$ concentration is determined for at least two or three locations on the event map.

Event organizers must notify potential participants of this policy in event notices and event web-sites, and provide links to nearby AQHI Plus or $PM_{2.5}$ data, so these potential participants can decide for themselves whether to travel to the event.

AQHI Plus	$PM_{2.5}$ Concentration ($\mu g/m^3$)	Recommendation
1 – 3	30 or less	Carry on as usual.
4 – 6	31 - 60	Notify participants of AQHI Plus value and advise caution.
7 – 10	61 - 100	Notify participants of AQHI Plus value, advise caution, and let all participants know that all competitive aspects of the event (e.g. posted results, medals) are removed.
10+	> 100	The event is cancelled.

If the air quality has been improving (i.e. measurements recorded over a period of time are decreasing), the committee has the option to postpone starts, as long as competitors can still finish during daylight hours.

It is recommended that the host club also post information as to whether refunds will be offered if the event is re-scheduled or cancelled outright.

5.2.5 Recommendations for Pre-Event Activities

What to do in the day or two before an event, and on the morning of the event, when air quality is bad, is more problematic.

- A possible scenario is that the AQHI Plus is 7, or even 10 or more at the site leading up to an event, when volunteers would normally be putting out controls**. We recommend that event organizers be granted the authority to cancel an event if their volunteers do not have a window to safely put out controls.**
- When air quality is rated as very high risk (AQHI Plus is greater than 10) early on the morning of an event, when volunteers would be doing set-up, some may be willing to carry on, wearing N95 or N99 masks, but others, understandably, may not be willing to even drive to the event site. We recommend that event organizers determine WELL ahead of time what to do in this case, and talk with their volunteers to determine what they would be willing to do, and adjust their plans accordingly.
- An event may be cancelled the day before. In this case, notification must be posted on all relevant websites as soon as possible.

6.0 GENERAL RECOMMENDATIONS WHEN ORGANIZING AN ORIENTEERING EVENT WHEN POOR AIR QUALITY IS POSSIBLE

Many of the following are common sense.

- An advisory must be placed on club and event-specific websites, and in other communications such as registration information, competitor newsletters, or information bulletins, that events could be cancelled, re-scheduled, or modified, in the event of poor air quality. Potential participants must be informed that the decision will be made at the event site, at the start time of the event. However, an event may be cancelled the day before. In this case, notification must be posted on all relevant websites as soon as possible.
- A link to AQHI Plus or $PM_{2.5}$ concentration data from as close to the event site as possible must be provided, so potential **participants can make their own decision whether to travel to an event,** given the possibility of cancellation, or modification of the event. They should be informed that an AQHI Plus of 7 or above ($PM_{2.5}$ concentration of 61 µg/m^3 or greater) at the event site means that there will be no publication of results or medals given, and when above 10 (or $PM_{2.5}$ concentration of 101 µg/m^3 or greater), the event will be cancelled.
- Impacts on health of poor air quality must be posted to club and event-specific web sites (the Environment Canada / Health Canada AQHI table should be posted, at a minimum).
- Course planners and other volunteers should modify their field work when the AQHI Plus is 7 or above: either go another time or wear a well-fitting mask that can block $PM_{2.5}$ particles (e.g. N95 or N99 masks).

The bottom line is that orienteering officials should always keep the welfare of participants and volunteers in mind, and base their decisions accordingly.

7.0 PRACTICAL CONSIDERATION IN APPLYING THIS POLICY (LESSONS LEARNED)

- It is CRITICAL that organizers, club members, and event participants be told about the club policy regarding air quality. Things to emphasise:

- Poor air quality is not just a temporary inconvenience, but can lead to long-term health impacts, including cancer;
- Anyone, no matter how healthy, participating in an outdoor sport is considered by Health Canada, to be in the “at risk” category;
- That it will be up to the potential participant to decide whether to travel to an event, as based on this policy.

- A common issue that participants raised was that the air quality information they had (whatever the source) said the air was fine. Our recommendation to address this is for a club to purchase a monitor and calculate the AQHI Plus value based on the measured $PM_{2.5}$ concentration at the event location, which value will determine the event status (good-to-go, modified, or cancelled).
- There will still be club members who will ignore any warnings, so at this point, as long as all efforts have been made to make them aware of the health risks, and organizers have applied the recommendations as described in section 5.2, organizers have done their best.

8.0 APPENDIX A

8.1 Air Quality Health Index (AQHI)

The AQHI is a scale used to measure air quality and its associated health risks. It is important for athletes and event organizers to understand and monitor the AQHI.

AQHI values range from 1 to 10+ (very high risk). The AQHI is calculated from measured concentrations of nitrogen dioxide, ground-level ozone, and particulate matter smaller than 2.5 µ.

8.2 How to monitor AQHI

- Urban AQHI in Canada
- Download the WeatherCAN app to your phone (provides the AQHI for urban areas)

8.3 $PM_{2.5}$ Measurement Data and Devices

- Use your own sensor, e.g. Temtop air quality monitors (temtopus.com) or PurpleAir (Portable Air Quality Monitor. The Edmonton club bought the Temtop M2000 as it does not need to be linked to the internet and can give the $PM_{2.5}$ concentration in various units.
- There are many different sites that provide real-time $PM_{2.5}$ data from sensors in an area. Two examples are:
  - Purple Air map AQHI Plus
  - AQI Map Alberta (near the top right-hand side in the window that opens change the drop-down menu from 'AQI' to 'PM 2.5').

Most air quality maps default is the USEPA AQI value, but one can sometimes obtain the $PM_{2.5}$ concentration from the map.

8.4 Educational materials

- "Assessment of the Air Quality Health Index (AQHI) and four alternate AQHI-Plus amendments for wildfire seasons in British Columbia", Can. J. Public Health, 2020, 111(1):96-106.

  This is the research paper describing the development of the AQHI Plus as a better indicator of health impacts of air quality during forest fire smoke incidents. As of 2023, most provinces and territories except Alberta, Quebec, and Ontario had adopted the AQHI Plus value.
- Background on AQHI Plus CBC 2023
- https://www.cbc.ca/news/science/aqhi-wildfire-smoke-air-quality-1.6947977
- Alberta government website: Alberta Gov: AQHI information
- Health Canada, with the Sport Information Resource Centre (SIRC) Health Canada/SIRC: Clearing the Air Around Air Quality and Outdoor Sport Safety
- SIRC, Health Canada, and the Coaching Association of Canada (CAC) developed a free e-learning module: *Air Quality and Outdoor Sport Safety*: CAC/SIRC: air quality learning module. Videos on this page provide excellent information on air quality and outdoor activities.
- Health Canada: Health Canada: Air Quality and Health