Ministry of Environment and Climate Change Strategy

COASTAL AIR ZONE REPORT (2013-2015)

Introduction

This is the third annual air quality report for the Coastal Air Zone. Annual air zone reporting is a commitment under the national Air Quality Management System (AQMS). This report describes achievement of the Canadian Ambient Air Quality Standards (CAAQS) for ground-level ozone (O_3) and fine particulates ($PM_{2.5}$), the associated management levels and recent actions to improve air quality. A province-wide summary can be found at: http://www.env.gov.bc.ca/soe/indicators/air/.

Background

The AQMS is the national approach to managing air quality in Canada. Under the AQMS, the CAAQS are developed to drive action to protect human health and the environment. Air zones are areas that exhibit similar air quality characteristics, issues and trends, and that form the basis for monitoring, reporting and taking action on air quality. The Coastal Air Zone (see Figure 1) is one of seven broad air zones across the province. Under the AQMS progressively more rigorous actions are expected as air quality approaches or exceeds the CAAQS. The level of action is guided by the Air Zone Management Framework outlined in Table 1.

Figure 1. Coastal Air Zone.

Table 1. Air zone management framework for ground-level ozone and $PM_{2.5}$. The CAAQS define the upper threshold, separating the "red" and "orange" management levels.

Management Level	O_3 (ppb)		$PM_{2.5}$ – Annual ($\mu g/m^3$)		$PM_{2.5}$ - 24h ($\mu g/m^3$)	
	2015	**2020**	**2015**	**2020**	**2015**	**2020**
Red	Actions for Achieving Air Zone CAAQS					
Threshold (CAAQS)	63	62	10	8.8	28	27
Orange	Actions for Preventing CAAQS Exceedance					
Threshold	56		6.4		19	
Yellow	Actions for Preventing Air Quality Deterioration					
Threshold	50		4		10	
Green	Actions for Keeping Clean Areas Clean					

Ozone Levels

Ozone monitoring was initiated in Terrace in 2015. Insufficient data are available to determine CAAQS achievement. However, based on 2015 data only, ozone levels (4th highest daily 8-hour maximum) reached 44 ppb. This is well below the CAAQS level of 63 ppb.

$PM_{2.5}$ Levels

$PM_{2.5}$ refers to inhalable particles up to 2.5 micrometres in diameter. $PM_{2.5}$ measurements are summarized in Figure 2. A distinction is made between data collected using the new Federal Equivalent Method (FEM) technology and the older TEOM instruments that are in the process of being phased out, as the FEMs provide a more complete measure of $PM_{2.5}$ than the TEOMs.

Daily concentrations (upper plot) ranged from 12-17 µg/m^3.[1] All three sites achieved the national standard of 28 µg/m^3. Annual concentrations ranged from 4.5 to 6.0 µg/m^3, and were well below the national standard of 10 µg/m^3.[2]

Annual mean concentrations between 2006 and 2015 are shown in Figure 3.[3] A shift to higher reported concentrations is seen with the change from TEOM to FEM instruments from about 2013 onward.

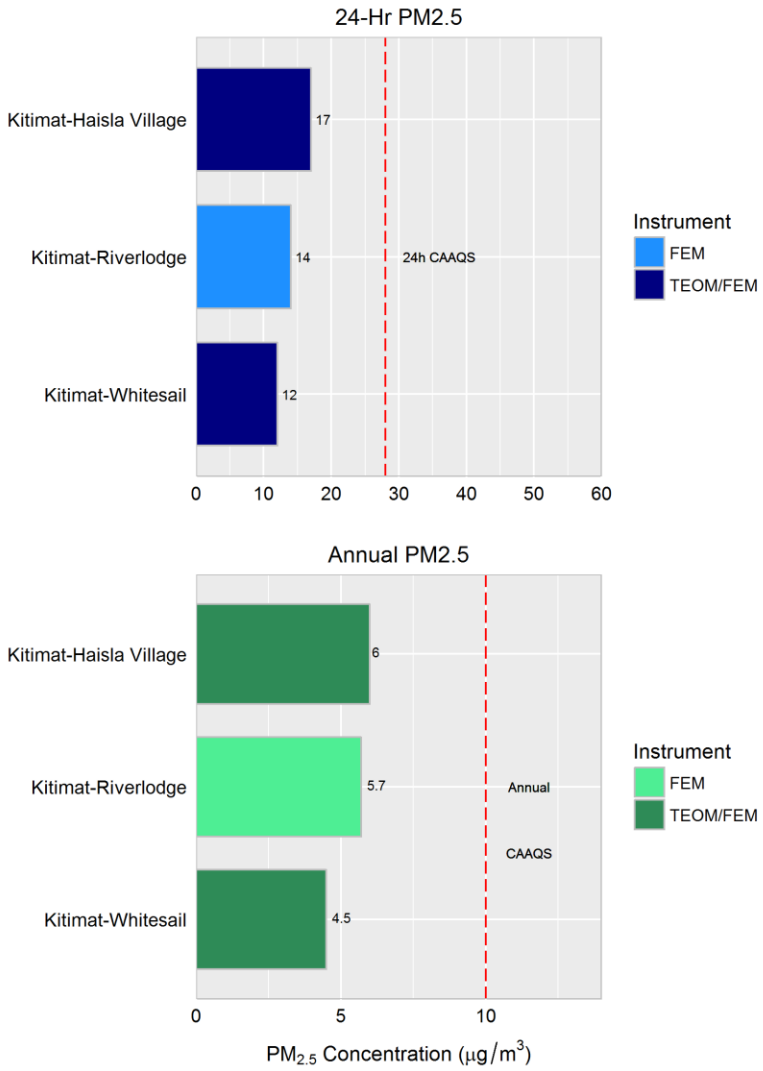

Figure 2. $PM_{2.5}$ concentrations in the Coastal Air Zone. Upper plot based on 24-hour concentration (annual 98th percentile, averaged over 2013-2015). Lower plot based on annual mean concentration (averaged over 2013-2015). Red dashed lines identify CAAQS of 28 µg/m^3 (upper plot) and 10 µg/m^3 (lower plot).

[1] Concentrations based on the annual 98th percentile of 24-hour values, averaged over three years (2013-2015).
[2] Concentrations based on the annual average of 24-hour values, averaged over three years (2013-2015).
[3] Concentrations based on the annual average of 24-hour values over single year.

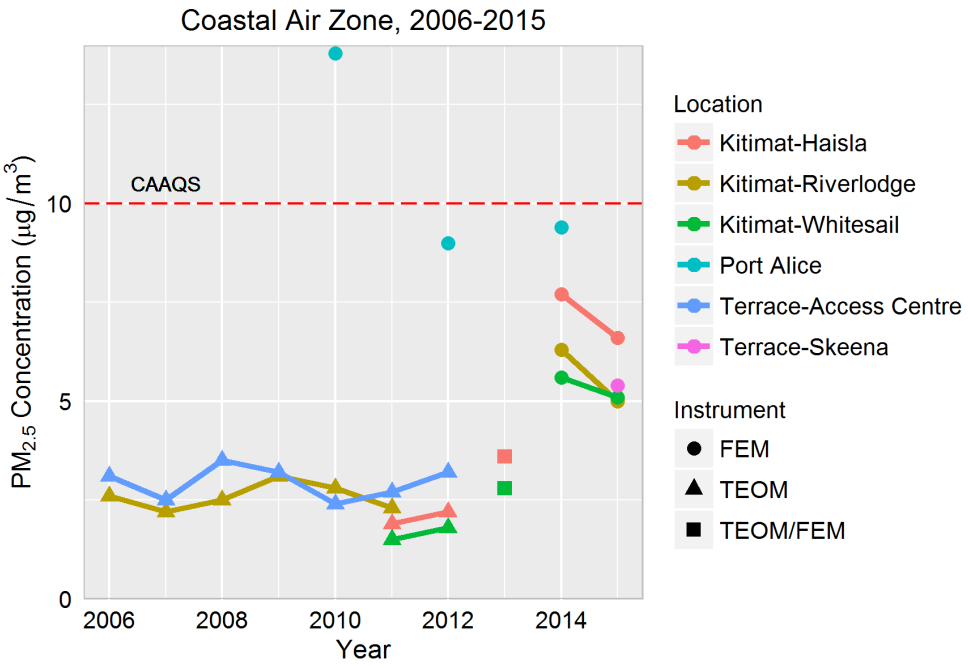

Figure 3. Trends in $PM_{2.5}$ concentrations (2006-2015), based on annual mean concentrations from a single year. The CAAQS value of 10 µg/m^3 is shown by the dashed line. $PM_{2.5}$ measurements prior to 2011 are reported at 25^{o}C and 1 atm. From 2011 onward, measurements are reported at local conditions.

Air Zone Management Levels

Air zone management levels are assigned on the basis of the highest concentrations within an air zone, excluding contributions from transboundary flows (TF) and exceptional events (EE) such as wildfires. This is done so that long-term management strategies are not developed on the basis of events that are beyond local or provincial control. The methodology for flagging wildfire influences is described in Appendix I.

Based on data collected between 2013 and 2015, there was insufficient information to assign management levels for ozone. For $PM_{2.5}$, no significant TF/EE influences were identified. A "yellow" management level is assigned for $PM_{2.5}$ on the basis of annual and daily mean concentrations in Kitimat. This indicates that $PM_{2.5}$ air quality is generally good, and that any actions that are undertaken should be to prevent further air quality deterioration.

Table 2. Summary of $PM_{2.5}$ concentrations as measured and air zone management levels for the Coastal Air Zone (based on 2013-2015 data).

Location	Monitor Type	No. Valid Years	Daily Mean (98th Percentile)		Annual Mean		Air Zone Management Level
			As Measured	TF/EE Removed	As Measured	TF/EE Removed	
Kitimat Haisla	TEOM/FEM	3	17	17	6.0	6.0	Goal: Prevent air quality deterioration
Kitimat Riverlodge	FEM	2	14	14	5.7	5.7	
Kitimat Whitesail	TEOM/FEM	3	12	12	4.5	4.5	

Actions to Protect Air Quality

A number of new industrial developments are currently proposed for the Kitimat and Prince Rupert Airsheds. To better understand the extent to which development can occur without causing unacceptable impacts on human health, a Kitimat Airshed Study was completed in 2014.[4] Using a similar methodology, the Prince Rupert Airshed was completed in 2016.[5] These studies focussed on emissions of sulphur dioxide and nitrogen oxides, which both contribute to $PM_{2.5}$ formation.

The Provincial Wood Stove Exchange Program encourages residents to change out their older, smoky wood stoves for low-emission appliances including new CSA-/EPA-certified clean-burning wood stoves. Between 2013 and 2015, wood stove change-out programs were supported in the Alberni and Bella Coola Valleys.

A description of other activities underway in B.C. air zones can be found in the "Air Zone Management Response for British Columbia" (see: www.gov.bc.ca/bcairquality).

[4] http://www.bcairquality.ca/airsheds/kitimat-airshed-assessment.html
[5] http://www.bcairquality.ca/airsheds/princerupert-airshed-study.html.

Appendix I – Approach to Identify Wildfire-influenced Data

Summertime air quality in British Columbia is periodically influenced by wildfire smoke – from local fires as well as long-range transport from outside of the province. The wildfire season in B.C. typically occurs between May and September, when warm and dry conditions prevail.

A myriad of different pollutants are emitted from wildfires. These include $PM_{2.5}$ and gaseous pollutants such as nitrogen oxides and volatile organic compounds (VOCs) that can react in the atmosphere to form ground-level ozone and additional $PM_{2.5}$.

Given that smoke-affected areas may be extensive, and that smoke may linger for days before being fully dispersed from an airshed, the current analysis has focussed on those periods when wildfire smoke may have contributed to an exceedance of the CAAQS levels for $PM_{2.5}$ levels. Criteria used to flag and evaluate wildfire-influenced data included the following:

- 24-hour $PM_{2.5}$ concentrations exceeded the CAAQS level of 28 $\mu g/m^3$ or 8-hour daily maximum ozone concentrations exceeded the CAAQS level of 63 ppb between May and September,
- Nearby wildfires of interest were identified based on data from B.C. Wildfire Management Branch,
- Wildfire smoke advisories had been issued by the Ministry of Environment & Climate Change Strategy during the period of interest,
- MODIS satellite images indicated smoke impacts over the region,
- Multiple monitoring sites in the area of concern exhibited similar air quality characteristics, suggesting a common source or contributing source, and
- Modelling studies identified enhanced pollutant concentrations due to wildfire smoke.

Based on the above criteria, no significant wildfire influences were identified for the Coastal Air Zone between and 2013 and 2015.