

Executive Summary

The 2018-2020 air zone reporting period is the first to apply the 2020 Canadian Ambient Air Quality Standards (CAAQS) for fine particulate matter and ozone, and the first air zone report to include nitrogen dioxide and sulphur dioxide. In this report, the Georgia Strait Air Zone is assigned "orange" management level for fine particulate matter (PM_{2.5}) and nitrogen dioxide (NO₂), "yellow" for ozone, and "green" for sulphur dioxide (SO₂).

Table 1. Management levels in the Georgia Strait Air Zone based on the 2018-2020 air zone reportingperiod.

Air Zone	PM _{2.5} Ozone		NO ₂	SO ₂
Georgia Strait	Orange	Yellow	Orange	Green

Introduction

This is the eighth annual air zone report for the Georgia Strait Air Zone. 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 fine particulate matter (PM_{2.5}), ground-level ozone (O₃), nitrogen dioxide (NO₂), and sulphur dioxide (SO₂), the associated management levels and recent actions to improve air quality.

Air Quality Management System

The AQMS is the comprehensive and collaborative approach of managing air quality by federal, provincial, and territorial governments in Canada. Under the AQMS, the CAAQS are developed to drive actions to protect human health and the environment based on the principles of continuous improvement and keeping clean areas clean. Air zones are defined under the AQMS as areas with similar air quality characteristics, issues, and trends, and serve as the basis for monitoring, reporting, and actions to improve air quality. 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 (Table 2).

Managamant		PM _{2.5}		Ozone	NO ₂		SO ₂	
Level	Objectives	Annual	24-hour	8-hour	Annual	1-hour	Annual	1-hour
		(µg/m)	(µg/m)	(aqq)	(add)	(aqq)	(add)	(aqq)
Red	Achieve CAAQS	>8.8	>27	>62	>17.0	>60	>5.0	>70
Orenzo	Prevent CAAQS	>6.4 and	>19 and	>56 and	>7.0 and	>31 and	>3.0 and	>50 and
Orange	Exceedance	≤8.8	≤27	≤62	≤17.0	≤60	≤5.0	≤70
Vallaur	Prevent Air Quality	>4.0 and	>10 and	>50 and	>2.0 and	>20 and	>2.0 and	>30 and
Yellow	Deterioration	≤6.4	≤19	≤56	≤7.0	≤31	≤3.0	≤50
Green	Keep Clean Areas Clean	≤4.0	≤10	≤50	≤2.0	≤20	≤2.0	≤30

Table 2. AQMS management levels and objectives for air pollutants based on the 2020 CAAQS.

Georgia Strait Air Zone

The Georgia Strait Air Zone (see Figure 2) is one of seven broad air zones across B.C. It covers the coastal areas of southwestern B.C. outside of the Lower Fraser Valley, and includes the municipalities in the Capital Regional District, Cowichan Valley Regional District, Comox Valley Regional District, Alberni-Clayoquote Regional District, Nanaimo Regional District, qathet Regional District, Squamish-Lillooet Regional District, Strathcona Regional District, Sunshine Coast Regional District, and all the Gulf Islands.



Figure 2. Map of the southwestern portion of B.C. highlighting the Georgia Strait Air Zone.

PM_{2.5} Levels

PM_{2.5} or fine particulate matter refers to solid particles and liquid droplets suspended in air that are smaller than or equal to 2.5 micrometre (µm) in diameter. These particles when inhaled, travels deep into the lungs and the bloodstream, and can cause adverse health effects like cardiovascular and respiratory diseases. PM_{2.5} is considered a non-threshold pollutant, that is, there are no safe limits for exposure.

Air zone reporting of PM_{2.5} summarizes the 24-hour¹ and annual² metrics to estimate the short-term and long-term exposures of the pollutant, respectively. In the 2018-2020 reporting period, there are 13 sites in the Georgia Strait Air Zone with sufficient data to calculate these metrics (Figure 2). Six of these sites exceeded the new 2020 CAAQS of 27 $\mu g/m^3$ for the 24-hour metric and another one (Port Alberni) exceeded the 8.8 μ g/m³ for the annual metric. Observed levels of the 24-hour metric ranges from 18 μ g/m³ at Powell River to $39 \,\mu\text{g/m}^3$ at Colwood, while annual metric ranges from $3.1 \,\mu\text{g/m}^3$ at Powell River to 9.4 μg/m³ at Port Alberni. All sites were impacted by heavy smoke during the 2018 wildfire season from record fires in B.C. and from the transported smoke during the 2020 season from fires in western United States. These external influences are removed during air zone reporting





¹ PM_{2.5} 24-hour metric are based on the annual 98th percentile of the 24-hour value, averaged over three years (2018-2020).

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² PM_{2.5} annual metric are based on the annual average of 24-hour values, averaged over three years (2018-2020).

following the methodology for transboundary flow and exceptional events (TF/EE)³. After adjustments, all sites report lower values and achieved 2020 CAAQS.

Figure 3 shows the wildfire adjusted levels and trends of the 24-hour and annual metric in Georgia Strait Air Zone. The figure features the 2015 and 2020 CAAQS and the reporting period where these standards apply. Figure also shows the recommended management levels based on either metrics. Table 2 shows the AQMS management levels for the air zone and communities in the air zone through various reporting periods.

The overall management level for the entire air zone is based on the highest metric reported from communities in the air zone. In the reporting periods before 2017-2019, the entire Georgia Strait Air Zone had been assigned "red" management level for PM_{2.5} due to the high levels that exceeded the 24-hour metric of CAAQS at Courtenay, Duncan, and Port Alberni. The 24-hour metrics from these locations had been decreasing throughout the years, improving the management levels from "red" to "orange" at Duncan in 2014-2016, Port Alberni in 2015-2017, and finally Courtenay in 2017-2019. The metrics had remained below the 24-hour standard even after the implementation of more stringent standards in the 2018-2020 reporting period.

The 2020 CAAQS for PM_{2.5} is implemented in the 2018-2020 reporting period. These standards are more stringent, with the 24-hour metric decreasing from 28 μ g/m³ to 27 μ g/m³ and the annual metric decreasing from 10 μ g/m³ to 8.8 μ g/m³. In the 2018-2020 reporting period, the Georgia Strait Air Zone achieved both 24-hour and annual CAAQS and is assigned "orange" management level for PM_{2.5}. The "orange" assignment is based on 24-hour and annual metrics of Courtenay, Duncan, and Port Alberni, and annual metric of Victoria. Under "orange" management level, actions related to reducing PM_{2.5} emissions are recommended to prevent CAAQS exceedances. This includes help with local actions to address the sources of PM_{2.5} at Courtenay, Duncan, Port Alberni, and Victoria.

³ See: <u>https://ccme.ca/en/res/guidancedocumentontransboundaryflowsandexceptionalevents_secured.pdf</u>



Figure 3. Wildfire-adjusted trends in the 24-hour and annual metrics of PM_{2.5} throughout the 2012-2014 until the 2018-2020 periods. The red dashed lines and background colours define the applicable CAAQS and AQMS management levels based on the metric.

Georgia Strait Air Zone

	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
GEORGIA STRAIT (CAAQS)	RED (2015)	RED (2015)	RED (2015)	RED (2015)	RED (2015)	ORANGE (2015)	ORANGE (2020)
Campbell River						18/7	16/6.4
Colwood	19/7.1	20/6.6	17/5.4	17/5.6	17/5.6	18/6.2	15/5.6
Courtenay	32/10.3	33/9.7	32/8.4	32/8.5	31/8.6	28/8.6	24/7.4
Crofton Georgia Hts			17/7.4	18/6.7	18/5.8		
Crofton Substation		16/6.5	14/5.9	20/5.9	23/6	23/6.3	16/5.6
Duncan	31/8.2	29/7.9	26/7.2	25/7.4	25/7.2	24/7.6	22/6.9
Duncan- Deykin Ave		22/6.5	20/5.8	20/6	19/6.3	20/7.2	18/6.9
Langdale	15/5.8	14/5.9	14/5.8	15/6.7	19/7.7	16/6.3	14/5.2
Nanaimo	-/-	14/4.6	13/4.3	12/4.1	12/4.2	13/4.3	11/4.1
Port Alberni	28/7.5	31/8.1	29/7.8	27/8.3	27/8.7	27/9.3	23/8.6
Powell River -JT School				6/2	8/2.3	8/2.5	7/2.2
Powell River- Wildwood	9/2.7	7/2.6	7/2.6	7/2.4			
Squamish				11/4.4	13/4.8	14/5.1	14/5.2
Squamish Gov't Bldg	15/6.2	15/6.5	15/6.5				
Victoria	19/6.4	20/6.5	15/5.5	17/5.7	17/6.3	19/7.3	17/6.8
Whistler	18/5.2	17/5.7	17/6.1	18/6.9	18/6.5	17/6	15/5.3

Table 2. Summary of PM2.5 metrics (shown below in 24-hour/annual metrics) and air zone managementlevels for the Georgia Strait Air Zone.

Management Goals for PM_{2.5} based on the Air Quality Management System

Ozone Levels

Ground-level ozone is a colourless and irritating gaseous pollutant. It forms just ab ove the earth's surface through chemical reactions between "ozone precursor" emissions. Unlike naturally occurring ozone in the ozone layer, ground-level ozone can be harmful to people, animals, and plants.

Figure 4 summarizes the ozone levels in the Georgia Strait Air Zone during the 2018-2020 reporting period. Ozone levels based on the 8-hour metric in the air zone ranged from 46 parts per billion (ppb) at Nanaimo and 52 ppb at Duncan.⁴ All sites achieved the new national standard of 62 ppb for the ozone metric. There were no data adjustments for transboundary flow and exceptional events (TF/EE) as levels did not exceed the standard.

Georgia Strait Air Zone



Figure 4. Ozone concentration in the Georgia Strait Air Zone based on the annual 4th highest daily 8-hour maximums averaged over 2018-2020. Red dashed line identifies the 2020 CAAQS of 62 ppb.



Colwood Courtenay Duncan Nanaimo Squamish Victoria Whistler
Figure 5. Trends in ozone concentrations based on the annual 4th highest daily 8-hour maximums

Figure 5. Trends in ozone concentrations based on the annual 4th highest daily 8-hour maximums averaged over three consecutive years. Red dashed line identifies the 2015 and 2020 CAAQS on the reporting period where it applies. Background colour shows management levels for the metric.

Annual trends and associated AQMS management levels in the ozone metric are presented in Figure 5 and summarized in Table 3. All the CAAQS-reporting stations in the Georgia Strait Air Zone achieved CAAQS throughout 2012-2014 to 2018-2020 reporting periods and has been under the "yellow" or

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⁴ Ozone 8-hour metric are based on the 4th highest daily 8-hour maximum, averaged over three years (2018-2020).

"green" management levels. Overall, the Georgia Strait Air Zone is assigned "yellow" management levels based on observations at Duncan and/or Whistler. Although most locations in the air zone are within "green" management levels, the air zone is assigned "yellow" because the highest metric defines the management level for the entire air zone. Under "yellow" management level, ozone-related actions are recommended to prevent the deterioration of air quality.

	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020
GEORGIA STRAIT (CAAQS)	YELLOW (2015)	YELLOW (2015)	YELLOW (2015)	YELLOW (2015)	YELLOW (2015)	YELLOW (2015)	YELLOW (2020)
Campbell River	46						
Colwood	50	49	49	49	50	50	50
Courtenay	47	47	46	47	47	48	48
Duncan	50	51	51	52	53	53	52
Nanaimo	45	45	44	45	45	46	46
Squamish				46	48	50	47
Squamish Gov't Bldg	48	48					
Victoria	46	46	45	45	46	46	46
Whistler	53	53	52	54	53	53	50

Table 3. Summary of ozone metrics and air zone management levels for the Georgia Strait Air Zone.

Management Goals for Ozone based on the Air Quality Management System

Achieve CAAQS	Prevent CAAQS Exceedance	Prevent Air Quality Deterioration	Keep Clean Areas Clean	Not Available
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Nitrogen Dioxide Levels

Nitrogen Dioxide (NO_2) is a gaseous pollutant formed along with other nitrogen oxides (NO_x) during the high temperature combustion of fossil fuels. It plays a major role in atmospheric reactions that form ground-level ozone and smog.

Figure 6 summarizes the NO₂ 1-hour and annual metrics for the 2018-2020 reporting period. The figure shows NO₂ levels from eight air quality monitoring stations in the Georgia Strait Air Zone reported as 1hour and annual metrics. It shows 1-hour metric ranges from 22 ppb in Whistler to 37.2 ppb in Victoria, and annual metric ranging from 3.0 ppb in Courtenay to 6.2 ppb in Victoria. All sites achieved the 2020 CAAQS of 60 ppb for the 1-hour metric⁵, and 17 ppb for the annual metric⁶. There were no data adjustments for TF/EE as levels did not exceed the standard.

Figure 7 and Table 4 contains summary of NO₂ metrics, CAAQS achievement, and management levels. Reporting periods from 2012-2014 to 2018-2020 are all included to illustrate annual trends even though 2020 CAAQS for NO₂ are not implemented before the 2018-2020 reporting period. In the Georgia Strait Air Zone, most sites are within the "yellow" management level on both NO₂ metrics throughout the



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Figure 6. NO₂ concentrations in the Georgia Strait Air Zone based on the 1-hour (left) and annual (right) metrics. The red dashed lines identify the 2020 CAAQS of 60 ppb for the 1-hour metric, and 17 ppb for the annual metric.

reporting periods presented. Powell River records the lowest metrics that are within the "green" management level, while Victoria reports the highest metrics that are within the "orange" management

⁵ NO₂ 1-hour metrics are based on the 98th percentile of daily 1-hour maximum over three consecutive years (2018-2020).

⁶ NO₂ annual metrics are based on the average of 1-hour readings over a single calendar year (2020).

level. There is a downward trend in the 2018-2020 reporting period for most sites that may be due to the reductions in vehicular emissions as a result of the COVID-19 pandemic.

Overall, the Georgia Strait Air Zone is assigned an "orange" management level because of the 1-hour metric at Victoria. An "orange" management level means that NO₂-related actions are recommended to prevent the future exceedance of CAAQS. In order to improve to the next management level, the 1-hour metric must be reduced below 31 ppb.



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Figure 7. Trends in the 1-hour and annual metrics of NO₂ in the Georgia Strait Air Zone. The 2020 CAAQS for NO₂ (red dashed lines) only applies during the 2018-2020 reporting period but presented throughout all reporting periods to visualize trends. The background colour shows the AQMS management levels.

Table 4. Summary of NO2 metrics (shown below are 1-hour/annual metrics) and air zone managementlevels for the Georgia Strait Air Zone.

Location	2012- 2014	2013- 2015	2014- 2016	2015- 2017	2016- 2018	2017- 2019	2018-2020
GEORGIA STRAIT (CAAQS)	2020 C	AAQS for I period. Da	NO2 not ap ita shown	oplicable b for illustra	efore 201 ation only.	8-2020	ORANGE (2020)
Campbell River	19/-						
Colwood	28/5	28/-	27/4.8	25/4.9	25/4.7	26/4.5	24/3.9
Courtenay	26/5	24/4.5	25/4	26/4.6	28/3.9	27/3.8	24/3
Crofton Escarpment Way	18/-						
Crofton Substation	21/-						
Duncan	23/4.7	21/4.5	21/4.5	21/4.4	22/4.3	23/4.2	22/3.6
Langdale	22/-	24/5.5	24/5.4	25/5.5	25/4.3	25/4.1	23/3.8
Nanaimo	26/5.8	27/6.2	27/6.3	29/6.7	29/6.1	30/5.6	27/4.5
Port Alberni Firehall MAML	-/4						
Powell River	15/2.2	15/2.2	15/2	15/-			
Powell River- Wildwood					-/2.4		
Squamish			-/5.9	27/6.1	26/6.2	26/5.8	24/5
Squamish Gov't Bldg	23/6.3	23/6.6					
Victoria	37/8.4	37/8.6	37/8.5	39/8.2	40/8.3	40/8	37/6.2
Whistler	23/3.5	22/4.1	21/3.9	23/4.4	23/4.2	24/3.9	22/3.3

Management Goals for NO₂ based on the Air Quality Management System

Achieve CAAQS	Prevent CAAQS Exceedance	Prevent Air Quality Deterioration	Keep Clean Areas Clean	Not Available
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Sulphur Dioxide Levels

Sulphur dioxide (SO₂) is a toxic gas emitted from volcanic eruptions, use of sulphur-bearing fossil fuels, and certain industries. Aside from toxicity, SO₂ can form secondary fine particulate matter and acid rain.

There are three locations in the Georgia Strait that are equipped to monitor SO₂ and has enough data for the 2018-2020 reporting period. These are summarized in Figure 7 and shows SO₂ levels ranged from 4.5 ppb to 12.3 ppb for the 1-hour metric⁷ and 0.2 ppb to 0.8 ppb for the annual metric⁸. The measurements are well below the 2020 CAAQS of 70 ppb defined for the 1-hour metric and 5 ppb defined for the annual metric.





The 2018-2020 air zone report is the first to implement the 2020 CAAQS and include SO₂. The assessment for CAAQS achievement of SO₂ and assignment of management levels on earlier reporting periods are not required but presented in Figure 9 and Table 5 to illustrate trends. Figure 9 shows the trends in the 1-hour and annual metrics are within the "green" management level except at Victoria-James Bay monitoring site that shows 1-hour metrics within the "yellow" management level for two reporting periods (2013-2015 and 2014-2016). The figure also shows values at most of the sites are decreasing. The most significant change is observed at Victoria-James Bay site with reductions in the 1-hour metric from 46.8 ppb to 7.9 ppb within two reporting periods (2013-2015 and 2015-2017). The 1-hour metric at the site reduced further to 2.9 ppb in the 2017-2019 reporting period. The site was

⁷ SO₂ 1-hour metrics are based on the 99th percentile of daily 1-hour maximum over three consecutive years (2018-2020).

⁸ SO₂ annual metrics are based on the average of 1-hour readings over a single calendar year (2020).

decommissioned in 2019 following completion of a special monitoring program (originally designed to understand cruise ship emissions within Victoria's Inner Harbour⁹).

Overall, as shown in Table 5, the Georgia Strait Air Zone is assigned "green" management level for SO2. This assignment is based on the readings from the three active monitoring sites. Under "green" management level, the lowest management actions are recommended to ensure SO₂ levels remain low.



Figure 9. Trends in the 1-hour and annual metrics of SO₂ in the Georgia Strait Air Zone. The 2020 CAAQS for SO₂ (red dashed lines) only applies during the 2018-2020 reporting period but presented throughout all reporting periods to visualize trends. The background colour shows the AQMS management levels

⁹ See: <u>https://www.islandhealth.ca/learn-about-health/environment/james-bay-sulphur-dioxide-monitoring-program-health-risk-guide</u>

Location	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020	
GEORGIA STRAIT (CAAQS)	2020 CA	2020 CAAQS for SO_2 not applicable before 2018-2020 period. Data shown for illustration only.						
Colwood	4/0.7	4/0.7	4/0.6	3/-				
Langdale	13/1.1	11/0.9	10/0.7	9/0.7	11/0.6	12/-	12/0.8	
Port Alberni	-/0.5	7/0.4	7/0.6	6/-				
Squamish			-/0.9	7/0.6	6/0.2	7/0.3	5/0.2	
Squamish Gov't Bldg	6/0.7	4/0.7						
Victoria	21/1	17/1	14/0.8	9/0.4	5/0.3	5/0.3	5/0.3	
Victoria-James Bay		47/0.2	32/0.1	8/0.1	3/0.2	3/0.1	3/-	

Table 5. Summary of SO2 metrics (shown below are 1-hour/annual metrics) and air zone managementlevels for the Georgia Strait Air Zone.

Management Goals for SO₂ based on the Air Quality Management System

Achieve CAAQS	Prevent CAAQS Exceedance	Prevent Air Quality Deterioration	Keep Clean Areas Clean	Not Available
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Actions to Protect Air Quality

The reduction of PM_{2.5} emissions is a priority across the province including the Georgia Strait Air Zone. In 2016, the Province adopted a new <u>Solid Fuel Burning Domestic Appliance Regulation</u>. This piece of legislation requires that most wood burning appliances sold in B.C. are certified to the 2015 U.S. Environmental Protection Agency (EPA) particulate emission standards, or equivalent 2010 Canadian Standards Association (CSA) (has this not now changed to the more stringent USEPA 2020 standard?). The regulation also specifies the types of fuels that can be burnt and has provisions around the sale and installation of outdoor wood boilers.

In 2019 the Ministry updated the Open Burning Smoke Control Regulation (OBSCR) to reduce the smoke from open burning. The revised OBSCR has shorter burn periods to discourage smoldering piles. It also increases the required setbacks between open burning and neighbouring residences and businesses. The OBSCR allows a Ministry director to prohibit open burning when there is a risk of pollution and also to vary requirements of the regulation when doing so is necessary to protect the environment or to meet the intent of the regulation.

The <u>Provincial Wood Stove Exchange Program</u> (https://www2.gov.bc.ca/woodstoveexchange) encourages residents to change out their older, smoky wood stoves for lower-emission appliances including new CSA-/EPA-certified wood stoves, natural gas or pellet stoves and electric heat pumps. Between 2018 and 2020, wood stove change-out programs were supported in the Cowichan Valley Regional District¹⁰, Regional District of Nanaimo and the City of Nanaimo, the Alberni-Clayoquot Regional District (including Port Alberni),¹¹ the Comox Valley Regional District, the Sunshine Coast Clean Air Society and qathet Regional District. The Regional Districts of Cowichan Valley, Comox Valley and Alberni-Clayoquot provided enhanced incentives to further encourage the transition away from wood stoves to natural gas or pellet stoves and electric heat pumps. .

Communities within the Georgia Strait Air Zone have continued to update their management frameworks and local bylaws that either directly or indirectly address air quality. For example, in 2019 the Resort Municipality of Whistler updated its Fire and Life Safety Bylaw No. 2201, 2019 which prohibits all backyard burning, and only allows campfires with a permit. A reduction of backyard burning may improve air quality conditions at a local scale.

Individual communities have taken various actions to reduce PM_{2.5} emissions and improve air quality. For additional information, please see the following webpages:

- Comox Valley Regional District: <u>https://www.comoxvalleyrd.ca/services/environment/air-</u> <u>quality</u>
- Cowichan Valley Regional District: <u>https://www.cvrd.bc.ca/2115/Air</u>
- Cumberland: <u>https://cumberland.ca/air-quality/</u>
- Port Alberni and the Alberni-Clayoquot Regional District: https://www.acrd.bc.ca/air-quality-council-web-directory

¹⁰ https://www.cvrd.bc.ca/3010/Apply-for-a-Woodstove-Rebate

¹¹ https://www.acrd.bc.ca/cms/wpattachments/wpID239atID2875.pdf

Appendix I – Approach to Identify Wildfire-influenced Data

Ozone and PM_{2.5} data from 2018-2020 for the Georgia Strait Air Zone were evaluated based on the criteria set out in Appendix I for TF/EE influences. Various pieces of evidence were used to support identification of wildfire-influenced periods. These included the following:

- Wildfires of note either due to size or proximity to populated areas are tracked by the BC Wildfire Service (see: <u>https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary</u>).
 - The 2018 wildfire season was a record-breaking year in terms of land area burned. Approximately 1.35 million hectares were burned throughout B.C.
 - Several large fires burned in the south-central interior of B.C. in the summers of 2017 and 2018 (see Table II-1 for example). The smoke impacts due to these fires was at times widespread and affected air quality in B.C. and beyond.
- Days flagged as wildfire-influenced (Table II-2) coincided with Smoky Skies Bulletins issued by the Ministry or were in between periods of Smoky Skies Bulletins.
- Satellite images during this period (see Figures II-1 and II-2) provide additional information on the number of wildfires and spatial extent of wildfire smoke within and near the Georgia Strait Air Zone.

Date Discovered	Size (ha)	Geographic Location	Description
2018-07-31	79,394	Tweedsmuir Complex – Ramsey Creek	Tweedsmuir Provincial Park; lightning-caused
2018-08-01	44,817	Tweedsmuir Complex - Dean River	Tweedsmuir Provincial Park; lightning-caused
2018-08-03	60,631	Tweedsmuir Complex – Pondosy Bay	Tweedsmuir Provincial Park; lightning-caused
2020-09-07	130,000	Cold Springs	Historic fire event caused by extreme drought conditions in the Pacific Northwest

Table I-1. Examples of notable wildfires in the south-central interior during 2018 and 2020.¹²

¹² <u>https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary</u>

Location	Date	Daily PM _{2.5}	Location	Date	Daily PM _{2.5}
		(µg/m³)			(µg/m³)
Campbell River	2018-08-13	42.4	Courtenay	2020-09-15	138.8
Campbell River	2018-08-19	35.9	Courtenay	2020-09-16	60.8
Campbell River	2018-08-20	108.9	Courtenay	2020-09-17	48.9
Campbell River	2018-08-21	146.9	Courtenay	2020-09-18	27.1
Campbell River	2018-08-22	101.4	Crofton-Georgia Hts	2018-08-08	29.3
Campbell River	2020-09-12	82.4	Crofton-Georgia Hts	2018-08-19	30.6
Campbell River	2020-09-13	123.7	Crofton-Georgia Hts	2018-08-20	136.2
Campbell River	2020-09-14	160.9	Crofton-Georgia Hts	2018-08-21	100.4
Campbell River	2020-09-15	125.0	Crofton-Georgia Hts	2018-08-22	143.5
Campbell River	2020-09-16	60.8	Crofton-Georgia Hts	2018-08-23	47
Campbell River	2020-09-17	48.9	Crofton Elementary	2020-09-08	27.9
Campbell River	2020-09-18	30.6	Crofton Elementary	2020-09-11	61.5
Colwood	2018-08-14	54.8	Crofton Elementary	2020-09-12	124.8
Colwood	2018-08-15	45.1	Crofton Elementary	2020-09-13	136.7
Colwood	2018-08-16	32.3	Crofton Elementary	2020-09-14	160.6
Colwood	2018-08-20	91.9	Crofton Elementary	2020-09-15	140.6
Colwood	2018-08-21	106.7	Crofton Elementary	2020-09-16	63.5
Colwood	2018-08-22	113.1	Crofton Elementary	2020-09-17	58.8
Colwood	2018-08-23	35	Crofton Elementary	2020-09-18	37.5
Colwood	2018-08-24	31.8	Crofton Substation	2020-09-08	27.3
Colwood	2020-09-08	44.9	Crofton Substation	2020-09-11	63
Colwood	2020-09-11	89.7	Crofton Substation	2020-09-12	116.4
Colwood	2020-09-12	142.3	Crofton Substation	2020-09-13	133.3
Colwood	2020-09-13	149.2	Crofton Substation	2020-09-14	153.1
Colwood	2020-09-14	168.5	Crofton Substation	2020-09-15	133.4
Colwood	2020-09-15	160.1	Crofton Substation	2020-09-16	61.9
Colwood	2020-09-16	70.4	Crofton Substation	2020-09-17	61
Colwood	2020-09-17	52.5	Crofton Substation	2020-09-18	42.3
Courtenay	2018-08-13	41.9	Duncan-College St	2018-08-14	40.2
Courtenay	2018-08-14	30.1	Duncan-College St	2018-08-20	86.3
Courtenay	2018-08-20	104.5	Duncan-College St	2018-08-21	82.4
Courtenay	2018-08-21	116.8	Duncan-College St	2018-08-22	103.2
Courtenay	2018-08-22	90.3	Duncan-College St	2018-08-23	37.8
Courtenay	2020-09-12	82.8	Duncan-College St	2020-09-08	27.8
Courtenay	2020-09-13	135.6	Duncan-College St	2020-09-11	63.3
Courtenay	2020-09-14	147.4			

Table I-2 – Wildfire-influenced $PM_{2.5}$ data from 2018-2020. All dates shown coincided with a Smoky Skies Bulletin.

Table I-2 (continued)

Location	Date	Daily PM _{2.5}]	Location	Date	Daily PM _{2.5}
		(μg/m³)				(µg/m³)
Duncan-College St	2020-09-12	108.8		Langdale	2018-08-20	83.9
Duncan-College St	2020-09-13	121.4		Langdale	2018-08-21	58.8
Duncan-College St	2020-09-14	145.2		Langdale	2018-08-22	91.6
Duncan-College St	2020-09-15	117		Langdale	2018-08-23	61.3
Duncan-College St	2020-09-16	52.4		Nanaimo	2018-08-13	36.3
Duncan-College St	2020-09-17	60		Nanaimo	2018-08-19	47.5
Duncan-College St	2020-09-18	35.1		Nanaimo	2018-08-20	145.1
Duncan-Deykin Ave	2018-08-13	32.5		Nanaimo	2018-08-21	125.2
Duncan-Deykin Ave	2018-08-14	47		Nanaimo	2018-08-22	160.5
Duncan-Deykin Ave	2018-08-20	107.7		Nanaimo	2020-09-11	51.0
Duncan-Deykin Ave	2018-08-21	90		Nanaimo	2020-09-12	126.1
Duncan-Deykin Ave	2018-08-22	117		Nanaimo	2020-09-13	140.7
Duncan-Deykin Ave	2018-08-23	44.8		Nanaimo	2020-09-14	158.1
Duncan-Deykin Ave	2020-09-08	30.5		Nanaimo	2020-09-15	137.2
Duncan-Deykin Ave	2020-09-11	63.4		Nanaimo	2020-09-16	75.4
Duncan-Deykin Ave	2020-09-12	116.3		Nanaimo	2020-09-17	55.9
Duncan-Deykin Ave	2020-09-13	127.5		Nanaimo	2020-09-18	42.5
Duncan-Deykin Ave	2020-09-14	149.3		Port Alberni	2018-08-14	48.7
Duncan-Deykin Ave	2020-09-15	124.6		Port Alberni	2018-08-15	34.3
Duncan-Deykin Ave	2020-09-16	58.7		Port Alberni	2018-08-20	79.2
Duncan-Deykin Ave	2020-09-17	62		Port Alberni	2018-08-21	83.6
Duncan-Deykin Ave	2020-09-18	39.8		Port Alberni	2018-08-22	73.7
Gibsons	2018-08-13	32		Powell River	2018-08-13	37.5
Gibsons	2018-08-14	57.4		Powell River	2018-08-14	36.2
Gibsons	2018-08-15	45.7		Powell River	2018-08-19	43.3
Gibsons	2018-08-16	33.2		Powell River	2018-08-20	100.5
Gibsons	2018-08-20	72.9		Powell River	2018-08-21	84.6
Gibsons	2018-08-21	54.8		Powell River	2018-08-22	102.5
Gibsons	2018-08-22	103.9		Squamish	2018-08-13	48.6
Gibsons	2018-08-23	50.2		Squamish	2018-08-14	73.8
Langdale	2018-08-13	41		Squamish	2018-08-15	57.3
Langdale	2018-08-14	67.1		Squamish	2018-08-16	36.3
Langdale	2018-08-15	55.3	1	Squamish	2018-08-19	44.7
Langdale	2018-08-16	38.7	1	Squamish	2018-08-20	94.4
Langdale	2018-08-19	33.3	1	Squamish	2018-08-21	50.5

Location	Date	Daily PM _{2.5}	
		(µg/m³)	
Squamish	2018-08-22	75.5	
Squamish	2018-08-23	68.8	
Squamish	2020-09-11	46.7	
Squamish	2020-09-12	101.3	
Squamish	2020-09-13	140.2	
Squamish	2020-09-14	155.3	
Squamish	2020-09-15	59.5	
Squamish	2020-09-16	41.8	
Squamish	2020-09-17	77.5	
Squamish	2020-09-18	75.2	
Squamish	2020-10-02	27.0	
Victoria-Topaz	2018-08-14	48.1	
Victoria-Topaz	2018-08-15	45.6	
Victoria-Topaz	2018-08-20	78	
Victoria-Topaz	2018-08-21	106.9	
Victoria-Topaz	2018-08-22	110	
Victoria-Topaz	2018-08-23	30	
Victoria-Topaz	2018-08-24	33.5	
Victoria-Topaz	2020-09-08	51.0	
Victoria-Topaz	2020-09-11	121.0	
Victoria-Topaz	2020-09-12	141.2	
Victoria-Topaz	2020-09-13	153.8	
Victoria-Topaz	2020-09-14	164.4	
Victoria-Topaz	2020-09-15	159.6	
Victoria-Topaz	2020-09-16	72.5	
Victoria-Topaz	2020-09-17	50.3	
Whistler	2018-08-12	29.2	
Whistler	2018-08-13	67.6	
Whistler	2018-08-14	76.6	
Whistler	2018-08-15	49.4	
Whistler	2018-08-16	31	
Whistler	2018-08-18	104	
Whistler	2018-08-19	233.5	
Whistler	2018-08-20	75.2	

Location	Date	Daily PM _{2.5}
		(µg/11)
Whistler	2018-08-21	35.8
Whistler	2018-08-22	63.5
Whistler	2018-08-23	85.1
Whistler	2020-09-12	54.6
Whistler	2020-09-13	127.5
Whistler	2020-09-14	166.6
Whistler	2020-09-15	48.5
Whistler	2020-09-16	37.0
Whistler	2020-09-17	70.5
Whistler	2020-09-18	62.0



a. NASA EOSDIS, 10 August 2018



c. NASA EOSDIS, 14 August 2018



b. NASA EOSDIS, 13 August 2018



d. NASA EOSDIS, 18 August 2018



e. NASA EOSDIS, 22 August 2018

Figure I-3. Corrected reflectance satellite images from NASA's Earth Observing System Data and Information System (EOSDIS) covering Satellite images on Aug. 13, 14, 18 and 22, 2018, showing smoke (grey plumes) over the Georgia Strait Air Zone. Red dots indicate fires and thermal anomalies. Large red circle in Figure II-1(b) identifies Nanaimo on map: NASA EOSDIS Snapshots at: <u>https://worldview.earthdata.nasa.gov/.</u>



September 8



September 12



September 16



September 11



September 15



September 18

Figure I-2. Corrected reflectance satellite images from NASA's Earth Observing System Data and Information System (EOSDIS) covering Satellite images in September 2020, showing smoke (grey plumes) over the Georgia Strait Air Zone. Red dots indicate fires and thermal anomalies. NASA EOSDIS Snapshots at: <u>https://worldview.earthdata.nasa.gov/.</u>