state of the air

BC LUNG ASSOCIATION 2014

Celebrating the Clean Air Month of June

FOREWORD

This year's State of the Air Report puts the focus on one of the main causes of air pollution in our province: diesel particulate matter (DPM). Recently classified as a human carcinogen by the World Health Organization, DPM has been linked to various diseases, including lung cancer, heart disease, asthma, and chronic obstructive lung disease.

We can't ignore the effects of DPM on air quality and human health. For that reason, we take a close look at various aspects of DPM: its sources (both road/non-road and workplace), its effects on exercise, and the programs designed to test for and reduce diesel emissions. We also underscore the need for an optimal metric to monitor DPM exposure.

Last March, the BC Lung Association hosted the 11th Air Quality and Health Workshop. We have a report on the event featuring international experts who presented a state of the science overview of the effects of natural gas and coal extraction, processing and transportation in B.C.

This report wouldn't be complete without an update on initiatives, policies and programs undertaken by different organizations and government agencies. It's interesting to note how some of the earlier efforts have evolved into entirely new programs – all with the shared goal of enhancing air quality for British Columbians.

Once again, I applaud the efforts of everyone who was involved in the production of this valuable document – and encourage readers to send in their suggestions on topics they'd like to see in future editions of this report.

SCOTT MCDONALD
President and CEO, BC Lung Association

CONTENTS

DIESEL PARTICULATE MATTER

What are the implications for B.C.?

Diesel exhaust, the product of incomplete combustion of diesel fuel, is a complex mix of gases and particulates. The vast majority of particulates emitted by diesel engines are small enough to be inhaled into the lung. The International Agency for Research on Cancer (IARC), which is part of the World Health Organization, classified diesel exhaust as Group 1 (carcinogenic to humans) in June of 2012, based primarily on evidence supporting long-term exposure to diesel exhaust as a cause of lung cancer.

It is estimated that 5% of the working population is exposed to diesel exhaust at the workplace, making it the second most common workplace carcinogen.

A study for Metro Vancouver estimated that diesel particulate matter accounts for 67% of the lifetime cancer risk and that non-road diesel engines contribute 41% of this amount. Thus, in 2012 (the year that IARC re-classified diesel exhaust), Metro Vancouver began implementation of the Non-Road Diesel Engine Emission Regulation Bylaw to reduce emissions from non-road diesel engines. Operators of diesel engines need to register and pay fees for

their engines but are eligible for a fee refund if they retire their engines or if they upgrade their engines with an emission reduction measure such as a diesel oxidation catalyst or a diesel particulate filter. Ongoing monitoring of data should help determine the effectiveness of this bylaw in reducing emissions in the region in the coming years.

These reductions should have benefits beyond potential reductions in lung cancer, since exposure to diesel exhaust is associated with a range of other health conditions, such as heart disease, asthma, and chronic obstructive lung disease. With mounting scientific evidence on how diesel exhaust may cause these health effects, and which groups of people are most vulnerable, there is increasing rationale for stricter regulations in order to protect "at risk" groups within the general public.

Workplace settings merit special attention, as diesel exhaust is common to several industries and often occurs at levels considerably higher than those found in ambient settings. It is estimated that 5% of the working population is exposed to diesel exhaust at the workplace, making it the second most common workplace carcinogen. Our preliminary research shows that workers are typically unaware of the actual level of diesel exhaust at their workplace and are similarly unfamiliar with the adverse health effects of diesel exhaust, and therefore are not motivated to minimize their exposure through industrial hygiene and personal protection. Clearly, it is important to address these knowledge gaps to protect the health and safety of workers.

Disagreement remains among experts as to the optimal metric for monitoring exposure to diesel exhaust, and exposure data has not been consistently and appropriately collected and catalogued. Because diesel exhaust is a complex mix of gases and particulates, potential exposure proxies include particulate matter, elemental or total carbon, representative gases, etc. As we potentially move to tighter workplace standards, the pros and cons of the various monitoring options need to be considered.

Workplace settings merit special attention, as diesel exhaust is common to several industries and often occurs at levels considerably higher than those found in ambient settings.

The World Health Organization has recently also designated ambient air pollution as a human carcinogen. Together with the IARC designation for diesel exhaust, the certainty of the impact is growing and should strengthen the case for ongoing reductions in diesel emissions. Because there is no known lower concentration threshold for effect, one can anticipate a complex process of deciding a reasonable path for further reductions into the future.

HEALTH IMPACTS & REDUCING EMISSIONS
from heavy diesel trucks

Chronic exposure to air pollution causes nearly nine times as many premature deaths in Canada as traffic crashes, according to University of B.C. researchers in an October 2013 commentary published in the Canadian Medical Association Journal. Much of this concern stems from traffic-related air pollution, such as diesel particulate matter (DPM). In the Lower Fraser Valley, DPM is estimated to be responsible for two-thirds of the lifetime cancer risk associated with air pollution.

In 2010, there were almost 29,000 registered heavy-duty diesel trucks and buses in the Lower Fraser Valley. Although this is less than 5% of the total registered vehicle population, the heavy truck fleet was responsible for about 15% of DPM emissions and about 12% of nitrogen oxides (NOx) in the region. Additionally, unlike other major sources of DPM and NOx emissions (such as industry, rail and marine vessels), heavy trucks and buses operate in close proximity to where people live, work and play.

Remote Sensing – Drive-through Emissions Testing

Driven by the need to address DPM and public concern about emissions from trucks, Metro Vancouver, in collaboration with the B.C. Ministry of Environment, Fraser Valley Regional District, Port Metro Vancouver and AirCare, undertook a study in 2012 to better understand the region's heavy-duty vehicles. Emissions testing was performed using remote sensing device (RSD) technology, which allows for an accurate roadside emissions test as vehicles drive through equipment set up alongside the road. During 55 days of testing, emissions from over 11,700 semi-trailer trucks, dump trucks, buses and other heavy-duty vehicles were tested.

> Heavy-duty vehicles with engines built in 2007 and later have sophisticated control technology to reduce their emissions to meet strict national standards.

Heavy-duty vehicles with engines built in 2007 and later have sophisticated control technology to reduce their emissions to meet strict national standards. The study found that the national standards for new vehicles are effective, with new vehicles producing significantly lower emissions than older models. In fact, nearly 75% of the vehicles tested were 2007 and older models, and they contributed 90% of the NOx and 98% of the DPM emissions measured.

However, over time, emissions control equipment may fail to operate as designed due to poor maintenance, or in some cases, deliberate tampering or removal of the equipment. Vehicles that have been tampered with or that have

failing emission control systems will likely show up as "gross emitters" – the minority of vehicles responsible for the majority of emissions from a fleet. The RSD study confirmed the presence of "gross emitters" in all age categories, including the newest vehicles. In fact, compared to a typical, properly-operating heavy-duty vehicle, the dirtiest ten percent of trucks emit approximately four to five times more NOx and PM, and eight times more hydrocarbon emissions.

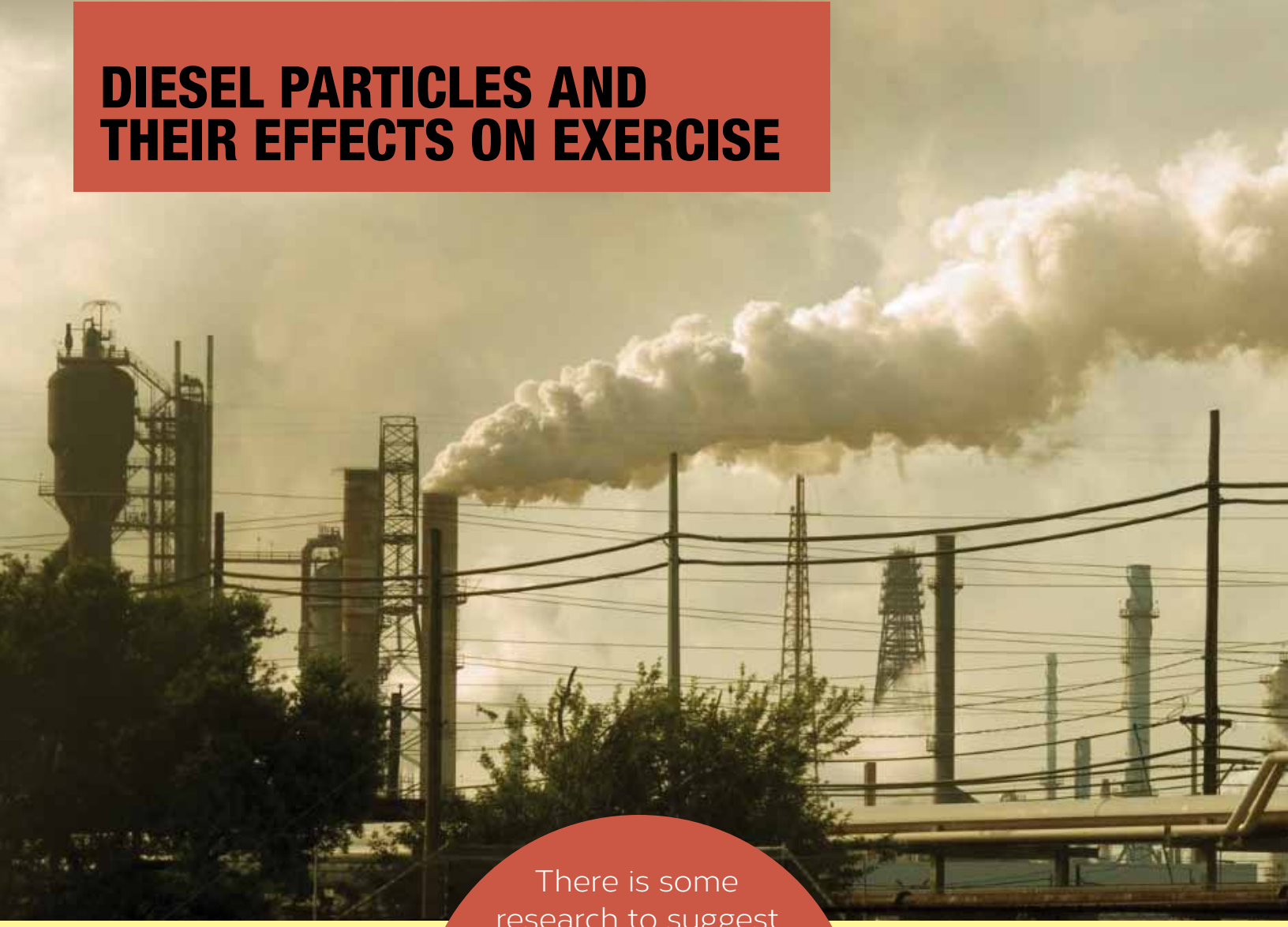
With the emissions test results in hand, the study partners are now working to identify and prioritize policies and programs that will address heavy truck emissions. A consultant was retained to evaluate a range of program options, and the following options were recommended:

• Inspection/Maintenance (I/M) program for heavy-duty vehicles: A regular I/M program was determined to be most effective at reducing emissions at relatively low cost. An I/M program could yield emission reductions by 2020 for DPM and NOx, and could use new technologies, like RSD testing, to minimize cost and impacts on operators.

• Variable registration combined with an I/M program: This option would include an I/M program, and add a variable registration fee that is higher for older vehicles and lower for newer vehicles, to create a financial incentive for retiring older vehicles, which have higher emissions than newer vehicles.

Further analysis will be carried out to determine the potential emissions benefits, program costs and timeframes that would accompany the above options, and will help inform development of effective programs to reduce emissions from heavy trucks in B.C.

DIESEL PARTICLES AND THEIR EFFECTS ON EXERCISE



Air pollution exposure and physical inactivity are associated with premature death. Regular exercise, on the other hand, reduces the risk of chronic disease and mortality. When an individual exercises, higher ventilation and mouth breathing will cause a greater number of smaller particles to deposit within the lung.This increases the intake and dose of air pollution, which may increase the associated health effects of air pollution.

There is some research to suggest that air pollution exposure (ozone and particulates) during exercise can impair lung and blood vessel function and cause inflammation. As some of the health effects of air pollution persist after exposure, a study was undertaken to determine how exposure to air pollution before exercise affects health. This study found that exposure to air pollution before a simulated cycling race (in clean air) increased exercise heart rate by 6.5 bpm (beats per minute).. This emphasizes the importance of considering your environment not only during but before exercise. If similar effects are seen in at-risk populations they may not be able to accommodate the higher exercise heart rate which may cause adverse effects.

There is some research to suggest that air pollution exposure (ozone and particulates) during exercise can impair lung and blood vessel function and cause inflammation.

The simple recommendation for exercising in polluted air would be to reschedule exercise, which makes sense for locations with brief periods of poor air quality. But in cases where an area experiences an extended period of poor air quality, this recommendation may result in chronic physical inactivity and adversely affect health. Another simple recommendation would be to encourage individuals

to modify how hard they exercise (exercise intensity), as a reduction in exercise intensity may reduce the dose and intake of air pollution and thus health effects. While this assumption makes sense, it is over simplistic and does not take into account that short-term benefits of exercise may offset the effects of air pollution, and that these effects may be more likely to happen as exercise intensity increases.

A subsequent study sought to assess how exposure to air pollution (using diesel particulate matter) during different exercise intensities affects health. For this study, individuals exercised for 30 minutes, at either low or high intensity, while breathing either clean air or polluted air. During these periods, participants were monitored for how much they breathe, how much energy they use, and how hard exercise feels. Participants were also monitored before and up to 2hours after exercise to see how the lungs, blood vessels, blood and heart were affected. It was anticipated that as individuals increased exercise intensity, the effects of air pollution would also increase.

When people exercised in polluted air, exercise felt more difficult than when people exercised in clean air. As exercise feels harder with air pollution exposure, this may affect how quickly athletes can race and therefore exercise performance. It may also affect how likely recreational exercisers are to terminate exercise prematurely, and if this happens frequently it may reduce the health benefits of exercise.

At the low exercise intensity, equivalent to a leisurely bike ride, the amount of air inhaled every minute, and the amount of energy required to exercise at the same pace where higher in polluted air compared to clean air. However, at the higher exercise intensity, equivalent to maximum that one can sustain for 30 minutes, there were no effects on breathing or energy expenditure. These effects may be related to airflow in the lungs and where diesel particles could deposit.

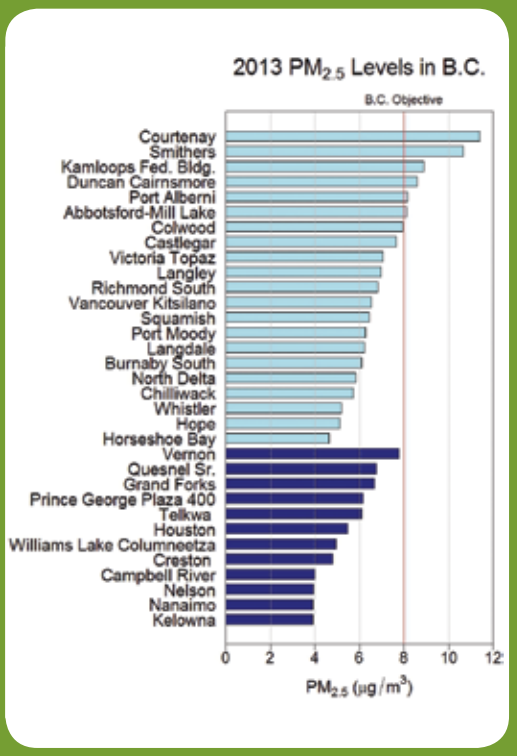
In the study, effects due to exercising in polluted air were not observed on the lungs, blood vessels, blood or heart. In addition, the health effects of air pollution were not greater as exercise intensity increased. Since the health effects of air pollution exposure were not modified by exercise intensity, advising individuals to reduce exercise intensity during episodes of air pollution may have no additional benefit. However, it is important to remember that the health effects within this study were only measured 2 hours after exercise. It is unclear how the effects may change over longer periods of time.

POLLUTION LEVELS:

HOW DOES B.C. MEASURE UP?

Air quality in 2013 was generally good, with short periods of degraded air quality occurring at various times of the year. Stagnant meteorological conditions led to smoky conditions and high levels of fine particulates in some B.C. valleys during parts of January and October. Although sunny, dry conditions prevailed over much of the summer, there were few large wildfires and relatively few smoky days compared to the previous summer. Ground-level ozone – a key component of summertime smog – remained below ambient objectives across the province.

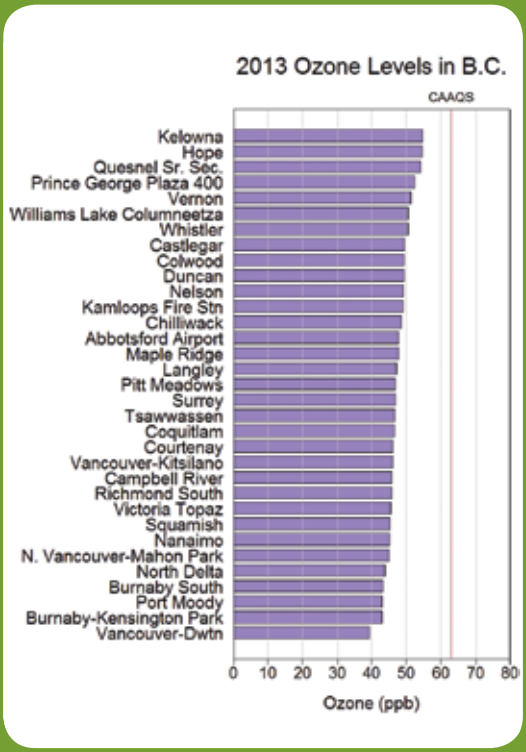
Air quality data from several monitoring sites are summarized in the following figures. The monitoring sites shown in the figures are restricted to those sites which best reflected community air quality, and which had a complete year of available data. Where large populations reside near a major source, additional sites may be shown. Data from all available monitoring sites are summarized in the Technical Appendix.

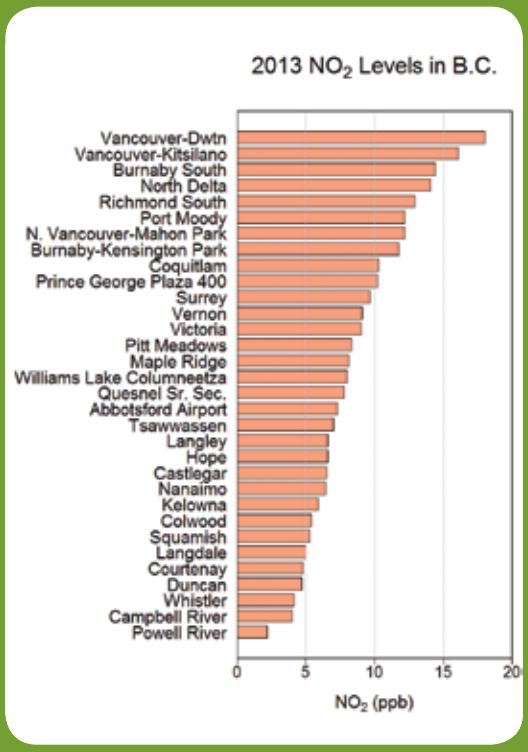


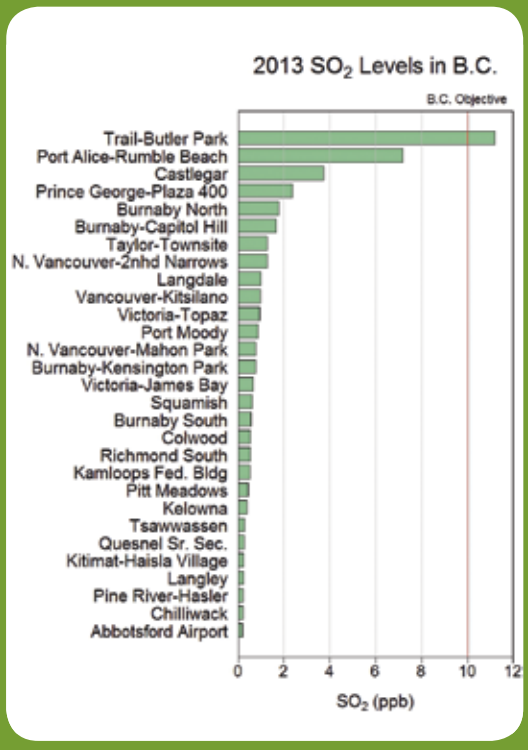
Fine Particulate Matter ($PM_{2.5}$)

Fine particulates ($PM_{2.5}$) are microscopic particles that are 2.5 micrometres or smaller in diameter. $PM_{2.5}$ affects respiratory and cardiovascular health. Major sources in B.C. include wood combustion (e.g. prescribed burning, wood stoves), marine vessels and diesel vehicles.

More sites exceeded the provincial annual objective of 8 µg/m³ in 2013 than in recent years. This is primarily a result of the ongoing transition from the old monitoring technology (dark blue bars) to the new monitors (light blue bars) that provide a more complete measure of $PM_{2.5}$. Annual mean concentrations ranged from 3.9 µg/m³ in Kelowna to 11.4 µg/m³ in Courtenay. Daily concentrations (not shown) exceeded the provincial objective of 25 µg/m³ and the new national standard of 28 µg/m³ (over one year) in Courtenay as well as Smithers, Duncan and Port Alberni. Each of these sites uses the new-technology monitors.







Ground-level Ozone (O_3)

Ground-level ozone is a gaseous pollutant that is formed in the air from reactions involving oxides of nitrogen (NOx) and hydrocarbons in the presence of sunlight. Motor vehicles are a major source of both NOx and hydrocarbons in B.C. Exposures to ozone have been linked to increased breathing difficulties, aggravation of asthma and other lung diseases, and early deaths.

In 2013, ozone levels were generally low across the province. No sites exceeded the level of the new national standard of 63 ppb (based on 4th highest daily 8-hour maximum). The highest concentrations were observed in Kelowna and Hope (55 ppb). The highest hourly concentration was recorded on July 1 in Agassiz, when ozone levels peaked at 73 ppb.

Nitrogen Dioxide (NO_2)

Nitrogen dioxide (NO_2) is a reddish-brown gas with a pungent odour that is a product of high-temperature combustion sources such as transportation and industry. Short-term exposures to elevated levels are linked to increased respiratory symptoms, and there are a growing number of studies linking NO_2 exposure to more serious health effects including cardiovascular, mortality, cancer and reproductive effects.

In 2013, annual mean NO_2 concentrations across B.C. ranged from 2-18 ppb, with the highest levels observed in Metro Vancouver, in areas near major transportation routes. Annual mean concentrations at all sites were below the national objective of 32 ppb and the Metro Vancouver objective of 21 ppb.

Sulphur Dioxide (SO_2)

Sulphur dioxide (SO_2) is a colourless gas with a pungent odour. Exposure to elevated levels can aggravate asthma and increase respiratory symptoms. Major sources in B.C. include metal smelting facilities, pulp mills, the upstream oil and gas sector, refineries and marine sources.

SO_2 concentrations were generally low across the province, with the majority of sites having an annual mean concentration of less than 1 ppb in 2013. The highest concentrations were observed near major industrial facilities. SO_2 levels in Trail exceeded the B.C. annual objective of 10 ppb at the Butler Park monitoring site. Short-term exceedances of the provincial 1-hour objective (170 ppb) were observed in both Trail and Port Alice.

A REPORT FROM THE 2014 AIR QUALITY & HEALTH WORKSHOP

Air Quality and Health Impacts of Energy Resource Extraction, Processing, and Transportation

Approximately 120 participants attended the BC Lung Association's 11th Annual Air Quality and Health Workshop on March 10, 2014. Participants heard from a distinguished panel of international experts, who provided a state of the science overview of the evidence regarding air quality and related health impacts from energy resource production. All presentations are available on the BC Lung Association website: http://www.bc.lung.ca/association_and_services/air_quality_workshop.html, and short video podcasts summarizing the key points from each presentation are also available .

Jim Standen from the B.C. Ministry of Environment began the day by providing an overview of the province's energy sector and its complex regulatory framework. The three following talks focused on the air quality and health impacts of natural gas production. Dr. Allen Robinson of Carnegie Mellon University discussed emissions of both criteria and hazardous air pollutants at different stages of the natural gas development process. Important emissions include nitrogen oxides (NOx) and volatile organic compounds, both precursors of ozone formation. Dr. Robinson explained that government air quality monitors are generally not well positioned to measure concentrations near natural gas development/production facilities in rural areas and suggested other approaches that might be useful for characterizing emissions and identifying the

small number of "high emitters" that may account for a significant portion of total emissions. Dr. John Adgate of the Colorado School of Public Health followed with a discussion of the potential public health impacts of unconventional natural gas development. His presentation described both a recent risk assessment, which suggested the potential for increased health risks for those living near well pads, and a retrospective cohort study, which reported an association between residential proximity to wells and adverse birth outcomes including congenital heart anomalies and neural tube defects. This group of presentations was concluded by Dr. Aimee Curtright from RAND Corporation who described a recent calculation of the regional air quality impacts of shale gas production and processing in Pennsylvania. Compressor station emissions were found to have the largest air quality impacts of the four activities considered (transport, well drilling and hydraulic fracturing, natural gas production, and compressor stations). Although the total emissions from shale gas production and processing are relatively small, they are of concern in some areas where activities are most concentrated (e.g., 90% of the state's wells are in 10 counties).

The next series of presentations began with Dr. Annibale Biggeri, a statistician from the University of Florence. Dr. Biggeri summarized the existing epidemiologic evidence linking both short-term and chronic air pollution exposures with a wide range of human health effects. He then described a successful research collaboration between researchers and the local government in Sarroch, Italy, the location of the second largest oil refinery in Europe. Dr. Paul Van Buynder, Chief Medical Health Officer for Fraser Health, described the proposed Fraser Surrey Docks Direct Transfer Coal Facility and its potential public health impacts. This proposed facility would transfer coal transported by train from the Powder River Basin in the US to barges for shipment to Texada Island. Dr. Van Buynder highlighted the large number of stakeholders with an interest in this proposed facility, noted some weaknesses and a lack of transparency in the review process to date, and called for a health impact assessment of the proposed facility.

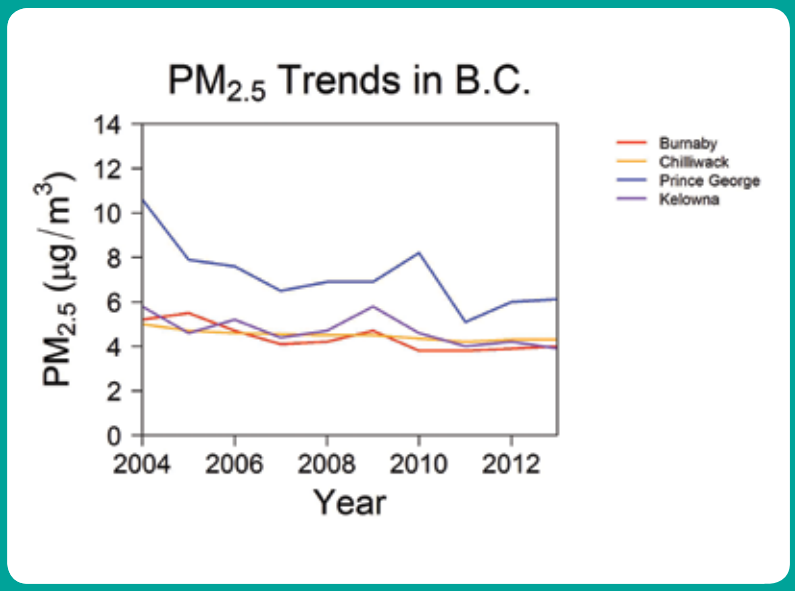
Two presentations, by Dr. Joule Bergerson of the University of Calgary and Dr. Craig Dalton from the University of Newcastle, highlighted some of the air quality and health issues of energy resource transportation. Dr. Bergerson presented her findings on the regional variability of effects from air pollution related to fossil fuel transport, and on-going efforts to establish control measures. Dr. Dalton reviewed studies of air pollution from coal transport in rail corridors and described the challenges of conducting research and communicating risk in settings with a diverse group of stakeholders with strongly-held beliefs.

Dr. James Lu, Medical Health Officer from Vancouver Coastal Health, described the potential contributions of health impact assessments in the energy sector. He noted that environmental impact assessments are routinely conducted using well established methods, but that those assessments are often narrow in focus and inadequate in their consideration of health. Dr. Lu then described the basic steps in a health impact assessment and provided some US examples of previous assessments in the energy sector. The workshop concluded with a presentation by Dr. Hadi Dowlatabadi from UBC, who discussed some of the links between energy policy, air quality, and climate change. He suggested that concerns about air pollution in China and other developing countries will be one driver of a shift to natural gas, following a trend previously observed in the UK and other developed countries. However, the climate benefits of this shift will be largely offset by methane emissions in the natural gas production process, highlighting the need for tight control of methane emissions. Dr. Dowlatabadi closed with a call for a greater focus on renewable energy and carbon capture for transportation fuels.

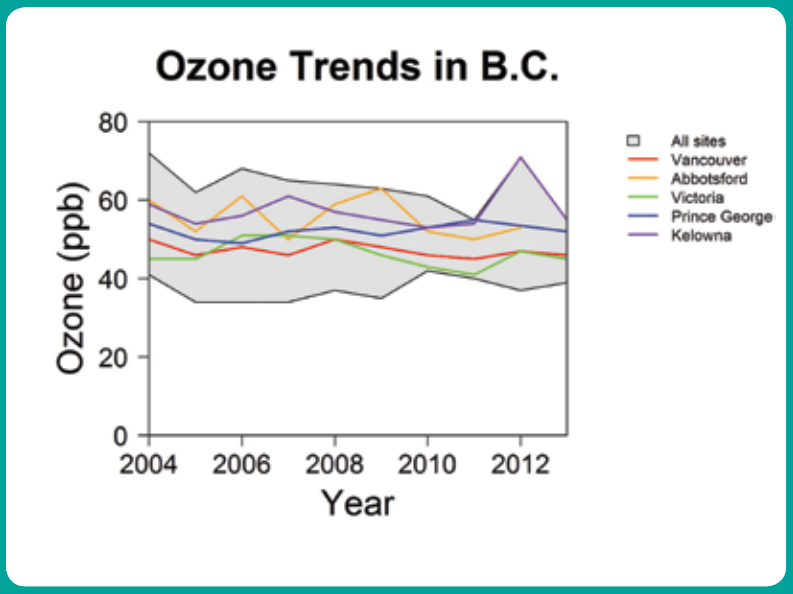
TRENDS

Air Pollution in B.C. Through the Years

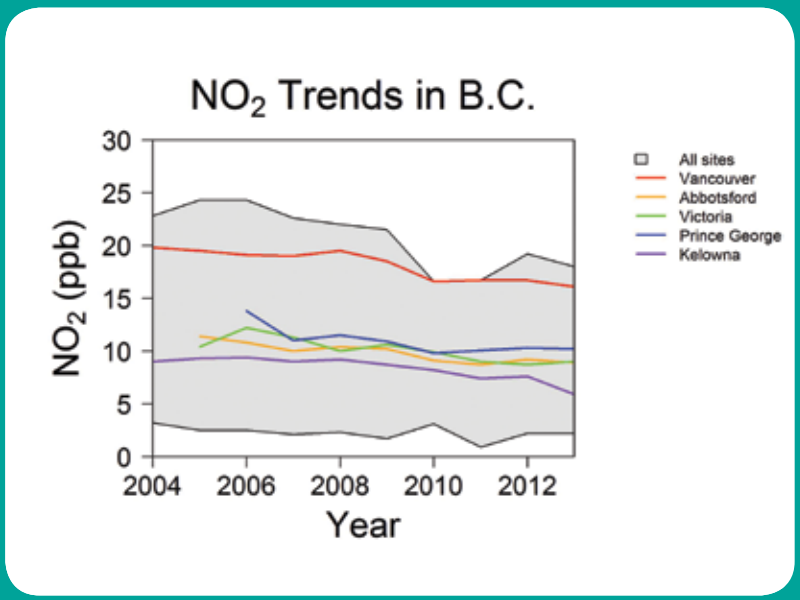
We track trends in air quality levels to determine whether actions to improve air quality are effective, and whether new actions may be needed to protect future air quality. Several factors influence trends beyond local emissions. These include year-to-year variations in the weather and emissions from natural or distant sources, such as the Siberian wildfires in 2012. Changes to monitoring technology that affect the monitored concentrations will also have an impact on trends analysis. In the following figures, trends at select monitoring sites are compared against the range of concentrations measured at all B.C. sites (shown by grey shading).



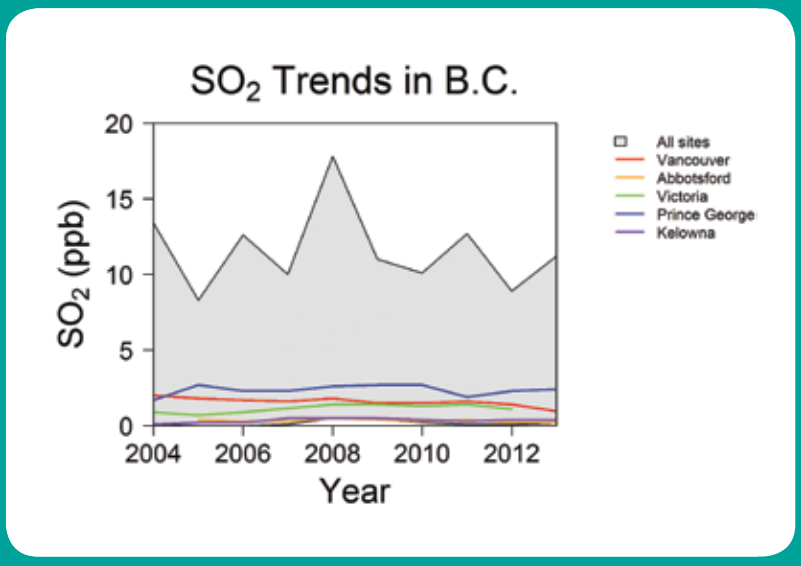
$PM_{2.5}$ measurements have been especially affected by recent changes to monitoring technology. For this reason, only data from select monitoring sites using the older instruments (which have a longer record of use) were considered here. Annual mean $PM_{2.5}$ levels have generally declined over the past decade, owing to improved motor vehicle emission standards, local restrictions on open burning and other local actions.



Meteorology has a large influence on ozone production, and this is seen in the large year-to-year variations in ozone concentrations (shown as 4th highest daily maximum 8-hour averages). Further influencing these trends are the increasing global background levels together with local actions to reduce the precursors to smog-emissions of NOx and hydrocarbons. In this regard, Metro Vancouver, the FVRD and other partner agencies have released the regional ground level ozone strategy to reduce both short-term peak and average ozone levels in the Lower Fraser Valley.



Over the past decade, annual mean NO2 levels have trended downward in urban areas such as Vancouver, due in large part to improvements in motor vehicle emissions and to the AirCare vehicle inspection and maintenance program in the Lower Fraser Valley.



SO2 concentrations in urban areas of the province have remained low, averaging less than 4 ppb on a yearly basis. Nevertheless, a downward trend is seen in Vancouver SO2 levels over the past decade. These improvements are linked to a reduction in the sulphur content of gasoline and diesel.

NEWS FROM PARTNER AGENCIES

HEALTH CANADA

Transportation

Health Canada recently completed a study in Vancouver that compared personal exposure to air pollutants during different modes of commuting including private cars, buses and the SkyTrain. Combined with urban transport data collected in Toronto, Montreal and Ottawa, the results of this study will improve our understanding of the potential health effects of commuter exposures. The data is being analysed and study results are expected in 2015.

In collaboration with Dr. Chris Carlsten at UBC, Health Canada initiated a small pilot study to investigate the effects of Traffic-related Air Pollution (TrAP) on the brain. The purpose of this pilot study was to determine if subtle changes in the ability to concentrate and process information optimally (cognition) could be seen in a group of people exposed to diesel exhaust. The full scale study protocol has been extended to include tests of cognition, mood, balance and circulating blood markers of brain function as well as functional Magnetic Resonance Imaging (fMRI). This study is providing us with important data about the impacts of TrAP on human brain function, specifically cognition; and may generate evidence of the mechanisms behind these effects.

Impact of wood smoke on cardiovascular health

Health Canada is currently conducting a wood smoke study in Courtenay, Kamloops, and Prince George, B.C. to evaluate the impact of $PM_{2.5}$ from biomass burning on the risk of myocardial infarction. Ambient air monitoring for this study began in January 2014 and will continue through March 2015. This study is a collaboration between Health Canada, the B.C. Ministry of Environment, the Vancouver Island Health Authority, and investigators at McGill University and the University of British Columbia.

Hybrid modeling

Health Canada is beginning the development of "hybrid" models that use information from diverse sources to estimate annual and daily air pollution across Canada. The study will generate NO_2 and $PM_{2.5}$ concentrations for point locations (e.g., homes, schools, and workplaces) to support exposure assessment in national health studies. Health Canada is conducting this study in collaboration with Carleton University, University of British Columbia, and Environment Canada. The study will be completed in 2016.

Indoor Air Quality

Health Canada continues to collaborate with partners on indoor air quality projects, including best practices for managing carbon monoxide in long term care facilities, the sources and health effects of phthalate exposure in young children and encouraging radon testing by home owners.

FRASER VALLEY REGIONAL DISTRICT

Air Quality Monitoring Stations

The FVRD expanded its air quality monitoring network with the launch of a station in Agassiz in June 2013. Another new station is slated to become operational in Mission later in 2014.

Reducing Traffic Emissions

The FVRD installed five electric vehicle chargers across the region through the Community Charging Infrastructure Fund. The FVRD also recently announced a

new express bus route connecting Langley, Abbotsford, and Chilliwack, expected to commence in 2015.

Air Quality Education

With the Fraser Basin Council, the FVRD is developing a school education program on air quality in the Fraser Valley.

Partnerships

The FVRD continues to collaborate with other agencies on many regional initiatives to better understand and improve air quality in the Lower Fraser Valley.

With the Diesel Vehicle Subcommittee of the AirCare Steering Committee, the FVRD is part of a team exploring options to address air emissions from heavy-duty diesel vehicles.

The FVRD is part of inter-agency groups in the LFV working on developing best management practices and health impact assessment frameworks for reducing exposure to traffic emissions.

METRO VANCOUVER

Assessing Risks from Toxic Air Pollutants

Metro Vancouver, with Vancouver Coastal Health, Fraser Health and the FVRD, are carrying out an assessment of the risk to human health from toxic air pollutants in the Lower Fraser Valley. Expected to be completed later this summer, the risk assessment will inform air quality managers regarding which toxic air pollutants are the most

important to address with management actions. It will also include an inventory of emissions of toxic air pollutants from all sources in the Lower Fraser Valley.

Air Quality Monitoring in Metro Vancouver

Metro Vancouver introduced AirMap.ca, an online resource that displays real-time measurements from regional air quality monitoring stations on a map, and colour-codes data to indicate readings from low to high. AirMap has 24-hour and seven-day air quality trends, as well as weather data for each station. Metro Vancouver will add new monitoring stations in New Westminster and North Vancouver. Enhancements to SO_2 monitoring are planned, which will support development of a new, more stringent ambient air quality objective for SO_2 in the region, and help assess effectiveness of the marine Emissions Control Area, which will result in significant reduction of the sulphur content of marine fuels used by ocean going vessels.

Proposed Coal Terminals

Metro Vancouver is monitoring for coal particles and other air pollutants in North Vancouver, near Burrard Inlet. The monitoring program is in response to questions about proposed changes at port facilities, including proposed expansion of a nearby coal handling facility. Coal particle monitoring will also occur in Delta and White Rock, to better inform environmental and health risk assessments associated with proposed coal movement and handling projects.

Caring for the Air

For more on these and other air quality stories, check out Caring for the Air, the annual "state of the air" report for Metro Vancouver at www.metrovancouver.org/air.

B.C. MINISTRY of ENVIRONMENT

Monitoring in the Northeast

Expanded natural gas exploration and production has raised some public concerns about possible impacts to local air quality and human health as a result of increasing industrial emissions. Responding to these concerns, the B.C. government and the energy industry have installed three new air quality monitoring stations in the South Peace area. Monitoring data are available online and in real-time from the following website: http://www.bcairquality.ca/readings/northeast/. To date, only very low concentrations of pollutants have been detected at these new stations.

Environmental Guidelines for the LNG Industry

A number of companies have expressed an interest in developing export facilities for liquefied natural gas (LNG) along the B.C. coast. LNG is natural gas that has been cooled to -160°C, taking up to 600 times less space than conventional natural gas and enabling overseas shipments. To support government's commitment to the cleanest LNG in the world, the Ministry is developing interim air quality objectives for nitrogen dioxide and sulphur dioxide and guidelines for gas turbine emissions from LNG processing plants and power-generating facilities. Decisions on these criteria are expected in 2014.

Kitimat Cumulative Effects Study

Early interest in LNG development has centred on the town of Kitimat in northwestern B.C. Already home to a major aluminum smelter, concerns have been raised about the potential for the Kitimat airshed to accommodate additional new sources without compromising local air quality. To respond to these concerns and to better inform future regulatory decisions in this airshed, the provincial government is funding a study to assess potential health and environmental impacts due to emissions of sulphur dioxide and nitrogen dioxide. Results from this study are expected in 2014.

Regulatory Updates

The ministry continues to work on new approaches to open burning to better protect air quality and human health in smoke-sensitive areas of the province, and to allow for greater flexibility in remote areas. The ministry is also finalizing amendments to the wood stove regulation that will restrict the sale of outdoor wood boilers, allowing only the cleanest models to be sold in B.C.

Wildfire Smoke Forecasting System

The BlueSky Smoke Forecasting System has now been expanded to include eastern Canada. First launched in 2010 as a tool to provide up-to-date wildfire smoke forecasts in B.C. and Alberta, BlueSky forecasts are now available nationally. During the wildfire season, forecasts are available at bcairquality.ca. Health researchers in B.C. are also trying to better understand the interactions between wildfire smoke and human health, and ways to communicate this information to the public

Collaborative INITIATIVES

Regional Ground Level Ozone Strategy

The Regional Ground Level Ozone Strategy, developed by the FVRD, Metro Vancouver, B.C. Ministry of Environment, Environment Canada and Port Metro Vancouver, was released in 2014. The objectives of the Strategy are to present the state of scientific understanding about ground level ozone formation in the LFV region, establish broad policy directions and specific actions based on the current scientific understanding and identify other areas for further study.

(Cont'd on page 16)

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B.C. Visibility Coordinating Committee

Clear views of the spectacular scenery of British Columbia can sometimes be obscured by air pollutants. The B.C. Visibility Coordinating Committee (BCVCC) has installed a network of visibility cameras and air pollutant monitoring equipment in Metro Vancouver and the Lower Fraser Valley to help address this issue. The BCVCC website, ClearAirBC.ca, displays current images from these cameras along with a wealth of information on how we can all help improve visibility. The BCVCC is developing an indicator of visibility conditions and is undertaking studies to determine how much visibility will improve with a range of future air pollution reductions.

Reducing Emissions from Light & Heavy-Duty Vehicles

The AirCare program, an emissions inspection and maintenance program for cars and light trucks in the Lower Fraser Valley airshed, will end after 2014; however, even with decades of improvement, motor vehicles are still the largest contributor of smog-forming emissions in the region. To maintain emissions improvements that have been achieved, Metro Vancouver, with the B.C. Ministry of Environment, FVRD, AirCare and other partners, is exploring options to prevent backsliding in emissions from motor vehicles. Emissions testing data indicates that vehicles subject to AirCare are newer and have lower emissions in comparison to vehicles not subject to the program, and that vehicles that failed their most recent AirCare inspection had much higher emissions than those that passed.

Work is also underway to develop and evaluate options to address emissions from on-road heavy-duty diesel vehicles. A 2013 consulting study evaluated potential programs for heavy-duty vehicles in the Lower Fraser Valley, and recommended inspection and maintenance, combined with a fee-based registration program as a means of promoting emissions reductions from the heavy vehicle fleet.

The study partners will continue to develop the above options to address emissions from light and heavy-duty vehicles.

VISIT OR CONTACT US

BC LUNG ASSOCIATION
www.bc.lung.ca
2675 Oak Street
Vancouver, B.C. V6H 2K2
(604) 731-5864 or toll-free at
1-800-665-5864 (in B.C. but outside the Lower Mainland)

ENVIRONMENT CANADA – PACIFIC AND YUKON REGION
401 Burrard Street
Vancouver, B.C. V6C 3S5
(604) 664-9100

HEALTH CANADA
ENVIRONMENTAL HEALTH PROGRAM – B.C. REGION
www.hc-sc.gc.ca/ewh-semt/air/index-eng.php
400-4595 Canada Way
Burnaby, B.C. V5G 1J9
(604) 666-2671

BC CENTRE FOR DISEASE CONTROL
www.bccdc.ca
655 West 12th Avenue
Vancouver, B.C. V5Z 4R4
(604) 707-2400

B.C. MINISTRY OF ENVIRONMENT
www.bcairquality.ca

Environmental Standards Branch
PO Box 9341, Stn Prov Govt
Victoria, B.C. V8W 9M1
(250) 387-9932

Ministry of Environment Regional Offices
www.env.gov.bc.ca/main/regions.html

METRO VANCOUVER
www.metrovancouver.org
4330 Kingsway
Burnaby, B.C. V5H 4G8
(604) 432-6200

FRASER VALLEY REGIONAL DISTRICT
www.fvrd.bc.ca
45950 Cheam Avenue
Chilliwack, B.C. V2P 1N6
(604) 702-5000 or
1-800-528-0061

B.C. MINISTRY OF HEALTH
www.bcairquality.ca

Health Protection Branch
1515 Blanshard Street, RBB 4-2
Victoria, B.C. V8W 3C8
(250) 952-1469

BRITISH COLUMBIA HEALTH AUTHORITIES

Northern Health Authority
www.northernhealth.ca
Suite 600, 299 Victoria Street
Prince George, BC V2L 5B8
(250) 565-2649

Vancouver Island Health Authority
www.viha.ca
1952 Bay Street
Victoria, B.C. V8R 1J8
(250) 370-8699

Vancouver Coastal Health Authority
www.vch.ca
11th Floor, 601 West Broadway
Vancouver, B.C. V5Z 4C2
(604) 736-2033 or
1-866-884-0888

Fraser Health Authority
www.fraserhealth.ca
Suite 400, Central City Tower
13450–102nd Avenue
Surrey, B.C. V3T 0H1
(604) 587-4600 or
1-877-935-5669

Interior Health Authority
www.interiorhealth.ca
220-1815 Kirschener Rd
Kelowna, B.C. V1Y 4N7
(250) 862-4200

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Data Source:
B.C. Ministry of Environment and Metro Vancouver

Units:
All data presented in ppb except PM2.5, which is presented in micrograms per cubic metre

Data completeness:
A valid day has data for at least 18 hours (75%).
A valid year has data for at least 75% of days in each quarter, with the following exceptions.
For PM2.5, at least 75% of days in the year must be valid, and at least 60% of days in each quarter (where "Q1" refers to first quarter from Jan-Mar, "Q2" is second quarter from Apr-Jun, etc.)
For peak (4th highest) 8-hour ozone levels, a valid 8-hour period has data for at least 6 hours, a valid day has data for at least 18 hours, and a valid year has at least 75% of days in the second and third quarters (April 1 to September 30).
Where data completeness requirements are not met, only number of hours per year, maximum value and number of exceedances are shown. Any exceptions are highlighted

Exceedance calculations:
Number of exceedances reflect actual number (not annually adjusted).

Collocated monitors:
Where more than one PM2.5 monitor is operating at a single site, data are shown for the monitor currently considered the primary reporting monitor and/or the monitor reporting a complete year of data.
A common example is the collocation of new FEM instruments alongside the TEOM instruments. This is done primarily for testing purposes, to ensure satisfactory FEM performance prior to
establishing the FEM instrument as the primary reporting monitor and decommissioning the older TEOM instrument.

Disclaimer:
While the information in these data summaries are believed to be accurate, the data summaries are provided as is without any warranty, and may be subject to change as changes to the underlying database occur.

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3. The information provided in these data is intended for educational and informational purposes only. These data are not intended to endorse or recommend any particular product, material or service provider nor is it intended as a substitute for engineering, legal or other professional advice. Such advice should be sought from qualified professionals.

2013 PM2.5 Summary (all concentrations in micrograms per cubic metre)

Station ID	Location	Instrument	No. Valid Days	No. Valid Hours	Hourly Mean	Percentiles (1h)					Maximum		98th Percentile (24h)		No. Days >25 µg/m³	% Valid Days Per Quarter			
						25	50	75	98	99	1h	24h	1yr	3yr Avg.		Q1	Q2	Q3	Q4
E289309	Abbotsford Airport	FEM	364	8709	6.3	3	5	8	20	24	235	19.7	15	.	0	100	99	100	100
E238212	Abbotsford -Mill Lake Rd.	FEM	345	8298	8.1	3	6	10	25	28	64	28.3	18	14*	1	100	92	86	100
E293810	Agassiz	FEM	208	5018	.	.	.	.	.	.	32	17	.	.	0	0	33	100	93
0310177	Burnaby-Kensington Park	FEM	165	3993	.	.	.	.	.	.	38	16.1	.	.	0	0	0	80	99
E207418	Burnaby South	FEM	364	8700	6.1	3	5	7	18	22	54	21.2	14	11*	0	100	99	100	100
E225267	Burns Lake Fire Centre	TEOM	226	5514	.	.	.	.	.	.	135	28.1	.	.	2	64	76	41	66
E222520	Campbell River-Elk Falls Campground	TEOM	365	8702	4	1	2	5	19	23	69	15.5	12	10	0	100	100	100	100
E286369	Castlegar Zinio Park	FEM	357	8638	7.6	3	6	9	24	27	96	51.7	20	18	2	100	91	100	100
E220891	Chilliwack	FEM	358	8610	5.7	2	4	7	17	19	63	20.3	13	11*	0	99	100	95	99
E240337	Colwood City Hall	FEM	324	7911	7.9	3	6	10	30	35	91	25.4	21	19	0	89	79	87	100
E285829	Courtenay Elementary School	FEM	347	8352	11.4	4	8	14	50	59	86	42.8	33	32	25	99	100	83	99
E221199	Creston PC School	TEOM	365	8697	4.8	1	3	6	18	20	40	22.4	14	13	0	100	100	100	100
E273443	Crofton Escarpment Way	TEOM	355	8473	4.2	1	2	5	18	24	76	20.4	12	10	0	98	96	100	96
E220217	Crofton Substation	TEOM	365	8697	4	1	3	5	14	16	70	12.6	9	10	0	100	100	100	100
E277329	Duncan Cairnsmore	FEM	358	8542	8.6	2	5	11	41	47	96	41.7	32	31	19	98	100	96	99
E234670	Duncan Deykin Avenue	TEOM	323	7678	.	.	.	.	.	.	53	14.3	.	11	0	100	100	100	54
E292149	Golden Helipad	TEOM	300	7175	.	.	.	.	.	.	60	21.4	.	.	0	34	93	100	100
E235070	Golden Hospital	TEOM	57	1373	.	.	.	.	.	.	76	20.6	.	16	0	63	0	0	0
E263701	Grand Forks City Hall	TEOM	329	7882	6.7	2	4	9	26	31	97	30.4	22	19	5	98	87	76	100
E223756	Hope	FEM	361	8638	5.1	2	4	6	15	18	42	14.5	12	11*	0	99	100	97	100
E275843	Horseshoe Bay	FEM	363	8710	4.6	2	4	6	12	14	61	25	10	9*	0	100	100	98	100
M107004	Houston Firehall	TEOM	329	7910	5.5	0	3	6	29	36	75	27	17	18	1	99	96	77	89
0605008	Kamloops Federal Building	FEM	355	8494	8.9	5	8	12	25	28	92	25.8	21	20	1	100	99	98	92
E286009	Kamloops Fire Stn #2	FEM	299	7122	.	.	.	.	.	.	93	25.3		.	0	100	100	99	29
0500886	Kelowna College	TEOM	362	8633	3.9	1	2	5	15	17	31	21.7	11	12	0	100	100	97	100
E282711	Kitimat Haisla Village	TEOM	282	6825	.	.	.	.	.	.	117	7.9		8	0	100	89	97	24
E223616	Kitimat Haul Road	TEOM	107	2623	.	.	.	.	.	.	40	10.3		.	0	0	15	93	8
E216670	Kitimat Riverlodge	TEOM	229	5547	.	.	.	.	.	.	50	12.2		.	0	49	73	98	32
E223615	Kitimat Whitesail	TEOM	254	6054	.	.	.	.	.	.	29	6.5		6	0	100	100	79	0
E222778	Langdale Elementary	FEM	363	8640	6.2	2	5	8	20	25	44	16	14	14	0	99	100	100	99
E209178	Langley Central	FEM	326	8035	7	3	5	8	24	28	134	22.9	18	14*	0	86	86	95	91
E229797	Nanaimo Labieux	TEOM	343	8375	3.9	1	3	5	13	15	47	14.9	10	9	0	94	88	97	97
E258315	Nelson Kutenai Place	TEOM	365	8729	3.9	1	3	5	12	14	31	13.5	10	10	0	100	100	100	100
E207723	North Delta	FEM	352	8503	5.8	2	5	7	17	19	50	17.7	14	13*	0	100	91	100	95
E209177	North Vancouver Mahon Park	FEM	334	8011	5.1	2	4	6	15	18	49	16.2	12	12*	0	66	100	100	100
0310179	North Vancouver Second Narrows	FEM	329	7929	6.2	3	5	8	18	20	43	18	15	12*	0	62	100	98	100
E232244	Pitt Meadows	FEM	288	6916	.	.	.	.	.	.	46	20.4		11	0	100	78	38	100
E273483	Port Alberni Elementary	FEM	353	8438	8.1	2	4	9	41	47	76	40.6	31	24	19	97	90	100	100
0310162	Port Moody	FEM	352	8489	6.3	3	5	7	17	19	121	20	14	13*	0	97	98	93	98
E271963	Powell River James Thomson School	TEOM	302	7253	.	.	.	.	.	.	75	11.2		.	0	100	48	83	100
0220205	Powell River Wildwood	TEOM	252	6000	.	.	.	.	.	.	45	11.3		.	0	58	18	100	100
0450270	Prince George Gladstone School	TEOM	341	8210	4.9	0	2	6	23	26	54	22.9	18	17	0	100	100	88	86
0450307	Prince George Plaza 400	TEOM	360	8549	6.1	1	3	8	26	31	84	37	18	21	4	100	100	96	99
E216667	Quesnel Maple Drive	TEOM	360	8561	6.6	1	3	9	31	38	60	28.7	20	25	2	94	100	100	100
E208096	Quesnel Senior Secondary	TEOM	335	8091	6.7	1	5	10	24	28	64	29.6	17	21	2	99	92	76	100

2013 PM2.5 Summary (all concentrations in micrograms per cubic metre)

Station ID	Location	Instrument	No. Valid Days	No. Valid Hours	Hourly Mean	Percentiles (1h)					Maximum		98th Percentile (24h)		No. Days >25 µg/m^3	% Valid Days Per Quarter			
						25	50	75	98	99	1h	24h	1yr	3yr Avg.		Q1	Q2	Q3	Q4
E228064	Quesnel West Correlieu School	TEOM	346	8391	5.6	2	4	7	18	21	49	18.4	15	.	0	100	98	82	100
E232246	Richmond Airport	FEM	312	7539	.	.	.	.	.	.	48	26.5	.	11	1	47	97	99	99
E207417	Richmond South	FEM	353	8451	6.8	3	5	8	22	25	44	25.2	17	14*	0	96	100	100	91
E221821	Port Alice-Rumble Beach Hospital	FEM	263	6339	.	.	.	.	.	.	97	46.2	.	.	5	59	100	85	45
E206589	Smithers St Josephs	FEM	337	8133	10.7	3	6	13	47	54	125	39.9	33	29	22	98	78	93	100
0310172	Squamish	FEM	345	8101	6.4	3	5	9	21	24	40	18	15	15	0	99	90	89	100
E206271	Surrey East	FEM	358	8615	5.6	2	4	7	19	21	78	21.4	15	12*	0	100	98	96	99
E230557	Telkwa	TEOM	347	8176	6.1	1	3	7	30	35	81	25.7	19	17	1	98	89	95	99
M107028	Terrrace BC Access Centre	TEOM	147	3534	.	.	.	.	.	.	58	17	.	9	0	99	64	0	0
E283549	Tsawwassen	FEM	364	8718	5.7	2	4	7	18	21	74	19	15	11*	0	100	100	99	100
0310175	Vancouver-Kitsilano	FEM	352	8487	6.5	3	5	8	20	23	63	18.7	16	13*	0	99	98	100	89
E269223	Vanderhoof	FEM	326	7660	*Data under review*											77	100	96	85
E249492	Vernon Science Centre	TEOM	364	8724	7.8	4	6	9	18	20	49	22.2	17	16	0	100	100	99	100
E231866	Victoria Topaz	FEM	365	8704	7	2	5	9	32	41	137	43.5	23	20	4	100	100	100	100
E227431	Whistler Meadow Park	FEM	321	7779	5.2	1	3	6	28	34	76	22.2	19	18	0	70	91	92	98
0550502	Williams Lake Columneetza School	TEOM	363	8689	4.9	1	3	6	18	21	39	20.5	14	15	0	100	100	100	98
E248797	Williams Lake CRD Library	TEOM	58	1396	.	.	.	.	.	.	34	14.3	.	15	0	64	0	0	0

2013 Ozone Summary (all concentrations in ppb)

Station ID	Location	No. Valid Hours	Hourly Mean	Percentiles (1h)					Max 1h	No. Hours >82 ppb	4th Highest 8h Avg.		% Valid Days Per Quarter			
				25	50	75	98	99			1yr	3yr avg.	Q1	Q2	Q3	Q4
E289309	Abbotsford Airport	8542	18.3	7	18	28	44	46	59		48	51	100	99	99	100
E238212	Abbotsford-Mill Lake Rd.	8539	17.8	7	17	27	43	46	66	0	48	50	100	100	99	100
E293810	Agassiz	4952	.	.	.	.	.	.	73	0	.	.	0	33	99	100
0310177	Burnaby-Kensington Park	8540	15.7	6	14	23	40	42	53	0	43	42	98	99	98	100
E206270	Burnaby Mountain	8521	27.1	21	27	34	46	49	58	0	51	51	98	99	98	100
E207418	Burnaby South	8547	15.7	6	15	24	39	42	50	0	43	42	97	100	100	100
E286369	Castlegar Zinio Park	8193	17.9	8	16	25	46	48	62	0	49	49	100	90	96	100
E220891	Chilliwack	8355	17.8	6	17	27	45	48	63	0	49	52	100	100	100	100
E240337	Colwood City Hall	7930	21.6	11	22	31	46	48	56	0	49	50	91	96	100	100
E242892	Coquitlam	8572	15.1	4	13	24	43	45	57	0	46	47	97	100	100	100
E285829	Courtenay Elementary School	8204	17.1	6	16	26	41	43	54	0	46	45	100	100	89	100
E277329	Duncan Cairnsmore	8179	16.2	4	14	26	44	46	62	0	49	49	98	100	91	100
E222520	Campbell River-Elk Falls Campground	8395	19.6	11	19	27	42	44	59	0	46	46	100	100	100	100
E223756	Hope	8590	18.5	6	18	28	47	50	71	0	55	54	98	100	100	100
0605008	Kamloops Federal Building	1247	.	.	.	.	.	.	35	0	.	.	0	0	0	100
E286009	Kamloops Fire Stn #2	6857	21.3	10	22	32	46	48	57	0	49	49	100	99	99	100
0500886	Kelowna College	8337	24.3	15	24	33	50	52	68	0	55	60	100	100	100	100
E209178	Langley Central	8413	19.1	8	19	29	44	47	67	0	47	49	100	98	99	100
E232245	Maple Ridge	8528	17.5	6	16	27	44	47	65	0	48	50	100	96	99	100
E229797	Nanaimo Labieux	8292	20	12	20	27	42	44	50	0	45	46	94	99	100	100
E258315	Nelson Kutenai Place	8392	21.8	14	21	29	45	48	65	0	49	51	100	100	100	100
E207723	North Delta	8618	15.6	5	14	24	40	43	52	0	44	44	100	100	100	100
E209177	North Vancouver Mahon Park	8587	15.9	6	15	24	41	44	55	0	45	45	100	100	98	100
0310179	North Vancouver Second Narrows	8581	12.9	5	11	19	36	39	51	0	41	40	99	100	100	100
E232244	Pitt Meadows	8563	16.7	4	16	26	43	46	60	0	47	48	100	99	98	100
0310162	Port Moody	8483	12.7	2	9	22	40	42	51	0	43	43	97	98	100	100
0450307	Prince George Plaza 400	8113	19.8	7	20	30	47	49	66	0	52	53	100	98	100	100
E208096	Quesnel Senior Secondary	7643	17.2	5	15	28	49	51	60	0	54	53	92	84	98	100
E207417	Richmond South	8488	15.6	3	14	26	43	45	52	0	46	46	100	100	99	100
E206589	Smithers St Josephs	4092	.	.	.	.	.	.	61	0	.	52	56	85	29	100
0310172	Squamish	8187	16.2	6	15	24	42	44	54	0	45	46	92	98	100	100
E206271	Surrey	8564	18.7	8	18	28	44	47	61	0	47	48	100	100	98	100
E283549	Tsawwassen	8526	20.9	12	21	30	44	46	56	0	47	47	100	100	96	100
E232246	Richmond-Airport	8273	15.7	4	15	25	42	44	50	0	45	43	98	92	91	100
0310175	Vancouver-Kitsilano	8612	14.1	2	11	23	43	45	52	0	47	46	100	99	100	100
0310174	Vancouver-Downtown	8600	10.4	2	7	17	35	38	45	0	39	38	100	100	100	100
E249492	Vernon Science Centre	8360	18.9	6	17	29	47	50	59	0	51	52	100	100	99	100
E231866	Victoria Topaz	8011	18.8	9	18	27	42	44	51	0	45	44	89	100	96	100
E227431	Whistler Meadow Park	8189	19.7	8	19	30	46	48	56	0	51	53	100	100	90	100
0550502	Williams Lake Columneetza School	8035	19.7	8	19	30	47	49	62	0	50	54	93	88	98	100

2013 NO2 Summary (all concentrations in ppb)

Station ID	Location	No. Valid Hours	Hourly Mean	Percentiles (1h)					Max		No. Hours >212 ppb	% Valid Days Per Quarter			
				25	50	75	98	99	1h	24h		Q1	Q2	Q3	Q4
E289309	Abbotsford Airport	8440	7.3	3	6	10	20	22	34	19	0	99	99	100	93
E238212	Abbotsford-Mill Lake Rd.	8293	9	4	8	12	25	28	37	20	0	93	100	99	92
E293810	Agassiz	4959	.	.	.	.	.	.	32	19	0	0	31	96	100
0310177	Burnaby-Kensington Park	8479	11.8	7	11	16	29	32	44	29	0	98	98	96	98
E206270	Burnaby Mountain	8502	7.8	4	7	10	23	26	39	20	0	99	99	97	97
E207418	Burnaby South	8591	14.4	9	13	19	33	36	46	38	0	100	99	100	100
E222520	Campbell River-Elk Falls Campground	8269	4	2	3	5	13	14	22	10	0	100	100	100	100
E286369	Castlegar Zinio Park	8214	6.5	3	5	9	20	22	30	17	0	100	88	100	100
E220891	Chilliwack	7746	7.9	4	7	11	20	23	33	17	0	100	85	100	74
E240337	Colwood City Hall	7801	5.4	1	4	8	19	21	33	16	0	88	96	100	100
E242892	Coquitlam	8539	10.3	5	9	14	26	28	41	26	0	99	99	98	98
E285829	Courtenay Elementary School	8067	4.8	2	4	6	16	18	32	13	0	100	100	93	99
E273443	Crofton Escarpment Way	8173	3.7	2	3	5	12	14	25	15	0	100	100	100	99
E220217	Crofton Substation	8213	3.7	2	3	5	12	14	27	14	0	100	100	100	100
E277329	Duncan Cairnsmore	8188	4.7	2	4	6	16	17	27	15	0	96	100	100	93
E223756	Hope	8522	6.6	3	5	9	18	20	32	18	0	99	97	100	100
0605008	Kamloops Federal Building	1225	.	.	.	.	.	.	36	27	0	0	0	0	58
E286009	Kamloops Fire Stn #2	6859	.	.	.	.	.	.	39	26	0	100	100	99	29
0500886	Kelowna College	8332	5.9	2	4	8	21	24	38	18	0	99	100	100	99
E222778	Langdale Elementary	7969	5	2	4	7	14	16	26	13	0	99	100	100	96
E209178	Langley	8510	6.6	3	5	9	19	22	29	20	0	100	98	99	97
E232245	Maple Ridge	8527	8.1	4	7	11	22	25	37	19	0	100	96	99	98
E229797	Nanaimo Labieux	8151	6.4	2	5	9	19	22	33	18	0	96	96	97	97
E207723	North Delta	8583	14.1	7	13	20	35	39	47	39	0	99	98	100	100
E209177	North Vancouver Mahon Park	8583	12.2	7	11	17	30	32	43	29	0	100	100	99	100
0310179	North Vancouver Second Narrows	8595	12.9	8	12	17	30	33	50	26	0	100	100	100	100
E232244	Pitt Meadows	8502	8.3	4	7	12	24	27	41	24	0	100	96	98	100
0310162	Port Moody	8225	12.2	7	11	16	28	30	46	26	0	84	98	99	100
0220204	Powell River Cranberry Lake	8220	2.2	1	2	3	8	10	20	10	0	100	99	100	100
0450307	Prince George Plaza 400	8136	.	.	.	.	.	.	55	46	0	0	95	99	92
E208096	Quesnel Senior Secondary	8204	7.8	3	6	11	25	27	65	24	0	99	91	98	100
E232246	Richmond-Airport	8573	14.5	7	13	21	36	40	57	35	0	98	100	100	100
E207417	Richmond South	8496	12.9	6	11	19	33	36	51	34	0	99	100	100	98
E206589	Smithers St Josephs	6217	6.5	1	4	11	23	25	37	23	0	98	98	66	27
0310172	Squamish	7610	5.3	3	5	7	15	17	29	15	0	91	92	79	100
E206271	Surrey	8557	9.7	5	8	13	28	30	42	32	0	100	99	98	99
E283549	Tsawwassen	8590	7	3	5	10	23	26	38	28	0	100	99	100	100
0310175	Vancouver-Kitsilano	8592	16.1	8	16	23	35	38	46	35	0	99	99	100	100
0310174	Vancouver-Downtown	8571	18	13	18	23	33	35	44	34	0	99	100	98	98
E249492	Vernon Science Centre	8351	9.1	4	7	13	27	29	41	30	0	100	100	98	100
E231866	Victoria Topaz	8046	9	4	7	13	27	30	41	20	0	88	100	100	95
E227431	Whistler Meadow Park	7872	4.1	2	3	5	16	19	32	20	0	97	96	97	85
0550502	Williams Lake Columneetza School	8231	8	3	6	12	28	30	41	26	0	100	100	97	93

2013 SO2 Summary (all concentrations in ppb)

Station	Location	No. Valid Hours	Hourly Mean	Percentiles (1h)					Max		No. Hours		% Valid Days Per Quarter			
				25	50	75	98	99	1h	24h	> 170 ppb	> 340 ppb	Q1	Q2	Q3	Q4
E289309	Abbotsford Airport	8421	0.2	0	0	0	1	2	6	1	0	0	91	100	100	100
E238212	Abbotsford-Mill Lake Rd.	8514	0.2	0	0	0	1	2	5	1	0	0	98	99	100	98
E244516	Burnaby-Capitol Hill	8608	1.7	0	0	1	11	21	252	37	2	0	100	100	100	99
0310177	Burnaby-Kensington Park	8509	0.8	0	0	1	4	5	18	4	0	0	99	99	98	100
E244517	Burnaby North	8600	1.8	1	1	2	8	9	31	9	0	0	100	100	100	99
E207418	Burnaby South	8591	0.6	0	0	1	3	3	9	3	0	0	100	100	100	100
E286369	Castlegar Zinio Park	8267	3.7	0	0	3	31	40	110	49	0	0	100	91	100	100
E220891	Chilliwack	8367	0.2	0	0	0	1	2	146	7	0	0	100	100	100	89
E240337	Colwood City Hall	8120	0.5	0	1	1	2	2	4	1	0	0	89	96	100	99
E273443	Crofton Escarpment Way	8383	1.4	0	1	1	12	18	123	29	0	0	100	99	100	100
E220217	Crofton Substation	7609	1.2	1	1	1	6	9	41	10	0	0	99	85	78	91
0605008	Kamloops Federal Building	7900	0.5	0	0	1	3	4	11	2	0	0	96	90	80	100
E286009	Kamloops Fire Stn #2	4777	0.3	0	0	0	1	2	8	1	0	0	100	100	29	0
0500886	Kelowna College	8351	0.4	0	0	1	1	1	2	1	0	0	100	100	100	99
E282711	Kitimat Haisla Village	8101	0.2	0	0	0	2	3	21	3	0	0	100	100	100	83
E223616	Kitimat Haul Road	4531	1.2	0	0	1	9	12	39	6	0	0	0	18	100	88
E216670	Kitimat Riverlodge	7751	0.4	0	0	0	5	7	30	3	0	0	59	100	100	95
E222778	Langdale Elementary	8259	1	0	1	1	4	5	24	5	0	0	100	93	100	100
E209178	Langley	8469	0.2	0	0	0	2	2	15	2	0	0	97	98	100	97
E229797	Nanaimo Labieux	115	0.4	0	0	1	1	2	3	1	0	0	4	0	0	0
E209177	North Vancouver Mahon Park	8609	0.8	0	0	1	4	5	24	4	0	0	100	100	100	100
0310179	North Vancouver Second Narrows	8562	1.3	0	1	2	7	8	33	6	0	0	100	100	98	100
E237631	Pine River Hasler	8282	0.2	0	0	0	1	1	12	2	0	0	100	97	97	100
E232244	Pitt Meadows	8182	0.4	0	0	1	2	2	5	2	0	0	83	97	99	100
E273483	Port Alberni Elementary	284	0.2	0	0	0	1	2	2	1	0	0	0	0	0	13
0310162	Port Moody	8299	0.9	0	0	1	6	7	110	12	0	0	97	88	100	100
E209179	Prince George CBC Transmitter	8297	3.1	0	0	2	29	43	154	33	0	0	100	100	98	98
0450270	Prince George Gladstone School	7887	1.6	0	0	1	14	21	48	26	0	0	100	100	93	76
0450322	Prince George Jail	8364	3.2	0	1	2	29	40	96	33	0	0	100	100	100	99
0450307	Prince George Plaza 400	8324	2.4	1	1	2	17	25	120	24	0	0	100	100	100	100
E208096	Quesnel Senior Secondary	8209	0.3	0	0	0	2	4	19	2	0	0	99	91	98	100
E207417	Richmond South	8495	0.5	0	0	1	2	2	6	2	0	0	100	100	100	98
E221821	Port Alice-Rumble Beach Hospital	8394	7.2	1	2	7	49	61	481	63	5	2	100	100	100	100
0310172	Squamish	7239	0.6	0	1	1	2	2	4	2	0	0	99	37	95	100
E234230	Taylor-South Hill	8352	0.5	0	0	1	3	5	31	2	0	0	100	100	100	100
0770708	Taylor-Townsite	8352	1.3	0	0	1	12	19	70	14	0	0	100	100	99	99
E257435	Trail-Birchbank Golf Course	8312	*Data under review*										100	100	99	100
0250009	Trail Butler Park	8293	11.2	1	3	10	87	118	546	63	31	1	100	96	100	100
0260012	Trail Columbia Gardens	8292	*Data under review*										100	100	99	100
0260011	Trail-Warfield	8273	*Data under review*										100	100	99	97
E283549	Tsawwassen	8397	0.3	0	0	0	2	2	10	2	0	0	100	100	100	89
E232246	Richmond-Airport	8602	0.7	0	1	1	3	3	18	2	0	0	100	100	100	100
0310175	Vancouver-Kitsilano	8610	1	0	1	1	4	5	15	3	0	0	100	100	100	100
0310174	Vancouver-Downtown	8112	2.2	1	2	3	8	10	20	7	0	0	99	100	100	76
E249492	Vernon Science Centre	6923	0.2	0	0	0	1	1	2	1	0	0	100	100	99	32
E285559	Victoria-James Bay	8242	0.7	0	0	1	4	10	60	10	0	0	100	100	99	78
E231866	Victoria Topaz	8022	0.9	1	1	1	3	5	18	4	0	0	89	100	91	100