

Development of an Air Quality Management Plan for Golden, BC

Terms of Reference



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Jon Wilsgard, Manager of Golden Area Initiatives.

TASK 1: State of the Air and Planning/Actions to Date

Purpose: To review, digest, and summarize available reports and data regarding air quality in Golden into a concise and easily understandable format.

Target audience: Town Council and residents.

Candidate documents, data include, but are not limited to:

1. http://www.env.gov.bc.ca/epd/regions/kootenay/air_quality/golden_pmf/golden_pmf.pdf
2. http://www.env.gov.bc.ca/air/airquality/pdfs/goldenqac_june%2005.pdf
3. http://www.env.gov.bc.ca/epd/regions/kootenay/air_quality/pdfs/spec_mon_source_golden.pdf
4. http://www.env.gov.bc.ca/epd/regions/kootenay/air_quality/air_emissions_golden/air_emiss_golden.pdf
5. http://www.env.gov.bc.ca/epd/regions/kootenay/air_quality/golden_source_app/golden_source_app.pdf
6. http://www.env.gov.bc.ca/epd/regions/kootenay/air_quality/golden_pmf/golden_pmf.pdf
7. The Golden Speciation Study: A Preliminary Investigation of Fine and Coarse Particulate Matter (Burkholder, MoE, 2006)
8. <http://a100.gov.bc.ca/pub/aqiis/air.summary>
9. <http://www.env.gov.bc.ca/air/particulates/aqrfbcp/aqrfbcp.html>
10. http://www.env.gov.bc.ca/air/particulates/pdfs/pmreport_final/pmreportfinal_feb04.pdf

TASK 2: Establish Stakeholder Group and Level of Commitment

Purpose: It is necessary to identify the key people/agencies/companies that are sources of emissions, or have capacity to invoke management strategies, or have an interest in supporting the management plan. This collective of stakeholders are then charged with identifying the short-term and long-term goals of the AQMP.

Candidate stakeholders include, but are not limited to:

Stakeholder	Emissions Source? (Y/N)	Affected by Emissions? (Y/N)	Capacity to Manage Emissions (Low,Med,Hi)	Level of Commitment to the Process (Low,Med,Hi)
Government				

Environment Canada				
BC Ministry of Environment				
BC Ministry of Forests and Range				
BC Ministry of Agriculture and Lands				
Regional District of Columbia- Shuswap				
Town of Golden (including GDAQC)				
First Nations				
Industry/Business				
LP Veneer Plant				
LP Logging				
BCT				
CPR				
Tembec				
Kicking Horse Resort				
Restaurants				
Sand and Gravel				
Construction				
Chamber of Commerce				
Golden Area Initiative				
Energy and heating appliance vendors				
BC Hydro				
Trucking and Golden Husky Truck Stop				
Highway Maintenance				

Farming/Ranching				
NGOs and Individuals				
Wildsight				
Interested residents				

TASK 3: Identify Potential Synergies with Other Planning Processes

Golden may already be undertaking or planning to undertake a number of initiatives that will help to maintain and/or improve air quality, or in some cases negatively impact air quality. Initiatives such as transportation planning, regional growth strategies, economic development plans, greenhouse gas planning and energy planning can have similar objectives to air quality planning and can yield important air quality co-benefits. However, in some cases there may be conflicts between the goals for these different plans. (refer to Appendix E)

Greenhouse gas action plans, community energy plans and air quality management plans are generally complementary in nature, both in terms of process and the potential actions.

Planning Initiative	Already Underway?	Planning to Initiate?	No Plans to Initiate?
Community Energy Plans			
GHG Action Plans			
Transportation Plans			
Smart Growth Plans (i.e., land use plans)			
Regional Growth Strategies			
Official Community Plan			
Anti-Idling Campaign			
Other			

TASK 4: Evaluate Emissions Baseline, Backcast, and Forecast

In 2005, the MoE completed a rigorous emissions inventory for the Golden airshed. The corresponding report can be found at:

http://www.env.gov.bc.ca/epd/regions/kootenay/aq_reports/air_emissions_golden/air_emiss_golden.pdf

While this inventory was intended to give a snapshot of the emissions in that year, it is prudent to attempt to establish trends from the various emission sources. It is necessary to factor in changes in all airshed emissions when evaluating performance of strategies applied to an individual source, or source category per the AQMP.

Some examples of source categories include, but are not limited to (refer to report cited above):

Source
AGRICULTURE
MISCELLANEOUS BURNING
PRESCRIBED BURNING
OTHER
SPACE HEATING
HEAVY-DUTY VEHICLES
LIGHT-DUTY VEHICLES
OFF-ROAD
RAILWAYS (TRAFFIC)
COAL DUST
WILDFIRES
WOOD PRODUCTS
PAVED ROAD DUST
UNPAVED ROAD DUST

TASK 5: Develop the Plan

5.1 Identifying Goals and Visions

Purpose: Develop goals for the AQMP that will collectively represent a vision for air quality management in Golden. When developing these goals also consider reviewing existing goals from other related planning initiatives that will contribute to air quality management. Highlight these existing goals within the AQMP. If you are undertaking a full-scale AQMP goals should be identified collaboratively by the GDAQC.

How:

1. Facilitate this identification of goals and visions with the Golden and District Air Quality Committee. Remember to separate “Goals” from “Strategies” (to be determined later).
2. Identify and evaluate potential synergies and conflicts with other planning processes. At this stage you should determine whether or not an integrated approach should be undertaken.
3. Solicit feedback from Council and all stakeholders.

Goals could include:

- Keep clean areas clean, and clean up areas with poor air quality
- Ensure continuous improvement in air quality throughout the community/region
- Protect human and ecosystem health by meeting/exceeding air quality objectives/standards
- Greater public awareness regarding the need to meet air quality objectives/standards
- Greater uptake of actions that will contribute towards improving/maintaining air quality (e.g., driving less)
- Meet provincial air quality objectives and Canada-wide standards
- Maximize co-benefits and minimize conflicts with other planning activities such as greenhouse gas and energy management.

Some example goals or vision statements from other BC AQMPs:

Goal	Source
Minimize the risk to public health from smoke and dust	Merritt

pollution	
Improve visibility	Merritt
Prevent future deterioration and work towards continuous improvement of air quality	Merritt
Less smoke in the Valley	North Okanagan
Less dust in the air	North Okanagan
Fewer emissions and fewer kilometers traveled on our roads	North Okanagan
Ensure that citizens in the Central Okanagan have healthy air to breathe, by meeting/exceeding Canada Wide Standards and Provincial air quality objectives	Central Okanagan
Ensure continuous improvement in air quality throughout the community/region	Central Okanagan
Educate and inform communities on air quality issues, especially the connection between air quality and health	Central Okanagan
Lead by example and bring about changes in behaviour as needed to protect air quality	Central Okanagan
Integrate regional air quality goals into all policies (i.e. land use planning, transportation planning, greenhouse gas management and energy management)	Central Okanagan
Facilitate cooperation with all levels of government for continued comprehensive monitoring of air quality	Central Okanagan
Harmonize regional air quality initiatives with the objectives of other agencies and all levels of government	Central Okanagan
Air quality in the Regional District of Okanagan-Similkameen will be safeguarded and improved so that it: <ul style="list-style-type: none"> Consistently protects and promotes human and environmental health Promotes excellent visibility Addresses issues of global warming and climate change Addresses unforeseen negative impacts upon air quality Enhances economic development 	Okanagan-Similkameen (note this is a vision statement; the AQMP did not state goals per se.)
Continuously improve air quality in the Bulkley Valley and Lakes District airshed and quality of life for area residents	BVLD (one overarching goal)
To address human health, we have improved regional air quality so there are substantially fewer incidences of respiratory related medical visits and health care costs	Sea to Sky
To address ecosystem health, we have continued to maximize green space and vegetation in community planning and land development to help maintain healthy air	Sea to Sky
To address economic health, we have a strong and sustainable local economy having a positive impact on air quality	Sea to Sky

To address climate change, we have managed the corridors' air emission contributions to climate change and its effects	Sea to Sky
To address visibility, we have maintained, protected and are improving aesthetic viewsapes and vistas through management of the emissions contributing to poor visibility events	Sea to Sky
To address odour, we have controlled the emission of odour causing substances that negatively impact on human, economic and ecosystem health	Sea to Sky
To demonstrate leadership, we have showcased our AQMP, partnerships and resulting successes regionally, nationally and internationally, and have maintained the perception of clean, healthy air for which we are recognized	Sea to Sky

5.2 Identifying Indicators

Identify indicators for evaluating future progress towards goals. Indicators are measurable parameters that can be used to evaluate whether there is progress being made towards a goal. An ideal indicator is one that (i) is easy to collect data for evaluation, (ii) is robust and not subject to short term changes, and (iii) is responsive to changes in policy – that is, it would be affected by the actions of an AQMP.

Potential indicators include:

- number of odour complaints per thousand people
- number of visibility complaints per thousand people
- number of severe asthma cases reported per year
- number of air quality advisories issued per year
- number of old technology wood stoves exchanged per year
- quantity of traction material deployed over the winter season
- number of open burning piles lit
- number of idling hours of CPR yard locomotives
- number of times air quality objectives and standards are exceeded per year
- descriptive statistics and trends of monthly/yearly ambient averages.
- percentage renewable energy sources.
- change in pre-plan and post-plan responses reflected in surveys which gauge public habits (e.g., driving, heating) and perceptions of local air quality.
- others:

5.3 Establish Targets for the Indicators

A target is a desired value of a specific indicator.

Sample targets include:

- Zero exceedances of the CWS for PM2.5 (24-hour average concentration of 30 micrograms per cubic metre for PM2.5)
- Per Capita CO2 equivalent Emissions will be xx tonnes per year
- X number of old technology wood stoves exchanged

5.4 Identify potential actions

Identify

Identify potential AQMP actions in a collaborative process with relevant stakeholders such as the GDAQC. It is also important to highlight those actions from other related plans (Task 3) that will contribute to air quality goals within the AQMP, and identify how to eliminate conflicts where they exist through new actions in the AQMP. A trade-off analysis should be conducted with a broader set of stakeholders to resolve conflicts when a decision cannot be readily made.

Here are some references to help identify potential actions:

The following is a compendium of air quality related bylaws from around the province:

http://www.env.gov.bc.ca/air/airquality/pdfs/aq_bylaws_bc.pdf

The following is a Best Management Practise for controlling road dust:

http://www.env.gov.bc.ca/air/airquality/pdfs/roaddustbmp_june05.pdf

Refer to Appendix F1 and F2 for examples of actions.

Prioritize

Prioritize actions to include in the AQMP and assign responsibility to appropriate organizations. Select those actions that have greatest impact for least cost, those that deliver multiple benefits and those that can be implemented quickly. Assign responsibility for the actions to the appropriate organizations on the GDAQC or AQMP stakeholders list.

Develop

The draft AQMP should summarize goals, targets and actions. It should also identify timelines for phased implementation of action, assign responsibility for actions to appropriate organizations on the GDAQC or AQMP stakeholders list, and possibly identify funding opportunities.

Appendix F2 is a section cut from the draft AQMP for Grand Forks. Note, the assessed parameters of cost, potential, and champion. This is a key exercise to help guide which actions have the best cost/benefit return.

5.5 Finalize

Seek feedback

Feedback should be obtained from all relevant stakeholders such as GDAQC members, the general public, and from other key stakeholders such as MoE. Consider holding workshops to obtain this feedback.

Approval

TASK 6: Plan Implementation and Measuring Success

As soon as the plan has been initiated, it is important to track progress on actions. Monitoring requires on-going assessment of progress, with results reported in a manner that enables evaluation of individual measures. Measuring and reporting commitments should be realistic, affordable and useful for evaluating the implementation phase. Annual progress reports and five-year updates should be considered as outlined below.

6.1 Prepare annual progress report; providing information on key indicators (from Step 5.2).

If you have access to air quality monitoring data this will include reporting ambient air quality data and comparing it against the air quality targets established in the AQMP.

6.2 Conduct a five-year review of the plan.

A five-year review presents the opportunity to evaluate progress towards or away from goals and targets. It also provides an opportunity to re-evaluate the content of the plan, to ensure that it is still relevant. This would include a review of goals, indicators, and measures. In particular, the review should identify which measures should be continued or cancelled, and identify new measures to include in the revised plan.

References

Website Name	URL
Office of the Provincial Health Officer	<i>Every Breath You Take</i> , Provincial Health Officer's Annual Report 2003 http://www.healthservices.gov.bc.ca/pho/ar/index.html
MHLS Air Protection	Provincial & Canada wide air quality objectives & standards http://www.env.gov.bc.ca/air/airquality/#8
MHLS Air Protection	Monitoring locations http://www.env.gov.bc.ca:8000/pls/aqiis/air.summary
MHLS Air Protection	Links to information on other AQMP processes http://www.env.gov.bc.ca/air/airquality/#5
MHLS Air Protection	Integration of Air-Quality Related Planning Processes http://www.env.gov.bc.ca/air/airquality/pdfs/int_aq_rep_may04.pdf
MHLS Air Protection	Information on other AQMP processes http://www.env.gov.bc.ca/air/airquality/#5
BC Health Authorities	Contact numbers http://www.healthservices.gov.bc.ca/socsec/contacts.html
Health Canada	General information & publications http://www.hc-sc.gc.ca/ewh-semt/air/index_e.html
Environment Canada	Clean Air Online http://www.ec.gc.ca/cleanairairpur/Home-WS8C3F7D55-1_Em.htm The Clean Air Picture ó Particulate Matter in British Columbia http://www.pyr.ec.gc.ca/en/air/pm_report/index.shtml

Government of Canada	Opportunities Envelope: funding information for cost-effective GHG programs and projects http://www.climatechange.gc.ca/english/oppEnv/
Burn It Smart! Natural Resources Canada	Tips on wood fires that can reduce the risk of a chimney fire and help to reduce air pollution at the same time. http://www.burnitsmart.org/english/index.html
Federation of Canadian Municipalities	Green Municipal Funds http://fcm.ca/english/gmf/gmf.html
Bulkley Valley AQMP	http://www.bvldamp.ca/html/working.htm
Prince George AQMP	http://www.city.pg.bc.ca/city_services/utilities/airquality/pgairquality.pdf
California Air Resources Board	AIR QUALITY AND LAND USE HANDBOOK: A COMMUNITY HEALTH PERSPECTIVE http://www.arb.ca.gov/ch/ej_meetings/may_10_2004_draft_land_use_handbook.pdf
Vancouver AQMP	http://vancouver.ca/sustainability/coolvancouver/backgroundunder.htm
Quesnel AQMP	http://www.city.quesnel.bc.ca/Home/qairshedmngt.asp
Kelowna AQMP	http://www.kelowna.ca/CM/Page438.aspx
Fraser Basin Council	http://www.fraserbasin.bc.ca/programs/documents/Airshed%20Tools.pdf

Appendix A: Glossary of Terms Related to Air Quality Management

Abatement - Reducing the degree or intensity of, or eliminating, pollution.

Aerosol - Suspensions of tiny liquid and/or solid particles in the air.

Air Contaminant - Any particulate matter, gas, or combination thereof, other than water vapour. (See: air pollutant.)

Air Quality Health Index (AQHI) - Together with Health Canada, Environment Canada and the BC Ministry of Environment - Interior Health is participating in a pilot program to report on air quality and the associated health risks in the Thompson and Okanagan valleys of British Columbia. A key part of this pilot is a new website called AirPlay (www.airplaytoday.org) which provides daily readings on air quality.

Air Pollutant - Any substance in air that could, in high enough concentrations, harm people, other animals, vegetation, or material. Pollutants may include almost any natural or artificial composition of airborne matter capable of being airborne. They may be in the form of solid particles, liquid droplets, gases, or in combination thereof. Generally, they fall into two main groups: (1) those emitted directly from identifiable sources and (2) those produced in the air by interaction between two or more primary pollutants, or by reaction with normal atmospheric constituents, with or without photoactivation. Air pollutants are often grouped in categories for ease in classification; some of the categories are: solids, sulfur compounds, volatile organic chemicals, particulate matter, nitrogen compounds, oxygen compounds, halogen compounds, radioactive compound, and odours. Common examples of pollutants include: dust, wood smoke, nitrogen dioxide, ground-level ozone, and particulate matter.

Air Pollution Episode - A period of abnormally high concentration of air pollutants, often due to low winds and temperature inversion, which can cause illness and death. (See: episode, pollution.)

Air Quality Index (AQI) - An AQI is a way of transforming complex air quality measurements into a single number or descriptive term. It describes the measured air quality and the publicly perceived air quality at any given time. AQI numbers are interpreted thus:

0 to 25 is GOOD

26 to 50 is FAIR

51 to 100 is POOR

100+ is VERY POOR

An AQI in excess of 50 represents the point at which BC Environment normally becomes concerned about the level of human health impact. The British Columbia AQI is directly comparable to the AQI's issued in all major Canadian cities as it follows the same Federal guidelines.

Air Quality Management - Administrative activities carried out to implement an air quality management plan, including amendment of permits for industrial and other point contaminant sources, establishment of by-laws and other local and regional regulatory controls on mobile and area contaminant sources, and public education on ways to reduce and eliminate use of air contaminants in everyday activities.

Air Quality Management Plan (AQMP) - A blueprint for managing community development and for controlling air contaminant sources so as to improve or maintain air quality for the protection of human health and the environment in an airshed.

Airborne Particulates - Total suspended particulate matter found in the atmosphere as solid particles or liquid droplets. Chemical composition of particulates varies widely, depending on location and time of year. Sources of airborne particulates include: dust, emissions from industrial processes, combustion products from the burning of wood and coal, combustion products associated with motor vehicle or non-road engine exhausts, and reactions to gases in the atmosphere.

Airshed - Topography (hills and valleys) and weather conditions can interact to prevent the mixing and exchange of air from inside and outside a given area. This area is called an airshed. A good example of an airshed is a valley where the surrounding mountains act as a physical barrier to air moving out of the valley when the air is still. An ocean coast can also define a boundary of an airshed where sea breezes can prevent air from moving out of coastal valleys. Because weather and wind conditions change from day to day, the boundary of an airshed isn't constant; it can change with the weather.

Ambient air quality - refers to the air in our immediate surroundings. Ambient air quality describes the level of air pollutants in a particular region. Poor ambient air quality means pollutant levels are high enough to cause concerns. Ambient air quality is measured near ground level, away from direct sources of pollution.

Ammonia (NH₃) - a compound containing nitrogen and hydrogen, and known for a sharp, pungent smell. It is emitted mostly from agricultural and animal husbandry activities. Other sources of ammonia are fuel and waste combustion, chemical industry and refrigeration facilities. It contributes to the formation of inhalable particulates and visibility-reducing particles.

Area Source - Any source of air pollution that is released over a relatively small area but which cannot be classified as a point source. Such sources may include vehicles and other small engines, small businesses and household activities, or biogenic sources such as a forest that releases hydrocarbons.

Carbon Monoxide (CO) - A colorless, odorless, poisonous gas produced by incomplete fossil fuel combustion.

Carbon Dioxide (CO₂) is a colourless, odourless, noncombustible gas and a normal constituent of air. This gas is formed by certain natural processes, the burning of fuels and wastes containing carbon, and heating of minerals or products containing carbonate.

Cogeneration - The consecutive generation of useful thermal and electric energy from the same fuel source.

Concentration is the amount of a pollutant in the air at a given location, expressed as the weight of volume of pollutant per volume of air, such as parts per billion (ppb) or micrograms per cubic metre of air ($\mu\text{g}/\text{m}^3$).

Common air contaminants (CACs) - CO, VOCs, NH₃, NO_x, SO_x and PM

Ecosystem - The interacting system of a biological community and its non-living environmental surroundings.

Emission - Pollution discharged into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities; from residential chimneys; and from motor vehicle, locomotive, or aircraft exhausts.

Emission Inventory - A listing, by source, of the amount of air pollutants discharged into the atmosphere of a community; used to establish emission standards.

Emission Standard - The maximum amount of air polluting discharge legally allowed from a single source, mobile or stationary.

Episode (Pollution) - An air pollution incident in a given area caused by a concentration of atmospheric pollutants under meteorological conditions that may result in a significant increase in illnesses or deaths. May also describe water pollution events or hazardous material spills.

Exposure is a combination of the level of a pollutant and the amount of time that a person spends in the presence of a pollutant. Exposure determines the level of risk associated with different levels of pollutants.

Fine particulates: Particulate matter with an aerodynamic diameter of 2.5 microns or less (PM_{2.5}). Fine particles are responsible for most atmospheric particle-induced extinction. Ambient fine particulate matter consists basically of five species: sulphates, ammonium nitrate, organics, elemental carbon, and soil dust.

Fugitive Dust - A particulate emission made airborne by forces of wind or people's activities. Unpaved roads, construction sites, and tilled land are examples of areas that originate fugitive dust. Fugitive dust is a type of fugitive emission.

Fugitive Emissions - Emissions not caught by a capture system.

Fume - Tiny particles trapped in vapor in a gas stream.

Greenhouse Gas (GHG) - A gas that, when in equilibrium, keeps our planet at a livable temperature. Since the industrial revolution a rapid increase in GHGs is believed to be contributing to global climate change. The major GHGs are carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O).

Ground Level Ozone - A gas that occurs both in the Earth's upper atmosphere and at ground level. Ozone can be "good" or "bad" for your health and the environment, depending on its location in the atmosphere. The layer closest to the Earth's surface is the troposphere. Here, ground level or "bad" ozone is an air pollutant that is harmful to breathe and it damages crops, trees and other vegetation. Created by chemical reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOC) in the presence of sunlight. Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NO_x and VOCs.

Hydrocarbons - Hydrocarbons refer to the most important class of organic compounds. Hydrocarbons contain only the elements hydrogen and carbon. They occur in petroleum and natural gas. Commercial petroleum products such as gasoline, kerosene, airplane fuel, lubricating oils, and paraffin wax are mixtures of hydrocarbons. Some hydrocarbons are found in coal tar and coal gas. Many other hydrocarbons are synthesized from hydrocarbons found in nature.

Inhalable Particles - All dust capable of entering the human respiratory tract, and typically refers to PM_{10} .

Inversion (a.k.a. Temperature Inversion) - A layer of warm air that prevents the rise of cooling air and traps pollutants beneath it; can cause an air pollution episode.

Irritant - A substance that can cause irritation of the skin, eyes, or respiratory system. Effects may be acute from a single high-level exposure, or chronic from repeated low-level exposures to such compounds as chlorine, nitrogen dioxide, and nitric acid.

Microgram (μg or mcg) - a metric unit of mass equal to 0.001 milligram (mg) or one millionth of a gram. One $\mu\text{g}/\text{m}^3$ is similar to a grain of sand suspended in a small apartment.

Micron - a unit of length equal to one millionth of a meter; the unit of measure for wavelength.

Mitigation - Measures taken to reduce adverse impacts on the environment.

Mobile Source - Any non-stationary source of air pollution such as cars, trucks, motorcycles, buses, airplanes, and locomotives.

Monitoring - Periodic or continuous surveillance or testing to determine the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, plants, and animals.

NH_3 ó Ammonia, see entry for Ammonia

Nitrogen - Nitrogen gas (N_2) makes up 78.1% of the Earth's air, by volume. All organisms must have nitrogen to live. Nitrogen makes up an important part of protein molecules, which are found in protoplasm. Protoplasm is the living material in all plant and animal tissues. Human beings and animals get protein by eating animal products and plants. Most plants must manufacture protein from simple nitrogen compounds dissolved in the soil. Some of this dissolved nitrogen comes from the atmosphere in the form of nitric acid (HNO_3). Lightning causes nitrogen and oxygen in the air to form compounds called nitrogen oxides. These oxides react with water to form nitric acid, which is carried to the earth dissolved in rainwater.

Nitrogen dioxide (NO_2) is a gas consisting of one nitrogen and two oxygen atoms. It absorbs blue light and therefore has a reddish-brown color associated with it.

Nitric oxide (NO) is formed as a by-product in the combustion of gasoline in automobile engines. Sunlight causes the nitric oxide in the lower atmosphere to react with oxygen to form ozone, which can be a harmful pollutant.

Nitrogen Oxides (NO_x) - The term used to describe the sum of nitric oxide (NO), nitric dioxide (NO₂), and other oxides of nitrogen, which plays a major role in the formation of ozone. The major sources of man-made NO_x emissions are high temperature combustion processes, such as those occurring in automobiles and power plants.

Non-Point Sources - These are a variety of pollution sources that are difficult or too small to measure on an individual basis. There are far too many cars, fireplaces, and lawnmowers to track exactly how much each one is emitting by itself, but they can all add up to a significant amount of total emissions. Therefore, for the purpose of developing an emission inventory, these sources are combined into categories called non-point or area sources.

Non-Road Emissions - Pollutants emitted by combustion engines on farm and construction equipment, gasoline-powered lawn and garden equipment, and powerboats and outboard motors.

Open Burning - The combustion of material with or without control of the combustion air and without a stack or chimney to vent the emitted products of combustion to the atmosphere.

Outdoor Wood-fired Hydronic Heaters (OWHH) - also known as an "Outdoor Wood Heater," "Outdoor Wood Boiler," or "Outdoor Wood Furnace", these units burn wood to heat water that is piped underground to a nearby structure (usually a home) resulting in heat for the building. An OWHH resembles a small shed with a smokestack, typically located on the outside of the building to be heated. Outdoor wood-fired hydronic heaters can be substantially dirtier and less efficient than most other home heating technologies. With their smouldering fires and short smokestacks (usually no more than six to ten feet tall), OWHHs can create heavy smoke and release it close to the ground, where it may linger and expose people in the area to nuisance conditions and health risks.

Oxygen (O₂) - Humans and the other animals obtain oxygen from the air, filtered into the bloodstream through the lungs. Blood then carries oxygen to the cells of the body, where it combines with other chemicals obtained from food to produce energy and to perform the functions of the individual cells. Carbon dioxide is produced in the cells as a waste product and is expelled from the body through the respiratory system. PM_{2.5} pollution deposits itself right alongside the O₂ molecules in the alveoli of the lungs, obstructing the absorption of O₂ with the smallest components of PM_{2.5} being absorbed into the bloodstream.

Ozone (O₃) - Found in two layers of the atmosphere, the stratosphere and the troposphere. In the stratosphere (the atmospheric layer 7 to 10 miles or more above the earth's surface) ozone is a natural form of oxygen that provides a protective layer shielding the earth from ultraviolet radiation. In the troposphere (the layer extending up 7 to 10 miles from the earth's surface), ozone is a chemical oxidant and major component of photochemical smog. Ozone in the troposphere is produced through complex chemical reactions of nitrogen oxides, which are among the primary pollutants emitted by combustion sources; hydrocarbons, released into the atmosphere through the combustion, handling and processing of petroleum products; and sunlight.

PM (Particulate Matter) - One of the major components of smog. PM include microscopic particles in the air. These particles, capable of being inhaled by humans, are divided into two size ranges: PM_{2.5} and PM₁₀. Between the two, "fine" particles less than 2.5 micrometers in size (PM_{2.5}) are responsible for causing the greatest harm to human health.

PM₁₀ are particles in the atmosphere with a diameter of less than ten or equal to a nominal 10 micrometers, otherwise known as inhalable particulates and/or coarse fraction particulates.

PM_{2.5} are particles in the atmosphere with a diameter of less than ten or equal to a nominal 2.5 micrometers, otherwise known as respirable particulates and/or fine fraction particulates.

Point Source - A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; e.g. a pipe, ditch, ship, ore pit, factory smokestack. A point source is easy to regulate using an emission permit process.

Pollutant - Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

Pollution - Generally, the presence of a substance in the environment that because of its chemical composition or quantity prevents the functioning of natural processes and produces undesirable environmental and health effects. Under the Clean Water Act, for example, the term has been defined as the man-made or man-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.

Precautionary Principle - When information about potential risks is incomplete, basing decisions about the best ways to manage or reduce risks on a preference for avoiding unnecessary health risks instead of on unnecessary economic expenditures.

Prescribed Burning - controlled application of fire to wildland fuels in either their natural or modified state, under specified environmental conditions that allows the fire to be confined to a predetermined area, and produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.

Risk Assessment - Qualitative and quantitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence and/or use of specific pollutants.

Smart Growth: an initiative or plan that intends to improve ways in which human settlement occurs for the purpose of reducing impact on the environment, as well as improve quality of life. In particular, Smart Growth initiatives address urban sprawl; motor vehicle use; environmental integrity and food-system security; and affordable housing, among many other topics.

Smog - A mixture of air pollutants, principally ground-level ozone, produced by chemical reactions involving smog-forming chemicals.

Smoke Control Forecast - Designed to predict the capability of the atmosphere to effectively disperse pollutants such as small particulate matter (smoke).

Smoke Dispersion Factors - Two factors control the spread or dispersion of small particles or gases. These factors are the wind speed (controls horizontal spread) and the height of the "mixed layer". The mixed layer is the portion of the atmosphere from the ground up to the level at which gases and small particles freely mix. For example, smoke from a smokestack will tend to rise to the top of the mixed layer and then level off.

Sulphur Dioxide (SO₂) - Sulphur Dioxide is a colorless, poisonous gas with a sharp odour. Sulfur dioxide forms naturally from volcanic activity and from the decay of organic matter. It can be manufactured by burning sulfur dioxide or heating metallic sulfur compounds. Sulphur dioxide is also released into the atmosphere by oil refineries and by factories and electric power plants that burn coal or oil. In the air people breathe, sulfur dioxide can irritate the eyes and respiratory system. It will also dissolve in water droplets to form acid rain, which can harm or even kill wildlife and damage buildings. Acid rain also may form when sulfur dioxide in the air is converted into sulfur trioxide. Sulphur dioxide can convert to an aerosol that is a very efficient light scatterer.

Sulphur Oxides (SO_x) - Oxides of sulphur, mostly sulphur dioxide (SO₂)

Ventilation Index - The ventilation index is formed by multiplying the mixed layer height by the average wind speed in this mixed layer. Stronger wind speeds and thicker mixed layers will produce higher ventilation index values. For convenience, the actual numbers are converted to a scale of 0 to 100. A ventilation index of 0 implies no ability of the atmosphere to disperse pollutants while a value of '100' implies an excellent ability to disperse pollutants.

The ventilation index in British Columbia is divided into the following categories:

0 -- 33 = POOR Burning is not acceptable (or permitted by some by-laws)

34 ó 54 = FAIR Burning is not acceptable

55 ó 100 = GOOD Conditions are acceptable for burning

For most locations, ventilation index values are poor from sunset until late morning. For locations within valleys, the ventilation index should be lowered if the mixing height is less than the height of the surrounding hills.

Volatile Organic Compound (VOC) - Any organic compound that participates in atmospheric photochemical reactions.

Wood-Burning-Stove Pollution - Air pollution caused by emissions of particulate matter, carbon monoxide, total suspended particulates, and polycyclic organic matter from wood-burning stoves.

Appendix B: Glossary of Acronyms

AAQO - Ambient Air Quality Objectives
AQHI - Air Quality Health Index
AQI - Air Quality Index
AQMP - Air Quality Management Plan
CET – Community Engagement Team
CO - Carbon Monoxide
CWS - Canada Wide Standards
GHG - Greenhouse Gas
MoE - Ministry of Environment (BC)
MoFR ó Ministry of Forests and Range (BC)
MoHLS ó Ministry of Healthy Living and Sport (BC)
NO₂ - Nitrogen Dioxide
NO_x - Nitrogen Oxides
O₃ - Ozone
OBSCR - Open Burning Smoke Control Regulation
OCP - Official Community Plan
PM - Particulate Matter
PM₁₀ - Particulate Matter (diameter Ö10µm)
PM_{2.5} - Particulate Matter (diameter Ö2.5µm)
PSA - Public Service Announcement
RDCS - Regional District of Columbia Shuswap
SCP ó Sustainable Community Plan
SO₂ - Sulphur Dioxide
SO_x - Sulphur Oxides
VOC - Volatile Organic Compound
µg - Microgram

Appendix C: Summary of Main Pollutants and their Impacts

Pollutant	Description	Sources	Health Effects	Environmental	
Particulate Matter (PM): Dust, soot, and tiny bits of solid material.	PM ₁₀ : Particles smaller than 10µm in diameter, also known as coarse particulates and/or inhalable particulates	Road dust, road and other construction dust	Coarse particles irritate the nose and throat, but do not normally penetrate deep into the lungs.	PM is the main source of haze that reduces visibility. It takes hours to days for PM ₁₀ to settle out of the air. PM contributes to smog	
		Mixing and applying fertilizers/pesticides			
		Wind and other natural sources			
		See also sources of PM _{2.5} below			
	PM _{2.5} : Particles smaller than 2.5µm in diameter, also known as fine particulates and/or respirable particulates	Combustion (motor vehicles, woodstoves, yard waste and fireplaces)	Fine particles enter the lungs, making it difficult to breathe, and lead to diseases such as bronchitis. Depending on the source and chemical composition of the fine particles, effects can be severe enough to cause cancer and premature death.	Because they are so small, PM _{2.5} stay in the air much longer than PM ₁₀ , taking days to weeks to be removed.	
		Produced in reactions of gaseous pollutants			
		Industrial Activity	PM _{2.5} is the worst public health problem from air pollution in BC (Research indicates the number of hospital visits increases on days with increased PM levels).		
		Garbage Incineration			
Agricultural, forestry, and back yard burning, forest fires					
Ground-Level Ozone (O₃): Bluish gas with a pungent odour	At ground level, ozone is formed by chemical reactions between volatile organic compounds (VOCs) and nitrogen oxides (NOx) in the presence of sunlight.	VOCs and NOx are released by burning coal, gasoline, and other fuels; VOCs are also released naturally by vegetation (e.g., the smell from evergreen sap/needles).	Exposure for 6-7 hours, even at low concentrations, significantly reduces lung function and causes respiratory inflammation in healthy people during periods of moderate exercise. Can be accompanied by symptoms such as chest pain, coughing, nausea, and pulmonary congestion. Impacts on individuals with pre-existing heart or respiratory conditions can be very serious.		Ozone occurs naturally high above the Earth (in the stratosphere) where it protects us from harmful ultraviolet rays. Ground level ozone contributes to smog
			Ozone exposure can contribute to asthma, and reduced resistance to colds and other infections.		At ground level, ozone can damage plants and trees, leading to reduced yields.
					At ground level, ozone leads to lung and respiratory damage in animals.
Other Pollutants	SO _x : sulphur oxides	Most of these come from combustion, particularly from vehicles, and industrial processes or the evaporation of paints and common chemical products.	The health impacts of these pollutants are varied.	While some of these pollutants have a local impact on the environment (e.g., heavy metals such as lead) or are relatively short-lived (NO ₂), some are long-lived (POPs), and can travel the world on wind currents in the upper atmosphere. NO _x and SO ₂ contribute to PM _{2.5} formation.	
	CO: carbon monoxide				
	NO _x : nitrogen oxides				
	TRS: total reduced sulphur				
	VOCs: volatile organic compounds				
	POPs: persistent organic pollutants				
	Pb: lead				
	Hydrocarbons				

Appendix D: Air Quality Standards and Objectives in BC

The Ambient Air Quality Objectives (AAQOs) in Table 6 reflect current knowledge about air quality and health science. AAQOs can be used to formulate air quality management programs comprised of, but not limited to, the following components:

- Long-term surveillance monitoring
- Reporting on the quality of the air
- One of several decision factors in permit evaluation and regulation development
- One of several decision factors in determining the need for and developing air quality management programs for area and mobile sources.

In accordance with the continuous improvement provision of the Canada-wide Standards, the AAQOs are medium-term, health-based objectives and a step towards achievement of the lowest observable effects levels.

Table 1: Canada Wide Standards & Ambient Air Quality Objectives for PM

Air Contaminant	Averaging Time	Standard	Ambient Air Quality Objectives [micrograms/m ³ (g/m ³)]
PM _{2.5}	*24 hour	Canada Wide Standards	30
	24 hour (proposed)	Ambient Air Quality Objectives	25
	Annual (proposed)	Ambient Air Quality Objectives	8
	Planning Goal (proposed)	Ambient Air Quality Objectives	6
PM ₁₀	24 hour	Ambient Air Quality Objectives	50

*based on annual 98th percentile value, averaged over 3 consecutive years;

Canada Wide Standards (CWS) for PM_{2.5} and Ozone

The Canada Wide Standards (CWS) for Particulate Matter (PM_{2.5}) and Ground Level Ozone were endorsed by the Canadian Council of Ministers for the Environment (CCME) (including the BC Ministry of Environment, federal, provincial and territorial governments) in June 2000. In recognition of the lack of health threshold levels for both PM and Ozone, the CWS contained a stipulation for "keeping clean areas clean" and "continuous improvements" in areas that are already meeting the standards.

BC Objectives for PM₁₀

Recognizing the threat that PM₁₀ poses to human health, the Ministry of Environment has established an air quality objective of 50 micrograms/m³ (24-hour average). The selection of this number was based on the findings by Vedal (1993) on the effects of wood smoke in B.C. Vedal found that each 50 micrograms/m³ increment in PM₁₀ was associated with an increase in health effects ranging from respiratory symptoms to death. Exceedances of the air quality objective indicate reduced protection against associated health effects. Hence, one measure of PM₁₀ air quality is the number or frequency of exceedances of the air quality objective.

BC Objectives for PM_{2.5}

In January 2008, BC Ministry of Environment announced its intention to establish provincial ambient air quality criteria for particulate matter 2.5 micrometres (μm) or smaller (PM_{2.5}) addressing objectives for 24-hour and annual averages, and longer-term planning goals. It is expected that the new objectives will be in place by 2009. The proposed levels are as follows:

- 24-hour AQO 25 $\mu\text{g}/\text{m}^3$
- Annual AQO 8 $\mu\text{g}/\text{m}^3$
- Planning Goal 6 $\mu\text{g}/\text{m}^3$

Air Quality Index (AQI)

Air quality objectives for PM₁₀ and other common contaminants form the basis of the Air Quality Index (AQI). The AQI is a scale used in parts of the province and elsewhere to determine if air quality is "good", "fair", "poor" or "very poor". At sites where numerous contaminants are monitored, the AQI reflects the concentration of the contaminant that is highest compared to its respective air quality objective. Where PM₁₀ is the contaminant of concern, air quality can be described as shown in Table 7. Exceedances of the air quality objective for PM₁₀ indicate that air quality may be poor or very poor.

Description of the air quality index, based on PM₁₀ measurements:

Table 2: Air Quality Index

Air Quality Descriptor	Air Quality Index	PM₁₀ Concentration (24-hour average, $\mu\text{g}/\text{m}^3$)
Good	< or = 25	< or = 25
Fair	26-50	26-50
Poor	51-100	51-100
Very Poor	> 100	> 100

(Source: MoE, 2007)

Air Quality Health Index

Canada has also created an Air Quality Health Index (AQHI) that directly ties air quality to health risk. This tool has been adopted by BC as a means of more effectively communicating health risk levels of air quality in real-time.

The AQHI is reported on a scale of 1-10+ based on concentrations of three different air pollutants that harm human health: ozone, particulate matter (PM₁₀ and PM_{2.5}), and nitrogen dioxide. Levels 1-3 indicate a low health risk, levels 4-6 indicate a moderate health risk, levels 7-10 indicate a high health risk, and level 10+ indicates a very high health risk.

For participating communities, the AQHI report is updated hourly and provides a current measurement as well as a forecasted high level for the day and for the next day. For more information on the AQHI in BC and current levels, see www.airplaytoday.org.

Appendix E: Integrated Planning Information¹

There are a number of pros and cons to adopting an integrated planning process.

One of the key risks to adopting an integrated process is the potential for diluting effort. For example, the most significant issue for off-grid/remote communities is typically energy supply and reliability, while another community whose economy is driven by forestry's primary issue might be poorer air quality due to slash burning. By adding air quality/greenhouse gas and energy planning to existing efforts in Golden respective plans may become diluted such that they cannot adequately address their primary issues.

Benefits include:

Improved ability to identify synergies and trade-offs. This will help the community identify solutions from one issue that will not end up creating problems in other areas in the future. For example:

- Replacing gasoline engines with diesel engines results in better fuel efficiency and therefore a reduction in GHG emissions, but an increase in harmful particulate matter;
- Some strategies to reduce burning of wood for residential heating (e.g. substituting electricity or natural gas) will conflict with objectives to reduce GHG emissions²; and
- Using emission control technology to reduce stack emissions of CACs will increase energy use and GHG emissions³.
- Increased cost effectiveness. By incorporating multiple issues into one planning process overall resource expenditures (including human resources) should be reduced compare it to undertaking the plan is separately.
- Reduced consultation fatigue. By addressing issues of simultaneously only one public consultation process will be required.
-

For a community that is already undertaking air quality planning and has developed an emissions inventory, adding greenhouse gas and energy to the inventory will be relatively simple.

Meanwhile, adding air quality to greenhouse gas and energy planning process represents a significant amount of work, unless the community has little to no industry. This is because air contaminants emissions in a community with little industry will primarily be a result of energy use (fossil fuel burning).

The table below outlines the unique and overlapping features of AQMPs, energy plans and GHG plans.

	AQMP	GHG	CEP
Targets/Standards	ÉNational, Provincial and Regional (GVRD) air	ÉTargets established locally but typically follow those agreed at	ÉNo Federal/Provincial standards ÉTargets established

¹ This section summarizes relevant parts from MOE's report on "Integration of Air Quality-Related Planning Processes", May 2004.

² Wood, like other biomass-based fuels is considered GHG neutral under the PCP initiative.

³ Note that adding GHG and energy to the CAC inventory is not necessarily that simple.

	<ul style="list-style-type: none"> quality standards/objectives ÉTargets established locally 	<ul style="list-style-type: none"> National Level - 20% below 1990 levels (corporate), - 6% below 1990 levels (community) by 2008-2012 	<ul style="list-style-type: none"> locally
Stakeholders & Consultation	<ul style="list-style-type: none"> ÉPublic ÉMunicipality ÉFirst Nations ÉIndustry (especially holders of air emissions permits) ÉLocal environmental groups ÉForestry companies ÉAgricultural groups ÉRoad dust operators 	<ul style="list-style-type: none"> ÉPublic ÉMunicipality ÉFirst Nations ÉIndustry (especially large energy users) ÉLocal environmental groups ÉUtilities 	<ul style="list-style-type: none"> ÉPublic ÉMunicipality ÉFirst Nations ÉIndustry (especially large energy users) ÉLocal environmental groups ÉUtilities
Study Boundaries	<ul style="list-style-type: none"> ÉAirshed defined by topography and meteorology 	<ul style="list-style-type: none"> ÉPolitical boundary of community 	<ul style="list-style-type: none"> ÉUsually political boundary of community
Temporal/Spatial Dimensions	<ul style="list-style-type: none"> ÉTemporal and spatial dispersion important. Good temporal/spatial resolution required. Uses monitoring and modelling to determine dispersion. 	<ul style="list-style-type: none"> ÉTemporal and spatial dispersion of pollutant generally unimportant. 	<ul style="list-style-type: none"> ÉTiming of energy use and location of energy users might be important for peak load management.
Characterization of Existing Conditions	<ul style="list-style-type: none"> ÉMonitoring of existing ambient air quality & compare with standards. ÉInventory of existing sources of emissions. ÉModelling to fill data gaps. 	<ul style="list-style-type: none"> ÉInventory of existing sources of GHG emissions ÉTwo-track analysis (corporate and community at large) 	<ul style="list-style-type: none"> ÉInventory of existing energy supply and consumption.
Inventory Approach	<ul style="list-style-type: none"> ÉUses bottom up approach of identifying sources and adding these incrementally to inventory. ÉEmissions factors to convert from fuel consumption can be complex and not always reliable. ÉLarge emphasis on accurate data ÉReliable estimates difficult to obtain. ÉLarge uncertainties 	<ul style="list-style-type: none"> ÉUses top down approach of identifying total energy consumption of different types (various fuels, electricity) but converts fuel consumptions estimates to GHG emissions ÉEmission factors relatively simple and reliable ÉReliable estimates easy to obtain 	<ul style="list-style-type: none"> ÉUses top down approach of identifying total energy consumption of different types (various fuels, electricity) ÉBack of the envelope calculations considered acceptable ÉReliable estimates fairly easy to obtain

Baseline	<ul style="list-style-type: none"> É Usually present day 	<ul style="list-style-type: none"> É Requires calculation of emissions in a baseline year (often 1990 to adhere to Framework Convention on Climate Change). É Presents several data challenges for municipalities. 	<ul style="list-style-type: none"> É Depends on local priorities. É Often aligned with PCP protocol to satisfy Milestones 1 and 3.
Forecasting	<ul style="list-style-type: none"> É Date chosen locally É Complex, involves modelling, many unknowns. 	<ul style="list-style-type: none"> É PCP preferred date is 2010 É Based on trends in energy consumption and solid waste management. 	<ul style="list-style-type: none"> É Date for future scenarios chosen locally. É Relatively straightforward. Based on trends in population, energy consumption and costs.
Energy Management & Emission Reduction Measures	<ul style="list-style-type: none"> É Controls on burning É Emission control technologies É Cleaner burning fuels É Energy efficiency 	<ul style="list-style-type: none"> É Renewable energy supply projects É Energy efficiency initiatives É Landfill gas capture and re-use 	<ul style="list-style-type: none"> É Renewable energy supply projects É Energy efficiency initiatives É Land use planning

Appendix F1: Potential Actions. Examples From Around BC

Potential Actions for Priority Emission Sources by Municipal and Regional Governments.

This table contains suggested measures that your community could implement, or encourage other levels of government to implement. However, every community is unique and Golden may have additional actions that would be appropriate.

	CATEGORY	ACTION	Implemented in: (refer to websites below)
Wood Smoke	Residential stoves	<ul style="list-style-type: none"> - Develop local bylaws for woodstoves that limit or prohibit use. - Wood stove change-out programs. - Burn-it Smart education programs. - Prohibit the burning of wood in residential neighbourhoods during PM10 air quality advisories, except where wood is the primary heating source. 	<ul style="list-style-type: none"> - Bulkley Valley - Golden - Prince George - Squamish
	Backyard burning	<ul style="list-style-type: none"> - Bylaws limiting or prohibiting backyard burning; - Burning permits - Open burning ban on all properties less than 5 acres and in a sensitive area. - Promote awareness for air quality advisories issued for PM10 (including PM2.5) that requests homeowners to refrain from using wood heating. 	<ul style="list-style-type: none"> - Smithers - Burns Lake - Prince George
	Slash burning / Land clearing	<ul style="list-style-type: none"> - Reduce amount of material burned by switching from broadcast burning to site preparation treatments that do not involve burning. - Reduce amount of debris targeted for burning. - Reduce emissions of PM by burning smaller, hotter piles of debris. - Establish smoke management zones / Coordinate burning operations to take advantage of available venting and avoid 	<ul style="list-style-type: none"> - Bulkley Valley - 100 Mile House

	CATEGORY	ACTION	Implemented in: (refer to websites below)
		overloading the airshed (burning too many piles in a given day).	
Transportation	Fleet management	<ul style="list-style-type: none"> - Reduce emissions by facilitating retrofits and accelerating the use of cleaner fuels in both on-road and off road engines. - Retrofit older public transit vehicles to support continuous improvement. - Develop a model sustainable fleet management policy for use by businesses. - Driver training program - Promote trip reduction services in business outreach programs. 	<ul style="list-style-type: none"> - GVRD - Kelowna - Natural Resources Canada Fleet Smart program
	Personal Vehicles	<ul style="list-style-type: none"> - Promote trip reduction services in residential outreach programs. - Promote anti-idling bylaws. (See Environment Canada anti-idling website.) 	<ul style="list-style-type: none"> - City of North Vancouver - City of Vancouver - GVRD - Kelowna - Nelson - Prince George
	Zoning and community planning	For ideas on how to sufficiently consider air quality issues through zoning and community planning refer to "Air Quality and Land-use Handbook: A community health perspective", California Air Resources Board, 2004, available at www.arb.ca.gov	
	Road dust	<ul style="list-style-type: none"> - Road surface treatments (e.g., paving or sanding) - Use of traction materials made from breaking up larger rocks. - Frequent sweeping of streets and additional dust control on unpaved high traffic routes. - Pave all traffic areas for new industrial and commercial developments. - Establish guidelines and standards for all paved commercial and public parking lots to mitigate the release of fine dust from sanding and sweeping. - Screen to particle size and/or use washed traction material to prevent very large and very fine particles from being applied to 	<ul style="list-style-type: none"> - Bulkley Valley - Prince George - GVRD

	CATEGORY	ACTION	Implemented in: (refer to websites below)
		roads. - Dust control applications using calcium chloride, magnesium chloride or lignosuphonates. - Prior to sweeping or vacuuming roads, apply water (or coordinate with a rainfall event). - Partner with other organizations to investigate the health risk associated with road dust	
Industry	Industrial emissions	- Zoning, community planning and bylaws all help to minimize impacts on sensitive areas (e.g. schools and hospitals) and reduces urban sprawl and its associated transportation emissions. - Building codes help lower emissions from energy used in the building's operations. - Emission timing/shutdowns (e.g. requirements to reduce emissions during air quality advisories) - Reduce emissions from existing non-road engines facilitating retrofits and accelerating the use of cleaner fuels. - Introduce measures to ensure that power production will support continuous improvement. - Introduce tax breaks for new and cleaner technologies. - Identify new areas for heavy industrial development, taking potential air quality effects into account.	- Prince George - GVRD - Quesnel
	Odour management	- Expand delivery of a natural yard care outreach program for homeowners.	GVRD
Other	Yard care	- Expand delivery of a natural yard care outreach program for homeowners.	GVRD

Further information can be obtained at:

- Bulkley Valley <http://www.bvldamp.ca/>
- Fraser Basin Council <http://www.fraserbasin.bc.ca/programs/documents/Airshed%20Tools.pdf>
- GVRD <http://www.gvrd.bc.ca/air/>
- Kelowna <http://www.kelowna.ca/CM/Page438.aspx>
- NRCan Fleet Smart <http://oee.nrcan.gc.ca/transportation/fleetsmart.cfm?attr=0>
- Prince George http://www.city.pg.bc.ca/city_services/utilities/airquality/pgairquality.pdf
- Quesnel <http://www.city.quesnel.bc.ca/Home/qairshedmngt.asp>
- City of Vancouver <http://vancouver.ca/sustainability/coolvancouver/backgroundunder.htm>

Appendix F2: Potential Actions. Examples From Grand Forks

CATEGORY	ACTION	COST	POTENTIAL TO IMPROVE AIR QUALITY (LOW/MED / HIGH)	YEAR OF IMPLEMENTATION	CHAMPION(S)/ COMMENTS
Industrial Emissions	1. New Works	Industry Funding \$13million	High	2008	Roxul Inc.
	2. PM emissions assessment	Industry Funding	No impact	2008	Interfor
	3. Stack emissions regulated through Permitting Process by MoE	Industry Funding	High	2009	Ministry of Environment (MoE) and Company with input from City of Grand Forks
	4. Install an afterburner on the melting furnace discharge to reduce organic odours from that source	Industry Funding	Medium	2008	Roxul Inc.
Smoke from Residential Sources	1. Wood stove exchange	\$45,000	Medium	2008/09	City of Grand Forks, RDKB Area öDö, MoE
	2. Implement Open Burning Bylaw	\$1,000	Medium	2009	RDKB Area öDö. Requires consultation with MoE & MoF to ensure conformity with Wildfire Regulation
	3. Enforcement of bylaw to reduce domestic smoke	\$10,000	Low	2009	City of Grand Forks
	4. Ban backyard burning in residential areas	\$1,000	Low	2009	RDKB Area öDö
	5. Education and awareness on proper burning and use of wood stoves	\$5,000 & In-Kind	Medium	2008-2010	City of Grand Forks, BAQC, BC Lung Association, Local Physicians, RDKB Area öDö
	6. Implement Wood Stove Bylaw requiring US EPA or CSA	\$1,000	Low-Medium	2009	City of Grand Forks, RDKB Area öDö

CATEGORY	ACTION	COST	POTENTIAL TO IMPROVE AIR QUALITY (LOW/MED / HIGH)	YEAR OF IMPLEMENTATION	CHAMPION(S)/ COMMENTS
	approved stoves to be installed				
	7. Implement Outdoor Wood-Fired Hydronic Boiler Bylaw	\$2,000	Low-Medium	2009	City of Grand Forks, RDKB Area öDö
Smoke from Controlled & Open burning	1. Education of farmers to burn only when air quality and wind direction is favourable.	\$1,000	Low	2009	Ministry of Agriculture and Foods, City of Grand Forks and RDKB
	2. Implement bylaw for controlled burning with fines and penalties for non-compliance.	\$2,000	Medium	2010	Ministry of Agriculture and Foods, City of Grand Forks and RDKB Area öDö.
	3. US and Canada Cooperation: Counties of Washington State and RDKB. Education on burning : Forestry and Farming	\$5,000	Medium	2011	Ministry of Agriculture-Federal, RDKB, City of Grand Forks, County Commissioners in WA State, Colville National Forest, WA Dept of Natural Resources, etc.
	4. Roll-out of new Open Burning Smoke Control Regulation	0	High	2009	Ministry of Environment
Vehicle & Engine emissions	1. Idle Free Ambassador	\$40,000	Low-Med	2008	City of Grand Forks and BC Youth Climate Leadership Alliance
	2. Anti ö Idling policy for company, employee and visitor vehicles	Industry Funding	Low	2008-09	Roxul Inc., EmCon, Pacific Abrasives
	3. Municipal Bylaw on Idling	\$2,000	Low-Med	2007	City of Grand Forks
	4. Upgrade fleet to more fuel efficient vehicles	Industry Funding	Low	On-going	EmCon
	5. öSmart Vehiclesö pilot	Industry Funding	Low	2008	EmCon
	6. Education and awareness on idling and vehicle emissions for general public and truckers	\$2,000	Low-Med	On-going	Ministry of Transport, City of Grand Forks, BAQC, Local Physicians, Ministry of Environment, Trucking Fleet managers
	7. Signage for idle-free zones	\$1,500	Low	2008	City of Grand Forks, Interior Health

CATEGORY	ACTION	COST	POTENTIAL TO IMPROVE AIR QUALITY (LOW/MED / HIGH)	YEAR OF IMPLEMENTATION	CHAMPION(S)/ COMMENTS
	8. Create electrified truck stops to reduce idling by tractor-trailers	Unknown	Low	2009-2010	Ministry of Environment
	9. Retrofits for all commercial on-road heavy-duty diesel vehicles, transit buses and school buses	Unknown	Low-Medium	2009	BC Government (see BC Air Action Plan, Actions #5, 6 & 7)
	10. Assess feasibility of establishing a truck by-pass route using existing roads	Unknown	Low-Med if by-pass created	2010	City of Grand Forks
	11. Increase use of videoconferencing to reduce vehicle travel	Industry Funding	Low	2008	EmCon
	12. Implement a public transportation system	\$150,000	Medium	2009	BC Transit, City of Grand Forks, and RDKB
	13. Develop trails and walkways	\$500,000	Medium	2009-2012	City of Grand Forks, Ministry of Transport
	14. Provide cycle network	\$500,000	Medium	2009-2012	City of Grand Forks and Ministry of Transport
Road Dust	1. Removal of sand early in the spring using pickup sweeper in local municipalities	\$15,000 (City)	Low-Medium	2008	City of Grand Forks and EmCon
	2. Reduce amount of sand on roads	Cost saving	Low-Medium	2008	City of Grand Forks
	3. Educate public on winter driving and alternate transportation	\$1,000	Low	2008	City of Grand Forks
	4. Where feasible and appropriate, reduce dust on selected road shoulders by planting grass to the edge of pavement	\$500,000	Medium	2009-15	City of Grand Forks and Residents
	5. Install a storm drainage system and pave	\$2 million	Medium	2009-20	City of Grand Forks

CATEGORY	ACTION	COST	POTENTIAL TO IMPROVE AIR QUALITY (LOW/MED / HIGH)	YEAR OF IMPLEMENTATION	CHAMPION(S)/ COMMENTS
	6. Flushing and wetting areas, application of dust suppressants in lanes in residential areas	\$52,000	Medium	2009	City of Grand Forks
	7. Pave downtown lanes and parking lots	\$500,000	Medium	2009-15	City of Grand Forks
	8. Sweep and flush parking lots and downtown streets on a regular schedule	\$20,000	Low-Medium	2009	City of Grand Forks
Dust from industrial sites	1. Establish Development Permit Area regulating separation barriers to contain dust within the industrial operating area and require a dust management plan.	Industry Funding	Low-Medium	2009	City of Grand Forks
	2. Regular sweeping of the industrial area streets and the surrounding neighbourhood	Property Tax-City \$5,000	Low-Medium	2009	City of Grand Forks
	3. Reduction of dust from the unpaved areas in the industrial plant	Industry	Low-Medium	2008	Interfor
	4. Wet down unpaved areas on a sustainable basis and on schedule	Industry	Low-Medium	2008	Interfor and the City
	5. Hire city sweeper to pick up dust and flush paved areas	Industry	Low-Medium	2008	Pacific Abrasives, City of Grand Forks
	6. Require trucks to do regular wash to remove muds, dirt and dust	Industry	Low-Medium	2009	Truck Owners, Interfor, Roxul Inc., Pacific Abrasives and City of Grand Forks
	7. Pave industrial yard	Industry	Low-Medium	2009	Interfor
	8. Install cattle guard grate at the entry and exit gate of plant to help prevent truck traffic from dragging slag onto the street	Industry	Low	2009	Pacific Abrasives

CATEGORY	ACTION	COST	POTENTIAL TO IMPROVE AIR QUALITY (LOW/MED / HIGH)	YEAR OF IMPLEMENTATION	CHAMPION(S)/ COMMENTS
	9. Purchase and use a wet brush attachment for the company front end loader to reduce fugitive dust generated by vehicle traffic on company property	Industry	Low-Medium	2008	Roxul Inc.
	10. Fabricate a road watering device to reduce dust generated by vehicular traffic on unpaved segments of the Roxul industrial site.	Industry	Low	2008	Roxul Inc.
	11. Install a filter system on the product cooling equipment to reduce particulate matter released to atmosphere	Industry	Medium	2008	Roxul Inc.
Area Sources of Dust	1. Encourage farmers to wet soil or plant as soon as possible to reduce dust from drying fields	Farmers	Medium	2009-15	Ministry of Agriculture and RDKB
	2. Plant grass and trees in open areas with moisture sustaining plants and grass	Property owners	Medium	2009-2020	Property owners and City of Grand Forks, MoE and RDKB
	3. Require that construction sites be watered down and streets cleaned at construction sites.	Property owners	Medium	2009-	City of Grand Forks and Property owners
	4. Wet down or apply dust suppressants to public gathering areas and have large parking lots of shopping centres flushed on a regular basis.	\$5,000 and Property owners	Medium	2008	Property owners and City of Grand Forks.
	5. Farm lands to plant tree wind barriers to reduce blowing soil	Property owners	Medium	2009-2020	Property owners and Ministry of Agriculture and MoE, RDKB
	6. Plant grass and trees and use	Property	Medium	2009-2020	Property owners and Ministry of

CATEGORY	ACTION	COST	POTENTIAL TO IMPROVE AIR QUALITY (LOW/MED / HIGH)	YEAR OF IMPLEMENTATION	CHAMPION(S)/ COMMENTS
	rock, gravels to reduce and eliminate erosion and dust.	owners			Environment, RDKB, City of Grand Forks, Ministry of Transport
	7. Educate residents and farmers on the adverse effects of erosion and dust and how to prevent both	\$5,000	High	2009-2010	Ministry of Agriculture, Ministry of Environment, RDKB and City of Grand Forks.
Air quality monitoring & modeling	1. Dispersion modeling	\$50,000	No impact	2009	BAQC and Ministry of Environment
	2. Implementation of modeling at the field level	\$50,000	Medium	2010	BAQC and Ministry of Environment
	3. Installation of 2 cameras to provide time lapsed photography of the City	\$20,000	No impact	2009	Ministry of Environment, City of Grand Forks
	4. Remote access capability of photography and data accessibility by MoE	\$1,200/p/yr	No impact	2009	City of Grand Forks and Ministry of Environment
	5. PM Data Trends and Analysis	In-kind	No impact	2008	Ministry of Environment
	6. Fundraising for additional air quality monitoring stations and modeling with the goal of installing a PM _{2.5} Partisol monitor and PM ₁₀ TEOM monitor.	To be determined	No impact	2008-2012	BAQC to lead fundraising efforts, with some support from MoE. Goal is for PM _{2.5} Partisol monitor in place for 2009/10 and a PM ₁₀ TEOM monitor for 2012.
Education and Awareness	1. Ongoing public education in a variety of media/formats about key air quality issues in Grand Forks, including keeping the BAQC website current	In-kind	Low-Medium	On-going	BAQC, BC Lung Association, Local Physicians
	2. Clean Air Day	\$2,000	Low	On-going	City of Grand Forks, BC Lung Association
	3. Promote Healthy Built Environment and Active Living	IHA	Low	2008 -	Interior Health Authority
	4. Community air quality survey	City of	No Impact	2010	City of Grand Forks, Area öDö

CATEGORY	ACTION	COST	POTENTIAL TO IMPROVE AIR QUALITY (LOW/MED / HIGH)	YEAR OF IMPLEMENTATION	CHAMPION(S)/ COMMENTS
		Grand Forks			
Energy Efficiency	1. Energy Assessment of Local Yards ó improved weatherization of buildings	Industry Funding	Low	2008	EmCon
	2. Use geothermal heating in new construction where feasible	Industry Funding	Low	2008 -	Emcon
Coordination	1. Explore feasibility of creating part-time air quality coordination role for City of Grand Forks	None	No impact	2008	City of Grand Forks
Policy Integration	1. Identify opportunities for integration of air quality management goals and actions with land use planning, climate action, transportation planning, and waste management at the local and regional level	City of Grand Forks	No Impact	2008	City of Grand Forks, RDKB
	2. Review proposed air quality actions, especially those related to dust control, to ensure that they do not create unreasonable adverse impacts on area water quality.	City of Grand Forks	No impact	2008	City of Grand Forks, BAQC
	3. Prepare a Memorandum of Understanding that outlines goals and processes for interagency consultation on significant permits, research projects, etc.	In Kind	No Impact	2009	City of Grand Forks, RDKB, Ministry of Environment, Interior Health Authority, Ministry of Forests and BAQC.

