



Wood Buffalo Environmental Association

Human Exposure Monitoring Program:

Part II – Methods and Procedures

**Wood Buffalo Environmental Association
Fort McMurray, Alberta
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Summary

The Wood Buffalo Environmental Association has established a Human Exposure Monitoring Program (HEMP) in Wood Buffalo region. This Part II report provides technical details on methods and procedures used in HEMP.

A companion report, Human Exposure Monitoring Program: Part I – Background and Design Documentation, provides general scientific information on the background, design, and methods of HEMP.



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Appendix A HEMP Partnerships, Roles and Responsibilities

Wood Buffalo Environmental Association (WBEA)

The WBEA is a community-driven, non-profit organization made up of environmental and Aboriginal groups, government, and industry. WBEA's mandate is to conduct air quality, ecosystem, and human health effects monitoring in the Regional Municipality of Wood Buffalo. The WBEA is committed to monitoring and providing information on air quality and air-related environmental impacts. This information allows people to make informed decisions that relates to their health, safety and quality of life, and traditional land use.

To ensure this information is available and accurate for people, it is necessary to monitor human exposure to air emissions over the longer term in Wood Buffalo region. The intent of HEMP is to include humans as bioreceptors to compliment and expand already existing air monitoring data collected in the region.

WBEA is crucial to the success of HEMP as they provide a means of conducting, coordinating, and managing the program through the Human Exposure Monitoring Committee. WBEA is the primary funder of HEMP through their general membership and funding agencies. Currently, WBEA is responsible for operations of the program that primarily includes the data collection phase of HEMP. WBEA is also responsible for communications of the program, including recruitment of volunteers and dissemination of the final report for the program.

Science Team

The primary role of the Science Team is to provide expert advice in making scientific decisions regarding HEMP program methodology and to ensure scientific integrity of HEMP data. Science Team members are ultimately responsible for the analysis, interpretation, and write-up of the final report.

Alberta Health and Wellness

A representative from Alberta Health and Wellness (AHW) chairs the Science Team. AHW currently provides analysis, interpretation, and write-up of the final report as in-kind contributions to the WBEA HEMC. AHW provides many in-kind resources for the data collection phase of the program. This including training of field staff, statistical and analytical support, and provision of air monitoring equipment during data collection. AHW provides access to the Centre for Toxicology for analysis of the passive air monitors on a cost recovery basis. Finally, AHW currently as the data custodian ensuring confidentiality of the data is maintained.

Northern Lights Health Region (NLHR)

A representative from NLHR chairs the Human Exposure Monitoring Committee. NLHR provides in-kind support for HEMP through provision of field staff for data collection and local health advice to communities in the program.

Health Canada

Health Canada – through the First Nations and Inuit Health Branch and Health Canada’s Safe Environments Programme – provide funding for the HEMP program on an annual basis. The funding is used to train and employ staff from First Nation communities to assist with data collection. This includes funding for the project coordinator and field staff. Funding provided by Health Canada is essential to ensure that expectations of First Nation participants are passed on appropriately and that accurate and complete data are received.

Nunee Health Authority

The Nunee Health Authority in Fort Chipewyan provides in-kind office space during data collection in this community. They provide health advice to the community during the program. They act as a liaison between the project coordinator and other members of HEMP. This liaison ensures consistency, accuracy, and completeness of data collection in Fort Chipewyan.

Appendix B HEMP Terms of Reference

Introduction

The Wood Buffalo Environmental Association is committed to monitoring and providing information on air quality and air related environmental impacts allowing people to make informed decisions that relate to their health, safety, and quality of life. To ensure this information is available, it is necessary to monitor long term human exposure to air emissions in the Wood Buffalo Region.

Statement of Issues

- The Regional Municipality of Wood Buffalo has experienced substantial population, industrial, and commercial growth resulting in increased emissions of potential concern. This trend is expected to continue.
- There is a need to generate information that will enhance our understanding of relationships between air quality and human health in the Wood Buffalo Region.
- Ambient air monitoring does not provide adequate personal human exposure data.

Rationale

- The Alberta Oil Sands Community Exposure and Health Effects Assessment Program – AOSCEHEAP (2000) – was a joint effort among Alberta Health and Wellness, Northern Lights Regional Health Authority, Fort McKay First Nation, Fort McMurray Environmental Association, Suncor Energy Inc., and Syncrude Canada Ltd. It was developed to examine possible links between human health and air quality in response to human health concerns raised in public hearings for Syncrude Canada Ltd.'s Mildred Lake Development Project in 1994. This program recommended a long term, systematic approach to data gathering to improve knowledge about the link between environment and human health.
- The multi-stakeholder Fort MacKay Interface Committee – a precursor to WBEA – was struck in the mid-1980s to identify and prioritize environmental issues and concerns in the region. Effects on human health ranked as a top concern. Human health concerns were expressed by aboriginal and non-aboriginal communities in Wood Buffalo region in 2002.
- Quality of human health in relation to air quality and air-related impacts is incorporated into the Vision and Mission of WBEA. This supports the establishment of a long-term human exposure monitoring program.

Purpose

To ensure on going monitoring of human exposure to air emissions in the Regional Municipality of Wood Buffalo.

Reporting Structure

- The Human Exposure Monitoring Committee Chair, on behalf of the Human Exposure Monitoring Committee, will report to the Board of WBEA on a quarterly basis.
- The Chair will be appointed by the WBEA Human Exposure Monitoring Committee for a period of two years. The appointment process will adhere to policies and bylaws of the Association.

Composition

- Composition and attendance shall adhere to WBEA bylaws.
- This committee will strive to have representation from health, community and industry stakeholders.
- This committee will work as a team.
- Indirect members may be brought in as required upon consensus by the Human Exposure Monitoring Committee to do so.

Responsibilities

- To ensure that human exposure to emissions of potential concern in the region is part of a long-term air quality monitoring strategy of the Wood Buffalo Environmental Association.
- To develop and assist in the coordination of a human exposure monitoring program with Alberta Health and Wellness and Northern Lights Regional Health Authority, including:
 - Identification of suitable human exposure monitoring methods.
 - Identification of experts to carry out human exposure monitoring.
 - Coordination of related projects.
- To report progress and present deliverables to the Board of the WBEA.
- To ensure that the information gathered by the Human Exposure Monitoring Committee is properly communicated to the aboriginal and non-aboriginal communities, and other stakeholders of the Regional Municipality of Wood Buffalo.
- To incorporate Traditional Environmental Knowledge in the Human Exposure Monitoring Program when applicable.
- To continuously evaluate and strive for improvement in long term human exposure monitoring programs and/or projects.

Meetings & Quorum

- Meetings will be held quarterly minimum. Frequency shall be decided by the Human Exposure Monitoring Committee.
- Meetings and quorums shall adhere to the policies and bylaws of the Association.

Deliverables

- A long term human exposure monitoring strategy for endorsement by the Board of the WBEA.
- A long-term Human Exposure Monitoring Program, the deliverables from implementation of which will include:
 - A reporting structure for pre- and post field sampling communications.
 - A sampling schedule, with triggers and rationale.
 - Quarterly reports on the Human Exposure Monitoring Program to the WBEA Board.
 - Annual reports on the Human Exposure Monitoring Program for the WBEA annual report.
 - Human Exposure Monitoring Program Project Reports to the Board of the WBEA for endorsement.

Definitions

- (1) Emissions of Potential Concern – Airborne substances that may be harmful to human health
(2) Environment – A concept that includes all aspects of the surroundings of humanity, affecting individuals and social groupings.

Appendix C Protocol for Passive Air Monitoring

Note: All passive air monitors are pre-packaged in participants' boxes and separated in plastic bags labelled according to the location (i.e., personal, indoor, outdoor, and blank).

Nitrogen Dioxide (NO₂), Sulfur dioxide (SO₂), and Ozone (O₃) Sampling Protocol

A. Set-Up of NO₂, SO₂, and O₃ Air Monitors:

1. The NO₂ and SO₂ monitors are packaged in identical white plastic transportation containers. The O₃ monitors are packaged in orange vials. The “no2” or “so2” prefix on the outside label of the container will identify the sampler. The “o3” prefix will identify that the sampler is an O₃ sampler. The original shipping container must be used to send the exposed monitor to the laboratory for analysis. Always ensure that the outside label corresponds to the type of monitor that you intend to open.
2. All of these containers should be shipped from the laboratory sealed with parafilm tape. Ensure that the parafilm seal is still intact before opening. If the parafilm seal is absent or broken, use a spare monitor from the emergency kit, if available, and/or make note of this on the field data log sheet before continuing.
3. Unscrew the plastic lid of the container and carefully remove the monitor.

IMPORTANT NOTE: NO₂ or SO₂: Do not touch the white film (permeation barrier). O₃: Do not touch the sides of the sampler (intake location).

4. Inside the container there should be three identical peel-away labels. There should also be a label on the back of the sampler as well as on the outside of the container.

IMPORTANT NOTE: Ensure that all labels are identical before proceeding. If the labels are not identical you should use the label affixed to the sampler and change all other labels, making note of these changes on the log sheets, which will be forwarded to the laboratory.

5. Affix one of the labels to the field data log sheet in the appropriate space provided. Place the remaining two labels back into the container (the laboratory will require the remaining labels during analysis).
6. The following should be recorded on the field data log sheet: participant number, site description, date and time (military time or be sure to indicate am/pm) of sample initiation, and relevant comments as deemed necessary.
7. Ensure that the sampler is intact and the clip is operable. If the clip is broken or the permeation barrier of the sampler is damaged, it is advised that you do not use this sampler or at the very least, record this information on the log sheet.

IMPORTANT NOTE: Note: If the clip has received damaged, please note this on the log sheet. You may be able to still use the monitor as a blank, by switching it with the monitor located in the blank set of monitors, or you may be able to repair the monitor using items from the emergency kit.

8. Attach the passive air monitors to the personal sampler necklace, the indoor stand, or the outdoor stand.

B. Preparation of NO₂, SO₂, and O₃ Blank:

IMPORTANT NOTE: Passive monitoring field blanks should be completed during the set-up stage and should be completed for every participant.

1. Follow all steps above, except for step 8 (i.e., do not expose the air monitor for any relevant length of time) and immediately continue to the retrieval steps as if the monitor was exposed. It is not necessary to record the time of exposure, as the “blank” monitors will not be exposed for any relevant length of time. It is important the blank monitors are handled and transported in the same way as the “exposed” monitors.
2. Be certain to parafilm blank NO₂, SO₂, and O₃ air monitors as soon as they are returned to the containers.

C. Retrieval of NO₂, SO₂, and O₃ Air Monitors:

1. After the sampling period has ended, remove the monitor from the sampling location and return it to the appropriate shipping vial **facedown** (i.e., NO₂ and SO₂). Ensure that the labels on the sampler and the container are identical.
2. Tightly screw the lid onto the transport vial and seal with parafilm tape.
3. Record the date and time of sample termination on the data log sheet. Record any relevant comments such as damage to the air monitor, discoloration on the face of the air monitor, movement of the sampling stand, or relevant participant comments (e.g., Participant indicated that the face of the sampler got wet).
4. Exposed monitors are collected at a central location and shipment is made to the laboratory.

Volatile Organic Compound (VOC) Sampling Protocol

A. Set-Up of VOC Air Monitors:

1. Each VOC monitor is packaged in a 3M aluminum can. The original shipping container must be used to send the exposed monitor to the laboratory for analysis. Ensure that the outside label corresponds to the type of monitor that you are intending to open.
2. Remove the plastic lid from the can. There should be four removable labels under the tab of the can. Ensure that all four labels as well as the label affixed to the side and lid of the can are identical. The “vo” prefix will identify that the sampler is a VOC sampler.
3. Open the can carefully and remove the air monitor from the can.

IMPORTANT NOTE: Do not touch the white face or remove the plastic ring when deploying. If the ring tab snaps off while attempting to open the container, you may be able to carefully use something

to assist in removing the lid. As a last resort, use the can opener provided in the emergency kit. This will destroy the container and will require you to use parafilm to reseal the exposed sampler.

4. **Important step:** Affix one of the labels to the **back of the VOC sampler** and one to the field data log sheet in the appropriate space provided. Place the remaining two labels back into the container (the laboratory will require the remaining labels). *Note: Please leave the plastic closure cap and the plastic piece of tube in the container.*
5. The following should be recorded on the field data log sheet: participant number, site description, date and time (military or indicate am/pm) of sample initiation, and relevant comments as deemed necessary.
6. Ensure that the sampler is intact and the clip is operable. If the clip is broken or the permeation barrier of the sampler is damaged, it is advised that you do not use this sampler or at the very least, record this information on the log sheet.

IMPORTANT NOTE: If the clip has received damaged, please note this on the log sheet. You may be able to still use the monitor as a blank, by switching it with the monitor located in the blank set of monitors, or you may be able to repair the monitor using items from the emergency kit.

7. Attach the air monitor to the personal sampler necklace, the indoor stand, or the outdoor stand.

B. Preparation of VOC Blank:

IMPORTANT NOTE: Passive monitoring field blanks should be completed during the set-up stage and should be completed for every participant.

1. Follow all steps above, except for step 7 (i.e., do not expose the air monitor for any relevant length of time) and immediately continue to the retrieval steps as if the monitor was exposed. It is not necessary to record the time of exposure, as the “blank” monitors will not be exposed for any relevant length of time. It is important the blank monitors are handled and transported in the same way as the “exposed” monitors.
2. Be certain to parafilm blank VOC air monitor as soon as they are returned to the containers.

C. Retrieval of VOC Air Monitors:

1. **Important step:** After the sampling period has ended, **remove the plastic ring and white film** from the face of the sampler.

IMPORTANT NOTE: If you are having trouble removing the plastic ring, you may use something (e.g., coin or key) to carefully pry it off.

2. Take the **plastic closure cap** from the container and firmly snap it onto the face of the sampler gently using your thumbs, starting at one end of the cap and gently working your thumbs around the sides, meeting at the top.

IMPORTANT NOTE: You should not have to use excessive force and it will be easiest to have one part of the closure cap fitted into place before continuing around the perimeter. You should hear evident clicking sounds when it is properly sealed.

3. Ensure that the two port plugs of the closure cap are firmly seated.
4. Turn the metal clip to one side and return the monitor to the appropriate can and seal with plastic lid provided. Ensure that the labels on the sampler and the container are identical. Seal the lid to the can with parafilm tape.
5. Record the date and time of sample termination on the data log sheet. Record any relevant comments such as damage to the air monitor, discoloration on the face of the air monitor, movement of the sampling stand, or relevant participant comments (e.g., Participant indicated that they spilled something on the face of the sampler).
6. Exposed monitors are to be collected at a central location and shipment is made to the laboratory.

Appendix D Protocol for Particulate Air Monitoring

IMPORTANT NOTE: *All new particulate air monitors are packaged in plastic canisters in coolers and are separated in plastic bags. The filter types can be distinguished by the following characteristics:*

Personal filter: *Black casing with clip; flow rate indicated on stickers as 4 LPM*

Indoor filter: *Black/gold or black casing without clip; flow rate indicated as 4 LPM*

Outdoor filter: *Red casing; flow rate indicated as 10 LPM*

A. Set-Up of Particulate Air Monitors:

1. **Important Step:** Prior to sampling, turn all active sampling equipment on and run for approximately 30 minutes to ensure that a stable flow is established. *Note: One of the first things that should be done at a participant's home is plugging in the outdoor and indoor particulate air monitors. The purpose is to warm-up the pumps so a more stable flow rate can be achieved prior to commencing the actual sampling period.*
2. There should be one removable label on the back of the particulate filter that corresponds to the fixed label. Ensure that these labels are identical before removing the appropriate label and placing it on the particulate field data log sheet.
3. To begin sampling, attach the particulate filter to the vacuum source and record the counter time displayed on the device. *Note: The personal/indoor monitors should be reset to zero just before or after connecting the filter by using one of the pushpins in the front pouch of the DryCal bag.*
4. Make a continuous connection between the particulate filter and the calibration device (i.e., DryCal) by using the appropriate attachments provided. *Note: Be sure to firmly seat the "DryCal to filter" calibration attachment.*
5. Turn on the DryCal and begin reading the flow rate by pressing and holding the "Read" button on the right-hand side of the DryCal display. *Note: Pressing and holding the button will commence continuous readings. Note: One of the DryCal units has a handheld display. There is a button on the right-side of the handheld display that lights the display. Use the flashlight in the emergency kit, if necessary.*
6. Slowly adjust the flow rate of the active sampling device by one of the following methods:
Personal/indoor pumps: Use the screwdriver type device from the front pouch of the DryCal bag to lock onto the inset "flow adjustment" screw on the backside and to the right of the personal pump housing.

IMPORTANT NOTE: *Be patient and careful when locking onto the set screw. It may be easiest to line both screwdriver and set screw up by eye before attempting to lock onto the screw. The set screw can be easily overshoot or slip. Damage can occur from the screwdriver to the internals of the pump so use caution.*

Outdoor pumps: Flow rate adjustment knobs can be found inside the housing of these devices. Turn them slowly and gently to adjust the flow rate. The flow rate should change with very little movement of the adjustment knobs.

IMPORTANT NOTE: If the flow rate does not increase or decrease with slight adjustments to the outdoor pump adjustment knobs, it could be due to the underside turning at the same time. Be sure to hold on the under-side of the knob while turning to see if this is the problem. This may occur more frequently with the grey, box-like outdoor monitors.

IMPORTANT NOTE: There should be very little adjusting of flow rate that needs to be made between participants. A low flow rate is most often an indication of a loose, missing, or incorrect connection somewhere in the circuit or a pinched or bent piece of tubing in the circuit. Other less frequent problems could be due to: broken or missing O-rings on the quick-connects of the filters or DryCal calibration attachment; inoperable pump(s); faulty filters; expired personal pump batteries; incorrectly connected personal or indoor pump battery or A/C adapters; inoperable power outlet; battery drained or inoperable DryCal (A/C adapter for DryCal in front pouch).

7. Once the flow rate is within the desirable range of the target flow rate, take several continuous readings during which the flow rate remains relatively constant and remains within the target flow rate. Record the average after ten continuous readings, which is shown on the DryCal display. *Note: You may wish to stop the readings at the 10th continuous reading to make it easier to transfer the average to the log sheet. If the flow rate seems to be bouncing around check for loose connections or pinched hoses. Take another average of 10 readings.*
8. Detach the calibration attachment. *Note: The DryCal will turn off automatically after a period of time.*
9. The following should also be recorded on the particulate field data log sheet: participant ID, date and time (military) of sample initiation, and relevant comments as deemed necessary.
10. **Personal pump:** Use both the waist strap and shoulder strap to outfit the participant with the pump and attach the particulate filter using the clip provided to the passive sampling necklace, which should all be placed within the participant's breathing zone.

IMPORTANT NOTE: Take the time to ensure the participant is comfortable wearing the monitor and ensure that they understand that the straps are adjustable and how to adjust them. Offer assistance with the adjustments, if required. Also be sure to take time to readjust all monitors on the sampling necklace to ensure weight is distributed appropriately.

IMPORTANT NOTE: At this time also ensure the participant understands how to change the batteries, which is required every 48 hours. Provide them with their schedule explaining when to change the batteries. Explain to them that if the personal pump goes off it could be due to low batteries or the pump could have been accidentally turned off. Show them the on/off switch.

Indoor pump: Carefully lay the pump flat on its back on the floor at the base of the passive air monitoring stand and use the plastic "zip strips" contained in the front of the DryCal bag or in the emergency kit to connect the filter to the neck of the indoor passive air monitoring stand approximately 6 inches below the passive monitors to avoid interference, but to ensure appropriate elevation of the filter.

Outdoor pumps: Affix the rain shield. Adjust the filter so that the holes are face-down, exposed to the air as much as possible, but so the filter remains sheltered from precipitation. If there is a problem with the tubing sliding down the arm of the outdoor pump, use a piece of slotted foam that can be found inside the emergency kits. This should not be a problem if the filter is positioned well.

IMPORTANT NOTE: *Explain to the participant that if at any time the particulate pumps turn off to please call the project coordinator as soon as possible.*

B. Preparation of Particulate Blank:

IMPORTANT NOTE: *Particulate (active) monitoring field blanks should be completed during the set-up stage and should be completed only when indicated by the project coordinator.*

1. Remove the filter from the plastic bag, check that the labels match, and apply the label in the appropriate location on the log sheet.
2. Personal, indoor, and outdoor blank particulate filters can be attached to the passive indoor monitoring stand using the zip strips provided in the front pouch of the DryCal bag or the emergency kit. *Note: If possible, attach the blank filter with intake holes facing downwards.*

C. Retrieval of Particulate Air Monitors:

1. Firmly seat the “DryCal to filter” calibration attachment onto the face of the filter.
2. Turn on the DryCal and begin reading the flow rate by pressing and holding the “Read” button on the right-hand side of the DryCal display. *Note: Pressing and holding the button will commence continuous readings. Note: One of the DryCal units has a handheld display. There is a button on the right-side of the handheld display that lights the display. Use the flashlight in the emergency kit, if necessary.*
3. Determine the end flow rate by taking the average of ten continuous readings during which the rate is relatively stable, which is shown on the DryCal display. *Note: You may wish to stop the readings at the 10th continuous reading to make it easier to transfer the average to the log sheet.*

IMPORTANT NOTE: *It is normal for the end flow rate to be slightly lower than the start flow rate. If the end flow rate seems to be fluctuating greatly between continuous readings or if it differs from the start flow rate by 1.0 LPM, check for proper DryCal connection, then take additional readings if it is suspected that was the cause. If the cause for the fluctuating flow rates or low flow rates cannot be determined, simply make comments in the space provided and record the average end flow rate.*

DO NOT, UNDER ANY CIRCUMSTANCES, ADJUST THE END FLOW RATE BEFORE RECORDING AN END FLOW RATE ONTO THE LOG SHEET AND DETACHING THE FILTER EVEN IF YOU ARE AWARE OF WHAT THE PROBLEM IS (e.g., detached tubing from one of the pump motors). You may wish to troubleshoot the operation of the pump after the filter is disconnected.

4. Record the end flow rate on the field data log sheet.
5. Detach the calibration attachment. *Note: The DryCal will turn off automatically after a period of time.*
6. Ensure that all appropriate spaces are filled in on the log sheet, including any relevant comments.
7. Turn the device off and record the end counter time on the field data log sheet.

8. Detach the particulate filter, ensuring to keep the intake portion of the device in an upright position.

IMPORTANT NOTE: After the sampling period, the intake holes on the particulate filters should always be kept upright during handling and shipment.

9. Carefully wrap the filter in the plastic bags provided and place the exposed filter with intake holes facing up into the canister in the cooler to be returned to the program office.
10. The project coordinator should check for arrows on shipping containers that indicate which way the boxes should be positioned and ensure they should ensure that shipping staff are aware that boxes must not be inverted and should be handled with care.
11. Samples are shipped to a central location, unloaded, cleaned, and reloaded for further sampling.

D. Retrieval of Particulate Blank:

1. Carefully remove the particulate blank from the indoor sampling stand using the scissors from the emergency kit.
2. Carefully wrap the blank filter in the plastic bags provided and place the filter with intake holes facing up into the canister in the cooler to be returned to the program office.
3. Ensure all information is recorded in the appropriate row of the log sheet including any relevant comments

Appendix E Schedule for Community Sampling

Year	Community
1	Fort McMurray/Fort Chipewyan
2	Fort McKay/Fort McMurray #468 First Nation
3	Fort McMurray/Janvier
4	Fort McKay/ Fort Chipewyan

Appendix F Volunteer Registration Form

1. Name _____
2. Phone Numbers: Home: _____ Work: _____
3. Age of Volunteer (must be 18 years or over at start date): _____
4. Gender: Male _____ Female _____
5. a) What type of work do you do? (Describe your occupation; job title)

- b) Where do you work? (Describe location and provide company name)

6. Home Address (complete home address including postal; legal land description may be useful if located in rural area)

7. Even though smokers and smoking households are not excluded from participating, does any person currently smoke in your home on a regular basis? Yes No
8. Dates unavailable to participate (i.e., vacation, traveling out of study area):

9. How did you hear about the program? (newspaper, radio, tradeshow, website, word of mouth):

Appendix G Time Activity Diary Instructions

The Time Activity Diary is designed to enable you to estimate the amount of time you spend in various locations while wearing the personal exposure monitors. There are seven locations of interest:

- 1) **Indoors at home** – includes any activities done inside your place of residence (e.g., housework, office work, eating, sleeping, watching television, using computer, etc.).
- 2) **Outdoors at home** – includes any activities done outside your place of residence (e.g., cutting grass, shoveling snow, gardening, painting deck, sunbathing, etc.).
- 3) **Indoors at work** – includes any activities done inside your place of work or school (**Note:** If you work out of your home, please use the “Indoors/Outdoors at home” category to record this information).
- 4) **Outdoors at work** – includes any activities done outside your place of work or school.
- 5) **Indoors Elsewhere** – includes any activities done inside other locations (e.g., grocery shopping, hairdresser, bank, indoor recreational activities, theatre, restaurant/pub, etc.).
- 6) **Outdoors Elsewhere** – includes any activities done outside other locations (e.g., outdoor recreational activities, picnic, walk dog, camping, waiting for bus, etc.)
- 7) **Travelling** – includes any activity involving the operation of or transport in a motorized vehicle (e.g., driving to work/school, riding a bus, truck driving, snowmobiling, motorcycling, etc.).

Ideally, it would be more accurate to keep your diary sheets with you throughout the day, periodically recording your activities. Please attempt to be as accurate as possible, ensuring that if you are moving from one category (i.e., outdoors at home) to another (i.e., indoors at home) to make a single entry for each location. Also, be sure that if you are changing locations from home to work/school to indicate how you arrived at this new location (i.e., walking = outdoors elsewhere, car = travelling).

SEE EXAMPLE ON OTHER SIDE.

For example, the participant below received their diary at 6:00pm:

- Entry #1) From 6:00-8:00pm they were outfitted with their monitors, filled in some of their questionnaire, ate supper, and watched television → check indoors at home
- Entry #2) From 8:00-8:10pm they drove to their friend’s house by car → travelling
- Entry #3) From 8:10-8:30pm they waited inside their friend’s house → indoors elsewhere
- Entry #4) From 8:30-8:50pm they walked to the movie theatre → outdoors elsewhere
- Entry #5) From 8:50-11:00pm they watched a movie → indoors elsewhere
- Entry #6) From 11:00-11:20pm they walked back to their friend’s house → outdoors elsewhere
- Entry #7) From 11:20-11:30pm they drove back to their house → travelling
- Entry #8) From 11:30pm-7:40am they got ready for bed, slept, had breakfast and got ready for work → indoors at home
- Entry #9) From 7:40-7:50am they went out the front door to the end of the driveway and waited for their ride → outdoors at home
- Entry #10) From 7:50-8:30am they rode in a car (or bus) to work (or school) → travelling
- Entry #11) and Entry #12) From 8:30am-12:30pm they worked about equal time indoors and outdoors → **Note:** This requires two separate entries (indoors at work and outdoors at work) -- please try and estimate the **amount of time spent in each location**. The actual time of day is not as important as the amount of time in each location.

	TIME	LOCATION (check only one location per row)			
1	6:00-8:00pm	<input checked="" type="checkbox"/> Indoors at home <input type="checkbox"/> Outdoors at home	<input type="checkbox"/> Indoors at work <input type="checkbox"/> Outdoors at work	<input type="checkbox"/> Indoors Elsewhere <input type="checkbox"/> Outdoors Elsewhere	<input type="checkbox"/> Travelling
2	8:00-8:10pm	<input type="checkbox"/> Indoors at home <input type="checkbox"/> Outdoors at home	<input type="checkbox"/> Indoors at work <input type="checkbox"/> Outdoors at work	<input type="checkbox"/> Indoors Elsewhere <input type="checkbox"/> Outdoors Elsewhere	<input checked="" type="checkbox"/> Travelling
3	8:10-8:30pm	<input type="checkbox"/> Indoors at home <input type="checkbox"/> Outdoors at home	<input type="checkbox"/> Indoors at work <input type="checkbox"/> Outdoors at work	<input checked="" type="checkbox"/> Indoors Elsewhere <input type="checkbox"/> Outdoors Elsewhere	<input type="checkbox"/> Travelling
4	8:30-8:50pm	<input type="checkbox"/> Indoors at home <input type="checkbox"/> Outdoors at home	<input type="checkbox"/> Indoors at work <input type="checkbox"/> Outdoors at work	<input type="checkbox"/> Indoors Elsewhere <input checked="" type="checkbox"/> Outdoors Elsewhere	<input type="checkbox"/> Travelling
5	8:50-11:00pm	<input type="checkbox"/> Indoors at home <input type="checkbox"/> Outdoors at home	<input type="checkbox"/> Indoors at work <input type="checkbox"/> Outdoors at work	<input checked="" type="checkbox"/> Indoors Elsewhere <input type="checkbox"/> Outdoors Elsewhere	<input type="checkbox"/> Travelling
6	11:00-11:20pm	<input type="checkbox"/> Indoors at home <input type="checkbox"/> Outdoors at home	<input type="checkbox"/> Indoors at work <input type="checkbox"/> Outdoors at work	<input type="checkbox"/> Indoors Elsewhere <input checked="" type="checkbox"/> Outdoors Elsewhere	<input type="checkbox"/> Travelling
7	11:20-11:30pm	<input type="checkbox"/> Indoors at home <input type="checkbox"/> Outdoors at home	<input type="checkbox"/> Indoors at work <input type="checkbox"/> Outdoors at work	<input type="checkbox"/> Indoors Elsewhere <input type="checkbox"/> Outdoors Elsewhere	<input checked="" type="checkbox"/> Travelling
8	11:30pm-7:40am	<input checked="" type="checkbox"/> Indoors at home <input type="checkbox"/> Outdoors at home	<input type="checkbox"/> Indoors at work <input type="checkbox"/> Outdoors at work	<input type="checkbox"/> Indoors Elsewhere <input type="checkbox"/> Outdoors Elsewhere	<input type="checkbox"/> Travelling
9	7:40-7:50am	<input type="checkbox"/> Indoors at home <input checked="" type="checkbox"/> Outdoors at home	<input type="checkbox"/> Indoors at work <input type="checkbox"/> Outdoors at work	<input type="checkbox"/> Indoors Elsewhere <input type="checkbox"/> Outdoors Elsewhere	<input type="checkbox"/> Travelling
10	7:50-8:30am	<input type="checkbox"/> Indoors at home <input type="checkbox"/> Outdoors at home	<input type="checkbox"/> Indoors at work <input type="checkbox"/> Outdoors at work	<input type="checkbox"/> Indoors Elsewhere <input type="checkbox"/> Outdoors Elsewhere	<input checked="" type="checkbox"/> Travelling
11	8:30-10:30am	<input type="checkbox"/> Indoors at home <input type="checkbox"/> Outdoors at home	<input checked="" type="checkbox"/> Indoors at work <input type="checkbox"/> Outdoors at work	<input type="checkbox"/> Indoors Elsewhere <input type="checkbox"/> Outdoors Elsewhere	<input type="checkbox"/> Travelling
12	10:30am-12:30pm	<input type="checkbox"/> Indoors at home <input type="checkbox"/> Outdoors at home	<input type="checkbox"/> Indoors at work <input checked="" type="checkbox"/> Outdoors at work	<input type="checkbox"/> Indoors Elsewhere <input type="checkbox"/> Outdoors Elsewhere	<input type="checkbox"/> Travelling

- | | Year | Circle, if true |
|---|-------|------------------------------|
| 5. a. What year did you move to this address? | _____ | N/A (lived here since birth) |
| b. What year did you move to this city/town? | _____ | N/A (lived here since birth) |
6. Some studies have shown that socio-economic status is associated with various dietary, lifestyle, and environmental factors. In order to make comparisons of groups of people, information about approximate household income is important. Please estimate the **total gross income of all members of the household**. Which of the following categories contains your estimate?
- | | |
|---|---|
| <input type="checkbox"/> Less than \$10,000 | <input type="checkbox"/> \$90,000 - 99,999 |
| <input type="checkbox"/> \$10,000 - 14,999 | <input type="checkbox"/> \$100,000 - 109,999 |
| <input type="checkbox"/> \$15,000 - 19,999 | <input type="checkbox"/> \$110,000 - 119,999 |
| <input type="checkbox"/> \$20,000 - 24,999 | <input type="checkbox"/> \$120,000 - 129,999 |
| <input type="checkbox"/> \$25,000 - 29,999 | <input type="checkbox"/> \$130,000 - 139,999 |
| <input type="checkbox"/> \$30,000 - 34,999 | <input type="checkbox"/> \$140,000 - 149,999 |
| <input type="checkbox"/> \$35,000 - 39,999 | <input type="checkbox"/> \$150,000 - 159,999 |
| <input type="checkbox"/> \$40,000 - 44,999 | <input type="checkbox"/> \$160,000 - 169,999 |
| <input type="checkbox"/> \$45,000 - 49,999 | <input type="checkbox"/> \$170,000 - 179,999 |
| <input type="checkbox"/> \$50,000 - 59,999 | <input type="checkbox"/> \$180,000 - 189,999 |
| <input type="checkbox"/> \$60,000 - 69,999 | <input type="checkbox"/> \$190,000 - 199,999 |
| <input type="checkbox"/> \$70,000 - 79,999 | <input type="checkbox"/> \$200,000 or greater |
| <input type="checkbox"/> \$80,000 - 89,999 | |

HOUSEHOLD CHARACTERISTICS AND EXPOSURE SOURCES

7. Which best describes your home?
- | | |
|--|---|
| <input type="checkbox"/> A mobile home or trailer | <input type="checkbox"/> A building for 5 to 9 families |
| <input type="checkbox"/> A one-family house detached from any other house | <input type="checkbox"/> A building for 10 to 19 families |
| <input type="checkbox"/> A one-family house attached to one or more houses | <input type="checkbox"/> A building for 20 or more families |
| <input type="checkbox"/> A building for 2 families | <input type="checkbox"/> A boat, tent, van, etc. |
| <input type="checkbox"/> A building for 3 or 4 families | <input type="checkbox"/> Other (please specify below) |
- _____

8. Is there an **unpaved** driveway on your property? No Yes

9. Is there a garden on your property? No Yes

10. Is there a garage on your property?

No Yes (please answer **both** questions below)

If yes, Is your garage heated? No Yes

If yes, Is your garage attached to the house? No Yes

11. Approximately when was your home originally built? Please consider when it was **originally built**, not when it was remodeled, added to, or converted.

2000 – Present

1970 – 1974

1995 – 1999

1960 – 1969

1990 – 1994

1950 – 1959

1985 – 1989

1949 or earlier

1980 – 1984

Don't Know

1975 – 1979

12. How many square feet (or square metres) of living space is there in your home?

_____ square feet, or _____ square metres Check box if estimated

13. Do you have carpets in your home? No Yes

14. What is the **main** type of heating system and fuel used to heat your home?

Type of Heating System	Type of Fuel						
	Natural Gas	Fuel Oil	Electricity	Kerosene	Coal	Wood	Other
Forced Air							
Wall Furnace or Heater							
Radiant							
Gravity							
Portable							
Fireplace							
Wood Stove							
Other (specify)							

15. Do you have a cold air return on your heating system? That is, does the heating system take the air from the outside of the home for heating and circulation?

No

Yes

Don't Know

16. Do you have:

a. a gas stove?

No Yes

If yes, was it used during the air-monitoring period? No Yes

b. a fireplace in the house or an attached structure?

No Yes (please answer **all** questions below)

If yes, was it used during the air-monitoring period? No Yes

If yes, Is the fireplace: Gas Wood-burning

If yes, Is the damper usually open? No Yes

c. a wood stove in the house or an attached structure?

No Yes

If yes, was it used during the air-monitoring period? No Yes

d. central vacuum system (built-in)?

No Yes

If yes, was it used during the air-monitoring period? No Yes

If yes, does this vacuum have a HEPA filter? No Yes

e. portable vacuum

No Yes

If yes, was it used during the air-monitoring period? No Yes

If yes, does this vacuum have a HEPA filter? No Yes

17. Are there any dogs or cats that live primarily inside your house (*not outdoors only*)?

No Yes

18. Is smoking permitted in your home?

No (go to question #19) Yes (please answer question below)

If yes, do people usually smoke when you are an occupant?

No Yes

19. Is smoking permitted in your vehicle?

No (go to question #20) Yes (please answer question below)

If yes, do people usually smoke when you are an occupant?

No Yes

20. Have you **ever** smoked as much as one cigarette a day for as long as one year?

No (**go to question #21**)

Yes (please answer **all** questions below)

If yes, how much did/do you smoke per day?

1 to 10

11 to 20

21 to 30

31 to 40

> 40

Daily cigarette

equivalent:

1 oz tobacco = 25
cigarettes

1 small cigar = 2
cigarettes

1 large cigar = 5
cigarettes

▶ How many years did you smoke/have you smoked?

▶ Do you currently smoke? No Yes

▶ **If you have quit**, how long has it been since you quit?
(Years and months, if known)

21. How many of your friends smoke?

None

A few

About half

Most

All

22. How much time (*in minutes or hours -- please specify*), **on a typical day**, are you exposed to second-hand cigarette smoke? If none, please indicate.

23. How many people regularly live in your household **including yourself**? _____

(PLEASE CONTINUE TO THE NEXT PAGE)

WORK ENVIRONMENT

24. Do you have a paid job outside of the home?

- Yes
- No, self-employed in the home
- No, full-time student
- No, full-time homemaker (**go to question #30**)
- No, out of work just now, but usually employed (**go to question #30**)
- No, retired, or disabled (**go to question #30**)
- No, other (please specify): _____ (**go to question #30**)

25. Where do you work or attend school? _____

26. At the present time, is your primary job or school attendance full- or part-time? (**Check one**)

- Full-time Part-time

27. What is your occupation **or** if you are a student, what program or training are you **currently** taking? _____

28. Thinking back over the **past 3 months**, which of the following **best** describes your **usual** daily activities or work habits?

- Usually sit during day and do not walk about very much
- Stand or walk about quite a lot but do not have to carry or lift things very often
- Usually lift or carry light loads, or have to climb stairs or hills often
- Do heavy work or carry very heavy loads

29. a. Do you work in a non-smoking environment? No Yes (**go to question #30**)

b. If yes, how many of your co-workers smoke?

- None A few About half Most All

(PLEASE CONTINUE TO THE NEXT PAGE)

30. It has been documented that some symptoms may be the result of certain environmental conditions in the home, workplace, or commuting microenvironments, and are not caused by other factors such as infections, food poisoning, sunstroke, etc. Please indicate if you have experienced **any** of the following symptoms **during the past year** by checking (✓) the appropriate box.

	Not Experienced	Home	Work or School	Commuting	Other Places (specify where?)
Eye irritation					
Nose irritation					
Throat irritation					
Dry mucous membranes					
Dry skin					
Erythema (skin redness)					
Mental fatigue					
Physical fatigue					
Headaches					
Unspecific airway infections					
Scratchy throats or coughs					
Colds or flu					
Nausea					
Dizziness					
Dry, itching, or tearing eyes					
Strained eyes or focusing					
Chest tightness					
Unspecific hypersensitivity					
Feeling heavy-headed					
Difficulty concentrating					
Dry facial skin					
Aching joints					
Muscle twitching					
Back pain					

31. Have you seen a doctor for **any or all** of these symptoms? No Yes

32. Do you have another job, **or** if employed, do you go to school part-time?

- Yes No (**go to question #36**)

33. At the present time, is your second job or school attendance full-time or part-time?

- Full-time Part-time

34. Where do you work or attend school? _____

35. What is your occupation for your **second job**, or if you are a student, what program or training are you **currently** taking? _____

GENERAL HEALTH AND WELLBEING

36. How tall are you? _____ feet _____ inches / _____ centimeters

37. How much do you weigh? _____ pounds / _____ kilograms

38. Have you gained or lost more than ten pounds (4.5 kilograms) **in the past year**?
Please **check the appropriate box** and **fill in one of the blanks** to indicate how much.

- No (**go to question #39**)
 Yes, I **gained** approximately _____ lbs. (or _____ kg) in the past year
 Yes, I **lost** approximately _____ lbs. (or _____ kg) in the past year

If yes, were there any specific reasons why your weight changed?

39. Would you describe your life as...

- very stressful
 somewhat stressful
 not very stressful
 not stressful at all

40. Would you describe yourself as usually...

- happy and interested in life
 somewhat happy
 somewhat unhappy
 very unhappy

41. We would like to know if you have any long-term health conditions (that is, conditions that have lasted or are expected to last 6 months or more) that have been diagnosed by a health care professional. Below is a list of chronic health conditions. Please indicate by checking (✓) the appropriate box if you have **ever** been diagnosed by a health care professional for any of the following conditions.

Have you **ever** been diagnosed with:

- Food allergies
- Other allergies
- Asthma –
 - If yes, have you had an attack in the past 12 months?** No Yes
 - Have you had any whistling or wheezing in the chest at any time in the **past 12 months?** No Yes
- Chronic bronchitis or emphysema
- Sinusitis
- Arthritis
- Back problems, excluding arthritis
- Diabetes
- Epilepsy
- High blood pressure
- Heart disease
- Effects of stroke
- Cancer – **what type** of cancer? _____
- Alcoholism
- Urinary incontinence
- Kidney failure or kidney disease
- Acne requiring prescription medication
- Cataracts
- Glaucoma
- Migraine headaches
- Head injury
- Alzheimer’s disease
- Dementia (**please specify**): _____
- Emotional illness (**please specify**): _____
- Mental health condition (**please specify**): _____
- Any disease affecting your nerves or brain (**please specify**): _____
- _____
- Any other long term condition (**please specify**): _____
- _____
- None

(PLEASE CONTINUE TO THE NEXT PAGE)

The next section of the survey examines general health and well being. Please remember that all results from this survey will be summarized for groups of people and no information about individual persons will be released. Please circle or check (“✓”) your responses or, where necessary, write in the information required.

42. In general, would you say your health is:

- Excellent
- Very Good
- Good
- Fair
- Poor

43. Compared to one year ago, how would you rate your health in general now?

- Much better now than one year ago
- Somewhat better now than one year ago
- About the same now as one year ago
- Somewhat worse now than one year ago
- Much worse now than one year ago

44. Aside from any paid vacation and holidays, how many days of scheduled work have you missed for any reason **in the past year**? _____ day(s)

45. How many times have you seen a medical doctor **in the past year**? _____ time(s)

46. Would you say that you (and your family) are **better off** or **worse off** or just the **same** financially as you were a **year ago**? Please **circle** your answer.

BETTER OFF SAME WORSE OFF

47. Now looking ahead – do you think that a **year from now** you (and your family), will be **better off** financially, or **worse off**, or just about the same as now? Please **circle** your answer.

BETTER OFF SAME WORSE OFF

(PLEASE CONTINUE TO THE NEXT PAGE)

48. On a scale of **1 (Strongly Disagree) to 7 (Strongly Agree)**, please state how much you agree with each statement. Please **circle one** of the seven numbers for each statement.

	Strongly Disagree						Strongly Agree
Overall, political-economic control of my community rests in the hands of a few prominent business people.	1	2	3	4	5	6	7
The provincial government has really helped my community's development.	1	2	3	4	5	6	7
The municipal government is interested in my needs and cares about my opinion.	1	2	3	4	5	6	7
If I have a concern with local bylaws, I can call and get action.	1	2	3	4	5	6	7
Local officials are easily accessible in my community.	1	2	3	4	5	6	7
Social class is important in my community.	1	2	3	4	5	6	7
Family breakdown is common in my community.	1	2	3	4	5	6	7
The local industries are responsible for a lot of pollution.	1	2	3	4	5	6	7
Pollution is better controlled than it used to be.	1	2	3	4	5	6	7
The local industries have reduced their pollution emissions in the past few years.	1	2	3	4	5	6	7
The local industries care about environmental damage and are actively working to reduce long-term impacts.	1	2	3	4	5	6	7
The Regional Health Authority (RHA) Board is interested in my health/welfare.	1	2	3	4	5	6	7

(PLEASE CONTINUE TO THE NEXT PAGE)

50. Please **circle** the appropriate response for the following questions:

	Not At All True	Barely True	Moderately True	Exactly True
a) I get easily upset when thinking about poisons in my environment.	1	2	3	4
b) I experience bodily symptoms that may be related to chemicals in my environment at home or at school.	1	2	3	4
c) I don't worry about being hurt by chemicals.	1	2	3	4
d) The image of being poisoned often pops into my mind.	1	2	3	4
e) I don't mind living in polluted environments because I am confident that I won't get hurt.	1	2	3	4
f) I feel worried about toxic effects on my body which might result in losing some of my intellectual abilities.	1	2	3	4
g) I have never really worried about water pollution.	1	2	3	4
h) I wonder whether there is radon or other dangerous substances in my house.	1	2	3	4
i) I feel frightened when I think of all the toxic waste dumps in the world.	1	2	3	4
j) I fear there will be a major nuclear accident or nuclear war in the near future.	1	2	3	4
k) Many people tend to overreact to the threat of environmental toxins.	1	2	3	4
l) I would not mind working in an office or plant built with asbestos or other possibly dangerous materials.	1	2	3	4
m) I have relaxed about environmental poisons because science always seems to succeed in providing remedies.	1	2	3	4
n) Poor memory can be a direct result of too much exposure to chemicals.	1	2	3	4
o) Toxic waste is a smaller problem than the media make it out to be.	1	2	3	4
p) Being exposed to most chemicals for a long time does not cause serious diseases.	1	2	3	4
q) People who handle chemicals are not at an increased health risk.	1	2	3	4

51. We would also like to know if you have had any medical complaints and how your health has been, in general, **over the past few weeks**. Please answer **ALL** the questions on the following pages by **circling the answer** which you think most nearly applies to you. Remember that we want to know about present and recent complaints, not those that you had in the past. It is important that you answer **ALL** of the questions. Thank-you.

Have you recently...

been able to concentrate on whatever you are doing?	Better than usual	Same as usual	Less than usual	Much less than usual
lost much sleep over worry?	Not at all	No more than usual	Rather more than usual	Much more than usual
been feeling mentally alert and wide awake?	Better than usual	Same as usual	Less alert than usual	Much less alert
been feeling full of energy?	Better than usual	Same as usual	Less energy than usual	Much less energetic
been having restless, disturbed nights?	Not at all	No more than usual	Rather more than usual	Much more than usual
been managing to keep yourself busy and occupied?	More so than usual	Same as usual	Rather less than usual	Much less than usual
been getting out of the house as much as usual?	More than usual	Same as usual	Less than usual	Much less than usual
been managing as well as most people would in your place?	Better than most	About the same	Rather less well	Much less well
felt on the whole you were doing things well?	Better than usual	About the same	Less well than usual	Much less well
been able to feel warmth and affection for those near to you?	Better than usual	About same as usual	Less well than usual	Much less well
been finding it easy to get along with other people?	Better than usual	About same as usual	Less well than usual	Much less well
felt that you are playing a useful part in things?	More so than usual	Same as usual	Less useful than usual	Much less useful
felt capable of making decisions about things?	More so than usual	Same as usual	Less so than usual	Much less capable
felt constantly under strain?	Not at all	No more than usual	Rather more than usual	Much more than usual
felt you couldn't overcome your difficulties?	Not at all	No more than usual	Rather more than usual	Much more than usual
been finding life a struggle all the time?	Not at all	No more than usual	Rather more than usual	Much more than usual

Have you recently...

been able to enjoy your normal day-to-day activities?	More so than usual	Same as usual	Less so than usual	Much less than usual
been taking things hard?	Not at all	No more than usual	Rather more than usual	Much more than usual
been getting scared or panicky for no good reason?	Not at all	No more than usual	Rather more than usual	Much more than usual
been able to face up to your problems?	More so than usual	Same as usual	Less able than usual	Much less able
found everything getting too much for you?	Not at all	No more than usual	Rather more than usual	Much more than usual
been feeling unhappy and depressed?	Not at all	No more than usual	Rather more than usual	Much more than usual
been losing confidence in yourself?	Not at all	No more than usual	Rather more than usual	Much more than usual
been thinking of yourself as a worthless person?	Not at all	No more than usual	Rather more than usual	Much more than usual
felt that life is entirely hopeless?	Not at all	No more than usual	Rather more than usual	Much more than usual
been feeling hopeful about your own future?	More so than usual	About same as usual	Less so than usual	Much less hopeful
been feeling reasonably happy, all things considered?	More so than usual	About same as usual	Less so than usual	Much less than usual
been feeling nervous and up-tight (or hung up) all the time?	Not at all	No more than usual	Rather more than usual	Much more than usual
felt that life isn't worth living?	Not at all	No more than usual	Rather more than usual	Much more than usual
found at times that you couldn't do anything because your nerves were too bad?	Not at all	No more than usual	Rather more than usual	Much more than usual

(PLEASE CONTINUE TO THE NEXT PAGE)

52. The following **five** questions are about your neighbourhood and the people around there. Please indicate by **circling** your answer.

1) How often do you get together with any neighbours just for a chat?

Never	Almost never	Less than once a month	Once a month	Several times a month	Several times a week	Almost daily	Daily
-------	--------------	------------------------	--------------	-----------------------	----------------------	--------------	-------

2) How often do you visit with friends in the surrounding area?

Never	Almost never	Less than once a month	Once a month	Several times a month	Several times a week	Almost daily	Daily
-------	--------------	------------------------	--------------	-----------------------	----------------------	--------------	-------

3) How often do you visit with relatives in the surrounding area either in your home or theirs? (includes all relatives)

Never	Almost never	Less than once a month	Once a month	Several times a month	Several times a week	Almost daily	Daily
-------	--------------	------------------------	--------------	-----------------------	----------------------	--------------	-------

4) How often are you in contact with friends outside the surrounding area, including letters, phone calls, and visits?

Never	Almost never	Less than once a month	Once a month	Several times a month	Several times a week	Almost daily	Daily
-------	--------------	------------------------	--------------	-----------------------	----------------------	--------------	-------

5) How often are you in contact with relatives outside the surrounding area including letters, phone calls, and visits?

Never	Almost never	Less than once a month	Once a month	Several times a month	Several times a week	Almost daily	Daily
-------	--------------	------------------------	--------------	-----------------------	----------------------	--------------	-------

53. Thank you for taking the time to provide this information. The field team will pick up the completed questionnaire at the next appointment time. If you have any concerns or comments please take the time to express these in the space provided below.

Appendix I Responsibilities of Project Coordinator

- a) recruit participants and schedule field appointments as necessary;
- b) follow-up with participants who phone regarding participation in the program or current participants who are having difficulties with their current participation (e.g., monitoring equipment not functioning properly);
- c) monitor and implement procedures to ensure quality assurance and quality control including:
 - verifying data collection completeness and accuracy of field monitoring staff;
 - following up with participants if there is incomplete data;
- d) data entry for the project including:
 - volunteer recruitment information;
 - field data collection materials (field sampling log sheets, time activity diaries);
- e) execute all shipping and receiving duties as required including:
 - contact laboratories when shipments are required;
 - follow-up with laboratories if any problems;
- f) act as a liaison between the laboratories and the field teams to ensure that quality control is being met in the field as well as in the laboratories (i.e., via feedback from field teams as well as laboratory staff);
- g) supervise the Field Monitoring Teams (if applicable);
- h) participate in the data collection process as a member of a Field Monitoring Team as necessary; and,
- i) other duties as required to support the Health Effects Assessment Program.

Appendix J Field Data Control Form

Participant ID#: _____

Data Instrument	Date Deployed	Date Received	Field Team	Received By	Comments
Volunteer Registration Form					
Passive Log Sheet					
Particulate Log Sheet					
Time Activity Diary					
Demographic, Exposure, and General Health Questionnaire					
Floor Plan					

Appendix K Procedures for Field Monitoring Teams

Deployment Appointment:

- 1) Arrive at program office to pick-up prepared packages and schedule.
- 2) Travel to first participant's home.
- 3) Introduce each other to participant and explain what you will be doing during your visit.
- 4) Explain to them it is important that you warm-up the equipment and request access to their backyard. Plug-in the outdoor air monitor in an appropriate location.
- 5) Continue back inside and ask the participant where they spend the majority of their time while awake in their household. Their response may be a good indication of where to set-up the air monitoring equipment.
- 6) Find an appropriate location and plug-in the indoor particulate air monitor.
- 7) Briefly survey participant's house and yard and note appropriate sampling locations.
- 8) Sketch map of house, yard, and indicate placement of all samplers on floor plan:
 - Indoor: note location of kitchen, living room, dining room, doors, windows, sofa, chair, stove, table, etc.
 - Outdoor: note which direction the front of the home faces and sketch in the road(s), trees, garden, shed, garage, etc.
 - Mark all passive sampler locations with an "X" (or "PM" or "PAH", if necessary)
- 9) Place personal samplers according to protocols.
- 10) Place indoor samplers according to protocols.
- 11) Place outdoor samplers according to protocols.
- 12) Complete blanks according to sampling protocols.
- 13) Explain to the participant how to complete the Time Activity Diary (TAD) and fill in initial time slot for participant. Ensure that participant is left with instructions for completing TAD.
- 14) After all appointments are completed, return to program office with completed program materials.
- 15) Return packages with empty sampling containers to drop-off location in program office.

Retrieval Appointment:

- 1) Arrive at program office to pick-up prepared packages and schedule.
- 2) Travel to first participant's home and greet participant and explain what you will be doing. Ask them how their week of participation went and make mental notes of any complaints or improvements that might be required.
- 3) Place personal samplers into corresponding containers according to protocols.
- 4) Place indoor samplers into corresponding containers according to protocols.

- 5) Place outdoor samplers into corresponding containers according to protocols.
- 6) Check all data collection sheets for completeness before placing in container.
- 7) Check Time Activity Diary and Questionnaire for completeness.
- 8) Thank participant for completing the program and their cooperation.
- 9) After all appointments are completed, return to program office with completed program materials.
- 10) Return packages with empty sampling containers to drop-off location in program office.

Appendix L Project Coordinator Letter to Participants

Dear Participant,

On the first night of your participation, two field staff will arrive at your home, at the previously scheduled appointment time. The field team will set-up an outdoor set of monitors, an indoor set of monitors, and a personal set of monitors that will be worn around your neck using a sampling necklace that will be provided. Particulate matter equipment will also be set-up, including a particulate pump that you will also be asked to wear. The field team will collect the monitors one-week from the day of the initial set-up.

It is critical that you wear all the personal air monitors as much as possible, because the monitoring program is designed to investigate your daily exposure to the selected contaminants. It is also important to remember to complete your time-activity diary on a regular basis as it is a great source of information when investigating your personal exposure. The diaries will be collected by the field team during the final appointment or can be provided along with your questionnaire in the envelope provided.

Please have the questionnaire completed by the last day of your participation. It may be advantageous to work at completing it each night, as it is fairly extensive. The completed questionnaire may be sealed in the envelope provided by the field staff and given to the field team, or you may, at any time, return your questionnaire in person to the project coordinator at the Wood Buffalo Environmental Association office (905, 9915 Franklin Avenue (Provincial Building)).

Your participation is greatly appreciated. The project coordinator will be available to respond to any concerns or questions you may have and may periodically call you to ensure that the monitoring equipment is functioning properly. Please feel free to call, e-mail, or visit the WBEA office at any time if you have any questions, concerns, or comments.

Sincerely,

(Project Coordinator Name)
WBEA HEMP Project Coordinator
Phone: (###-####)
Fax: (###-####)
Email: wbea.airmon@shawlink.ca

Appendix M Volunteer Consent Form

I understand that the Wood Buffalo Environmental Association is engaged in an ongoing human air monitoring program of people's exposure to certain airborne substances. I understand that this program is being conducted in order to help measure levels of exposure to selected substances, and is limited to the purpose stated.

I do hereby freely consent to participate in the WBEA Human Exposure Monitoring Program and agree to provide the following data:

- answers to questions related to environmental exposure through work and living conditions;
- air monitoring data collected through the use of a personal exposure monitor;
- air monitoring data collected inside and outside my home through the use of fixed location air monitors; and
- a record of my time spent in various locations during my participation.

I understand and agree that:

- an agent of the program will distribute the questionnaires, will collect the resulting information; and will set up the monitoring equipment in my home;
- the Wood Buffalo Environmental Association may use and disclose the information thus obtained to meet the objectives of the program, so long as my name or other identifying features are never referred to in any way and that information is only published in aggregate form;
- there is no obligation to be provided with any individual results from my participation in this program.

It has been explained to me that there are no significant risks or direct benefits to me from participation in this program. I understand that I am free to withdraw at any time, and withdrawing from the program will not have any adverse effect on my access to health care services. I further understand that while participating in this program I will be free to ask any questions concerning the program.

I have read and agree with the above.

Signature: _____

Date: _____

***Please note, due to the limited number of volunteers required, entry submission will not guarantee or imply that you will be selected for the program.

Appendix N Passive Air Monitoring Field Data Log

Participant ID #: _____

Start Date: _____

Received by: _____

Submitted by Field Team Members: _____ End Date: _____

		NO ₂	SO ₂	O ₃	VOCs
PERSONAL	Sampler ID #:				
	Start Time:				
	End Time:				
	Comments:				
INDOOR	Sampler ID #:				
	Start Time:				
	End Time:				
	Comments:				
OUTDOOR	Sampler ID #:				
	Start Time:				
	End Time:				
	Comments:				
BLANK	Sampler ID #:				
	Comments:				

Appendix O Particulate Air Monitoring Field Data Log

Participant ID: _____ Start Date: _____ Start Time: _____

Field Team: _____ End Date: _____ End Time: _____

Location	PM Filter ID	PM Unit #	Start Counter	Target Flow	Start Flow	End Flow	End Counter	Comments
Personal (black with clip)				4.00 ± 0.1				
Indoor (black or black/gold; no clip)				4.00 ± 0.1				
Outdoor (red)				10.00 ± 0.1				
Blank --			XXXXXXXXXX	XXXX	XXXXXX	XXXXXX	XXXXXX	
Blank --			XXXXXXXXXX	XXXX	XXXXXX	XXXXXX	XXXXXX	

Appendix P Procedures for Data Entry

- All survey and other data collected by field teams will be returned to a secure location (designated program office) at the end of each day. These data will be carefully reviewed by the Project Coordinator to verify completeness. If necessary, a study participant may be approached again to complete missing information in the time activity diary or demographic and health survey.
- Raw data gathered by field personnel will be entered into an electronic database and sent to Alberta Health & Wellness (Edmonton). A database coordinator at Alberta Health & Wellness will then verify data entry.
- Once data entry is completely verified, electronic data files will be built and combined as necessary into a complete database for statistical analysis. Statistical data analysis will be conducted by scientific staff at Alberta Health & Wellness (Edmonton) using standard statistical software.^{1,2}
- All data components will be made linkable only by an arbitrarily assigned “participant identification number.” Other identifiable information will be removed from the records to ensure confidentiality of results.
- All data will be retained in a secure location at Alberta Health & Wellness (Edmonton). These data will be retained for a period of seven years. After this time a decision will be made to archive or properly destroy the data.

Appendix Q Laboratory Analysis Procedures – Passive Samples

The contaminants analyzed from passive monitoring include nitrogen dioxide, ozone, sulphur dioxide, and a set of thirteen volatile organic compounds (VOCs) including the BTEX compounds: benzene, toluene, ethylbenzene and the xylenes.

The preparation of the passive air monitoring devices for deployment and all analysis is performed by the Centre for Toxicology (CFT), University of Calgary, Calgary, AB.

The nitrogen dioxide monitor was developed by the CFT and its performance has been described by Dmitrovic et al. (2003).³ It consists of a holder with a Teflon barrier to guard against dust and moisture. A filter paper coated with a chemical that will absorb nitrogen dioxide is placed in the holder. After a measured time of exposure (i.e., 7 day sampling period), the filter paper is removed and the absorbed gas is eluted with deionized (Milli-Q) water.

Nitrogen dioxide is measured as nitrite in water by ion chromatography (IC). Sulfur dioxide is measured similarly to nitrogen dioxide. The design of the two monitors is identical with the only difference being the chemical used to absorb the gas. The absorbed sulphur dioxide is analyzed as sulphate using IC. Both monitors have been validated using a custom-built exposure chamber.

To measure ozone, an Ogawa (Pompano Beach, Florida) monitor is used and the manufacturer's protocol is followed. The principle is similar to the nitrogen dioxide and sulphur dioxide monitors. The filter paper is coated at the CFT. Analysis is by IC and the absorbed ozone is measured as nitrate.

The VOCs are measured by the use of a 3M (St. Paul, Minnesota) Organic Vapor Monitor has been used and the manufacturer's protocol followed. The absorbent material is activated charcoal. The absorbed compounds are eluted with carbon disulfide and analyzed by gas chromatography/mass spectrometry.

Appendix R Laboratory Analysis Procedures – Particulate Samples

Filters requiring gravimetric analysis are handled according to a procedure based on the United States Environmental Protection Agency.⁴ Filters are loaded and maintained as described in the manufacturer's manual (MSP Corporation, Minneapolis, MN).⁵

A battery-powered air sampler draws air at a constant volumetric flow rate into a specially shaped inlet and through an inertial particle size separator (impactor) where the suspended particulate matter in the PM_{2.5} size range is separated for collection on a polytetrafluoroethylene (PTFE) filter over the specified sampling period. The air sampler and other aspects of this reference method are described by the United States Environmental Protection Agency.⁴

Each filter is weighed (after moisture and temperature equilibration) before and after sample collection to determine the net weight (mass) gain due to collected PM_{2.5}. The total volume of air sampled is determined by the sampler from the measured flow rate at actual ambient temperature and pressure and the sampling time. The mass concentration of PM_{2.5} in air is computed as the total mass of collected particles in the PM_{2.5} size range divided by the actual volume of air sampled, and is expressed in micrograms per actual cubic meter of air ($\mu\text{g}/\text{m}^3$).

Particulate matter on filters requiring metals analysis are digested using procedures described elsewhere.^{6,7} ICP-MS (inductively coupled plasma - mass spectrometry) is used to analyze digested samples according to United States Environmental Protection Agency Method 6020a.⁸

References

- ¹ SAS Institute Inc. 2006. SAS/STAT Software. SAS Institute Inc., Cary, NC. See: <http://www.sas.com/technologies/analytics/statistics/stat/factsheet.pdf> (accessed February 2006).
- ² SPSS Inc. 2006. SPSS for Windows. SPSS Inc., Chicago, IL. See: <http://www.spss.com/spss/> (accessed February 2006).
- ³ Dmitrovic, J., Hill, A., Prince, D., Chan, S.C., Chan, S.H.Y., Gabos, S., and MacKenzie, A. 2003. Validation of a passive sampler for monitoring atmospheric nitrogen dioxide. 27th *International Congress on Occupational Health, (ICOH 2003)*, Iguassu Falls, Brazil, 23-28 February 2003.
- ⁴ United States Environmental Protection Agency. 1998. *Quality Assurance Guidance Document. Method Compendium: PM_{2.5} Mass Weighing Laboratory Standard Operating Procedures for the Performance Evaluation Program*. US EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC. October 1998.
- ⁵ MSP Corporation. 1992. *Model 200 Personal Environmental Monitor Instruction Manual Rev. 2*. MSP Corporation, Shoreview, MN. October 1992.
- ⁶ Jalkanen, L.M. and Häsänen, E.K. 1996. Simple method for the dissolution of atmospheric aerosol samples for analysis by inductively coupled plasma mass spectrometry. *Journal of Analytical Atomic Spectrometry*, **11**, 365-369.
- ⁷ Wu, S., Zhao, Y., Feng, X., and Wittmeier, A. 1996. The application of inductively coupled plasma mass spectrometry for total metal analysis in silicon-containing solid samples using the microwave assisted nitric acid-hydrofluoric acid-hydrogen peroxide-boric acid digestion system. *Journal of Analytical Atomic Spectrometry*, **11**, 287-296
- ⁸ United States Environmental Protection Agency. 1998. Method 6020a – Inductively Coupled Plasma-Mass Spectrometry. SW-846-Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. US EPA, Washington, DC. January, 1998.