

## Requirements for the Ambient Air Quality Monitoring Plan Roaster Complex Deconstruction

During the deconstruction of the roaster complex, two Ambient Air Quality Monitoring programs will be executed: a real time monitoring plan; and an environmental effects monitoring plan. Monitoring is to commence a minimum of 7 days before deconstruction work begins, and shall continue until the PWGSC representative has confirmed completion of final site grading and restoration. The minimum monitoring program particulars are outlined below; however, specific details will be provided once a contractor is in place, a detailed schedule for work completion has been obtained, and climate conditions under which monitoring will be required are clear. The contractor's reviewed and accepted Deconstruction Plan will also outline the specific mitigative methods that will be implemented to control dust.

The detailed air quality monitoring plan will include QA/QC methods, instrument selection operation and maintenance requirements, proper instrument positioning, and sample collection methodology, following standard accepted methods, such as those outlined in the following reference documents:

- Ontario MOE 2008. Operations Manual for Air Quality Monitoring in Ontario.
- Environment Canada 2004. National Air Pollution Surveillance Network Quality Assurance and Quality Control Guidelines.
- U.S. EPA 1999. U.S. Code of Federal Regulations, Title 40, Part 58, Appendix D (Network Design Criteria for Ambient Air Quality Monitoring) and Appendix E (Probe and Monitoring Path Siting Criteria), and Part 53 (Ambient Air Monitoring Reference and Equivalent Methods).

The real-time monitoring plan will address at minimum, the following requirements:

1. One air monitoring station placed adjacent to Highway 4 – Ingraham Trail and three air monitoring stations at the Project Work Area perimeter surrounding deconstruction work, placed at appropriate locations to:
  - i. Account for typical wind directions and dust source areas, including source areas outside of project work area.
  - ii. Capture potential dust emissions from deconstruction work.
  - iii. Identify potential upwind dust contributions to air quality.
2. Real-time monitoring from portable, continual recording instruments on stable tripods at predetermined approximate locations, with exact positioning selected at start of each day based on prevailing wind direction(s), wind speeds, type of work activity, and location of deconstruction work being completed. Instrument selection, and potential shelter requirements, will consider the climate under which the monitoring will need to take place, and each location will use the same methodology to allow for direct comparison of data.
3. Real-time monitoring instruments are to measure particulate matter of 10 micrometres or less ( $PM_{10}$ ), recording fifteen (15) minute average concentrations on a continuous basis throughout the work day.

4. Real-time monitoring instruments are to incorporate an alert system set to go off at specific action levels outlined in Table 1 below.
5. Responses/actions to be taken in the event that an action level is reached are outlined in Table 1 below.
6. Action levels below may be modified, as required, based on PM<sub>10</sub> and arsenic concentrations from environmental effects monitoring, and upwind monitoring data during deconstruction work.

The environmental effects air monitoring program will address, at minimum, the following requirements:

1. Collection of ambient air samples at the following locations: 1) Immediately adjacent to the real-time monitoring location beside Highway 4 – Ingraham Tail; and 2) Immediately adjacent to the down-wind real-time monitoring location with highest PM<sub>10</sub> readings at the Project Work Area perimeter surrounding the deconstruction work.
2. Samples are to be collected over a 24 hour period, with one sample collected every three (3) days. Sampling frequency may be extended to 6-day periods if there are no action level exceedances.
3. Samples are to be collected and analyzed for the mass concentration of total suspended particulate matter (TSP), PM<sub>10</sub>, and arsenic, according to same methodology used during baseline sampling. For the first sampling event once deconstruction work has commenced, one sample will be collected to analyze for all metals to confirm that arsenic is the only metal requiring monitoring. The environmental effects monitoring program is to be modified accordingly in the event of additional elevated metal concentrations.
4. For environmental effects monitoring, comparison of results to the criteria in Table 2 below.

**Table 1 - Summary of Action Levels for Dust Monitoring**

Parameter	Action Level	Monitoring Location	Averaging Period	Action Required if Level Exceeded
Dust Plumes at Project Work Area*	Visible dust emissions	At Project Work Area	Not Applicable	If visible dust emissions are observed at Project Work Area, the PWGSC Representative may conduct fugitive dust monitoring. Results will be communicated to the Contractor, with implementation of mitigative measures as outlined below if required. Mitigative measures may include such actions as wetting down structures, changing deconstruction methodology, and/or whatever other measures the contractor may propose in the Deconstruction Plan.
PM <sub>10</sub>	180 µg/m <sup>3</sup>	at downwind location of Project Work Area	15 Minutes	Deconstruction work continues. Contractor to investigate potential source of dust emissions and report results to PWGSC Representative. Visible dust plumes on-site shall be an early indicator that immediate corrective measures are warranted. Contractor to initiate appropriate measures as required to correct operations and protect air quality to have particulate concentrations below the action levels.
PM <sub>10</sub>	125 µg/m <sup>3</sup>	at downwind location of Project Work Area	1 - Hour	Current Deconstruction Work stops. Deconstruction Work may be shifted to another activity. Work resumes at previously halted Deconstruction Work activity when reason(s) for the dust emissions are identified and corrective procedures are implemented
PM <sub>10</sub>	85 µg/m <sup>3</sup>	at downwind location of Project Work Area	4 - Hours	All Deconstruction Work stops. The Contractor and PWGSC Representative will review corrective action(s) taken to date and identify additional measures to reduce air emissions. Construction practices and procedures will be examined to assess potential modifications. Work does not resume until a strategy satisfactory to the PWGSC Representative is formulated and implemented.

\* Project Work Area defined as area immediately surrounding Roaster Complex where the deconstruction contractor's work is confined.

**Table 2 – Environmental Effects Monitoring Criteria**

Parameter	24 Hour Criteria
Arsenic	0.3 µg/m <sup>3</sup>

## Requirements for the Air Quality Monitoring Plan - Industrial Hygiene – Roaster Complex Deconstruction

The selected contractor will be required to develop and execute an air quality monitoring plan for the purposes of ensuring safe industrial hygiene, which addresses at minimum the following requirements:

1. Inside enclosure air quality monitoring, with a sample collection frequency of two samples per shift for every ten workers inside the enclosure. Samples are to be analyzed for asbestos and arsenic, to be representative of worker breathing space, and collected for comparison to time-weighted average limits and 15-minute ceiling limits.
2. In addition to the above, for arsenic, cyanide and asbestos work area inside enclosure air quality monitoring, coverage of one personal data logging monitor for hydrogen cyanide for each work activity, with alarm set to sound at 50% of the ceiling limit.
3. Outside enclosure air quality monitoring with a minimum of:
  - i. One air sample for arsenic and asbestos within the clean room of each decontamination area.
  - ii. One air sample for arsenic and asbestos and one hydrogen cyanide gas data logging monitor equipped with alarm adjacent to each enclosed area entrance.
  - iii. One additional air sample for arsenic and asbestos adjacent to the enclosure for every 450 m<sup>2</sup> of enclosure area.
4. Identified locations for outside enclosure air quality monitoring.
5. All asbestos air monitoring to be completed in accordance with the Northwest Territories Workers' Safety and Compensation Commission Code of Practice: Asbestos Abatement, May 2012 and following National Institute for Occupational Safety and Health method 7400.
6. All arsenic air monitoring to be conducted following NIOSH Method 7901, Arsenic Trioxide, as arsenic, (particulates only). If material is heated and vapours may be present, additional air sampling for arsenic trioxide vapours and arsine will be conducted following NIOSH 7901 (particulates and vapours) and NIOSH 6001, Arsine, respectively.
7. Under wet removal, or if existing material is wet and hydrogen cyanide gas may be generated, conduct air monitoring using a gas detection monitor equipped with a hydrogen cyanide sensor with data logging capabilities and alarm.
8. Submit all air monitoring sample results to the PWGSC representative for review within the following timeframes:
  - i. Asbestos within 24 hours.
  - ii. Hydrogen cyanide, as required, at end of each work shift.
  - iii. Arsenic and arsine as required, within 48 hours, or as soon as practical based on shipping and laboratory analytical requirements.

Failure to provide air monitoring sample results will result in suspension of work.

Air monitoring results are to be posted samples for the information of workers.

9. Air samples will be obtained inside the work areas as required to establish type of respirators to be used. Workers may be required to wear sample pumps for up to full shift periods.
10. If asbestos fibre levels, arsenic or hydrogen cyanide contaminants are above 50% of the protection factor of respirators in use, stop abatement, apply means of dust suppression, and use a higher safety factor in respiratory protection for personnel inside the enclosure or work area.
11. If air monitoring shows that areas outside work area or enclosures are contaminated, enclose, maintain and clean these areas, in a manner applicable to the work areas.
12. **Stop work** and implement corrective procedures when measurements outside of the abatement work area exceed 0.05 f/cc asbestos, 0.005 mg/m<sup>3</sup> arsenic, or if hydrogen cyanide is detected.
13. Occupational air quality monitoring shall be completed by dedicated on-site personnel from a specialized firm that is separate from the contractor workforce completing decontamination Work.

## Ambient Air Quality Monitoring Plan - Underground Stabilization

The detailed plan for ambient air quality monitoring carried out for the underground will, at a minimum, include the following:

1. A Real-Time Monitoring Program including portable, continual recording instruments; positioned along downwind perimeters of work areas, measuring PM<sub>10</sub> during construction activity.
2. Procedures that ensure action levels (Table 1) are achieved through the work day.
3. The monitoring results for dust will be recorded as averages, with an appropriate warning system in place to indicate any exceedances of action levels at the fence line.
4. Fixed monitors will be positioned on stable tripod along exposed downwind property perimeters at the start of each work day. Each monitoring site will measure and record fifteen (15) minute average concentrations (PM<sub>10</sub>) on a continuous basis throughout the work day.
5. All real-time measurements will be performed at predetermined locations, with exact locations selected prior to start of each work day based on a review of the prevailing wind direction(s), wind speeds, type of work activity and location of activity (source) in relation to downwind receptors. Fence line monitors, attached to tripods, will be positioned along downwind exposed perimeters to ensure adequate coverage and protection is provided between adjacent property boundary and remedial activity(s). The siting of monitors will primarily be driven by location of remedial work relative to fence line and wind direction. Real-time monitoring locations along all downwind perimeters shall be located prior to start of any scheduled remedial work.
6. Environmental effects air monitoring will also be carried out at four (4) sampling stations. The locations are to be the same locations used for previous air sampling programs at the site.
  - a) Air sampling for environmental effects will be conducted every six (6) days for a 24 hour period.
  - b) The following parameters are to be monitored: TSP, PM<sub>10</sub>, inorganic trace elements (from PM<sub>10</sub> filters). The inorganic metals are listed below:

Aluminum	Cobalt	Nickel	Vanadium
Antimony	Copper	Potassium	Zinc
Arsenic	Iron	Selenium	
Barium	Lead	Silver	
Beryllium	Lithium	Sodium	
Boron	Magnesium	Strontium	
Cadmium	Manganese	Thallium	
Calcium	Mercury	Tin	
Chromium	Molybdenum	Uranium	

- c) As a minimum, air monitoring samples are to meet the following 24 hour criteria:
- TSP: 120  $\mu\text{g}/\text{m}^3$  (adopted from Northwest Territories' Ambient Air Quality Standards)
  - PM<sub>10</sub>: 30  $\mu\text{g}/\text{m}^3$  (adopted from Northwest Territories' Ambient Air Quality Standards)
  - Arsenic: 0.3  $\mu\text{g}/\text{m}^3$  (adopted from Ontario's Ambient Air Quality Criteria)
  - Lead: 0.5  $\mu\text{g}/\text{m}^3$  (adopted from Ontario's Ambient Air Quality Criteria)
- d) Samples will be collected for the mass concentration of total suspended particulate matter (TSP) and particulate matter with an aerodynamic diameter less than or equal to a nominal ten (10) microns (PM<sub>10</sub>) in ambient air. Samples will be collected and analyzed in accordance with the following protocols:
- i. US EPA National Primary and Secondary Ambient Air Quality Standards, Appendix B – Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere (High-Volume Method) (40 CFR Subchapter C Part 50).
  - ii. US EPA National Primary and Secondary Ambient Air Quality Standards, Appendix M – Reference Method for the Determination of Particulate Matter as PM10 in the Atmosphere (40 CFR Subchapter C Part 50). Immediately report exceedances of air monitoring criteria to Departmental Representative and providing monthly air monitoring summaries.

**Table 1 - Summary of Action Levels for Dust Monitoring**

Parameter	Action Level	Monitoring Location	Averaging Period	Action Required if Level Exceeded
Dust plumes on site	Visible dust emissions on site	On-site	Not Applicable	If visible dust emissions are observed on-site, the Environmental Inspector is to conduct fugitive dust monitoring. The Environmental Inspector is to communicate the results and if the results require mitigation measures as outlined below.
PM <sub>10</sub>	180 µg/m <sup>3</sup>	At downwind project boundary or receptor (whichever is closer to the emission source)	15 Minutes	Site continues to operate. Contractor instructed by Environmental Inspector to investigate potential source of air emissions. Visible dust plumes on-site and/or sensory detection of organic odors shall be an early indicator that immediate corrective measures are warranted. First line of defense measures will include the addition of water sprays to control airborne dust at the source. Contractor to initiate appropriate measures to correct operations and protect air quality to have particulate concentrations below the action levels. Mitigative measures to be considered were previously outlined in Section 5.
PM <sub>10</sub>	125 µg/m <sup>3</sup>	At downwind project boundary or receptor (whichever is closer to the emission source)	1 - Hour	Temporary site relocation practices will be evaluated. The Contractor and the Environmental Inspector will evaluate work practices and determine the appropriate course of action. The site work location will be relocated until proper techniques are identified and implemented. Contractor to initiate appropriate control measures. Work shall resume within a short time period when corrective procedures are implemented.
PM <sub>10</sub>	85 µg/m <sup>3</sup>	At downwind project boundary or receptor (whichever is closer to the emission source)	4 - Hours	Stop work practices are implemented. The Contractor, Environmental Inspector and PWGSC will review corrective action(s) taken to date and identify additional measures to reduce air emissions. Construction practices and procedures will be examined to assess potential modifications. Work does not resume until a satisfactory strategy is formulated and implemented. Contractor, Environmental Inspector and PWGSC to agree on proposed strategy.
PM <sub>10</sub>	70µg/m <sup>3</sup>	At downwind project boundary or receptor (whichever is closer to the emission source)	8 - Hours	Site work is terminated for the remainder of the work day. The Contractor, Environmental Inspector and PWGSC will discuss and examine remaining options available to correct air emission exceedances. A course of action will be developed for the next day of remedial activity.