Asbestos Exposure Control Plan for Earthwork in Dawson City, YT

February 1, 2018

Prepared for:

Government of Yukon
Community Services
Infrastructure Development Branch

Prepared by:

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PROTECTING WORKERS DURING EARTHWORK

Activities that disturb sub-surfaces contaminated with serpentinite rock may release asbestos fibres into the air. Breathing in asbestos fibres can cause asbestosis, a serious lung disease characterized by scarring and thickening of the lungs, mesothelioma, and other lung cancers.

HOW TO INTERPRET THIS DOCUMENT:

The following points give context and are provided to assist the reader in interpreting this document.

- Asbestos is naturally occurring.
- The amount of asbestos that may become airborne during the earth works is unknown and could be negligible. Safety precautions are implemented due to the uncertainty until evidence is shown otherwise.
- This Exposure Control Plan (ECP) assumes a worst-case scenario for the potential for asbestos becoming airborne during earth works.
- Air monitoring during the earth work will be conducted to determine if airborne asbestos fibres are below the applicable occupational exposure limit.
- If it is found that asbestos fibre concentrations during earth works are below the Yukon Occupational Health and Safety limits, some controls may be reassessed, or altered within the work plan.

USE

This document has been prepared for the use of the Government of the Yukon and any entity working partnership or on its behalf on civil construction projects in Dawson City. It may be used as a standalone document or as a modified template for Government of Yukon or others to produce their own project or site-specific Asbestos Exposure Control Plan.

EMPLOYER

Government of Yukon, Department of Community Services, Infrastructure Development Branch
Box 2703 (C-13), Whitehorse, YT, Y1A 2C6

When work is being performed by another entity, that entity is considered the employer.

WORKSITE INFORMATION

The proposed worksites as of the date of publication of this document are shown in Appendix A and B. Worksite locations are subject to change.

- Refer to **Appendix A** City of Dawson Water & Sewer Infrastructure – North schematic
- Refer to **Appendix B** City of Dawson Water & Sewer Infrastructure – South schematic

PURPOSE

The purpose of the Exposure Control Plan (ECP) is:

- To protect workers from exposure to asbestos fibres during earthwork.
- To meet the legislated requirements of the Yukon Workers' Compensation Health and Safety Board (YWCHSB) Occupational Health and Safety (OHS) legislation.

RESPONSIBILITIES

The employer will:

- Ensure that supervisors and workers are educated in the hazards of asbestos exposure and trained to work safely with asbestos as detailed in this ECP.
- Ensure that the tools, equipment, and personal protective equipment (PPE) required to fully implement and maintain this ECP are readily available.
- Maintain written records of training (for example, training on this ECP and proper use of respirators), respirator fit-test results, tailgate meetings, asbestos air monitoring reports and field hazard assessments.
- Coordinate work with the prime contractor and other employers to ensure a safe work environment.

Supervisors will:

- Review this ECP and provide adequate instruction to workers on the hazards of asbestos.
- Select and implement the appropriate control measures.
- Ensure that workers using respirators have been properly trained and fit-tested and that the results are recorded.
- Ensure that work is conducted in a manner that minimizes and adequately controls the risk to workers and others. This includes ensuring that workers use appropriate engineering controls and wear the necessary PPE.
- Ensure that equipment and vehicle cabs are free from dust at the end of each shift.

Workers will:

- Know the details contained in this ECP and the hazards of asbestos dust exposure.
- Use the assigned PPE in an effective and safe manner.
- Follow established work procedures as directed by the supervisor.
- Report any unsafe conditions or acts to the supervisor.
- Report to the employer any exposure incidents or any signs or symptoms of asbestos-related illness.

BACKGROUND

Asbestos

- Asbestos is a term used to describe a group of naturally occurring fibrous minerals, divided according to their mineralogical properties, into serpentines (S-shaped) and amphiboles (needle-like).
- Asbestos has very useful physical properties such as heat resistance, tensile strength, and insulating properties.
- Asbestos has been used in over 3000 different commercial products worldwide and in a diverse range of industrial products from fireproofing to building construction materials.

Health Hazards from Asbestos Exposure

- Asbestos is classified by the International Agency for Research on Cancer (IARC), the American Conference of Governmental Industrial Hygienists (ACGIH), and the Environmental Protection Agency (EPA) as a class one, group A, human carcinogen.
- Asbestosis is a chronic lung disease resulting from prolonged exposure to asbestos dust. The fibres gradually cause the lungs to become scarred and stiff, making breathing difficult.
- Mesothelioma is a rare, rapidly progressing, malignant form of cancer affecting the lining of the chest or the abdominal cavity. There is a strong link between asbestos exposure and mesothelioma.
- Smoking tobacco in combination with inhaling asbestos greatly increases the risk of developing lung cancer.
- Workers exposed to asbestos-contaminated air can inhale the fibres.
- Due to the relationship between asbestos exposure and cancer, exposure to asbestos fibres must be kept as low as reasonably achievable (ALARA Principle).

Asbestos in City of Dawson

- An investigation report prepared in 1985, by J.S Murray and R.J. Cathro, reported that asbestos fibre-bearing serpentinite rocks underlay a 200-hectare portion of Midnight Dome at the north end of Dawson City.
- The serpentinite rocks contain tremolite and chrysotile asbestos fibres in the range of less than 0.1 percent (%) to 1%.
- The report states that the same concentration range of tremolite asbestos is present in two rock pits at the north end of the city, the Front Street Pit, located at the base of the Moosehide Slide, and the Fifth Avenue Pit, located at the corner of Albert Street and Fifth Avenue.
- Observations noted in the report indicate that asbestos fibres are suspected to be ubiquitous because the serpentinite was used as backfill during construction of the sewer and water systems in 1979, to build roadbeds, and to build rock pads for buildings throughout the city. Note: the risk is assumed to be associated with sub-surface materials and not on the surface.
- Dawson City was also the staging area for shipments of asbestos from the Clinton Mine, and the authors believe that asbestos contamination at the old Skyline docks from this activity occurred.
- A geotechnical investigation in September 2013, for a new subdivision site north of Albert Street, found asbestos in the bedrock at depths as shallow as 2.0 metres and within the subsurface soil overlying the bedrock.
- Soil sampling at various depths in the crawlspace and areas adjacent to the crawlspace of the Palace Grand Theater was completed in 2016. Chrysotile asbestos was detected in 10 of the 11 samples collected within the crawlspace area, at depths ranging from approximately five centimetres to 38 centimetres. Chrysotile asbestos was detected in six of seven samples collected outside of the footprint of the building, at depths ranging from 0.8 metres to 2.3 metres. Chrysotile asbestos was also detected at the Commanding Officer's Quarters site (508 Fifth Avenue), at the Commissionaire's Residence site (602 Front Street), and the Maintenance Compound site (1324 Third Avenue).
- Air sampling during soil disturbance was conducted for one day at the Palace Grand Theater site only. Three ambient air samples were collected downwind of the soil sampling locations, and two occupational samples were collected on a worker hand-digging to collect soil samples. The air samples were initially analyzed according to the National Institute for Occupational Safety and Health (NIOSH) Method 7400, Asbestos and Other Fibers by Phase Contrast Microscopy (PCM), and then analyzed specifically for asbestos fibres using Transmission Electron Microscopy in accordance with NIOSH Method 7402 Asbestos by TEM. The ambient air sample results measured by PCM analysis ranged from less than (<) 0.002 to 0.054 fibres per cubic centimeter (f/cc), and TEM analysis detected no asbestos fibres.
- In 2017, 11 borehole samples were analyzed for asbestos, 10 were positive for tremolite asbestos and chrysotile asbestos in the range of 0.11 % to 1.4 %, refer to **Appendix C** for locations and depth.
- To date, there has been no systematic program of air quality testing to determine the concentration of asbestos fibres in the air in Dawson City.

Further air quality monitoring is required in a variety of different locations to determine if airborne asbestos concentrations during subgrade earth works is below the applicable occupational exposure limits.

RISK IDENTIFICATION

Soil samples cannot be used to estimate the risk of contracting an asbestos-related illness. However, they are useful in estimating the extent of contamination and the type of asbestos present which may become airborne. If the earthwork disturbs the surface/sub-surface that contains asbestos, workers may breathe in asbestos fibres. Based on the evidence detailed above it is reasonable to expect that asbestos fibres may be present in the:

- Front Street Pit;
- Fifth Avenue Pit;
- bedrock at depths as shallow as 0.2 metres;
- subsurface soil overlying the bedrock;
- backfill covering the sewer and water systems;
- roadbeds;
- rock pads used for buildings throughout the city; and
- old Skyline docks.

APPLICABLE LEGISLATION

Yukon Occupational Health and Safety Legislation

The Yukon Occupational Health Regulations (O.I.C. 1986/164) under the Occupational Health and Safety Act Section 34 to Section 41 detail the requirements for worker exposure control to asbestos. The requirements are specific to indoor situations but the four basic principles of handling asbestos outdoors should be followed:

- Isolate the work area;
- Protect workers;
- Minimize the release of fibres; and
- Ensure adequate clean-up and decontamination.

Before a project can start, a pre-project meeting must be conducted with the contractor, the on-site supervisor and an Occupational Health and Safety Officer from the Yukon Workers' Compensation Health and Safety Board.

Maximum Permissible Concentration (MPC)

The Yukon Occupational Health Regulations (O.I.C. 1986/164) under the Occupational Health and Safety Act, Table 10 Mineral Dust lists the MPC for asbestos. The MPC is an airborne concentration to which it is believed that nearly all workers may be exposed, day after day, without suffering from adverse health effects. An 8-hour MPC refers to the average airborne concentration of a substance that a worker is exposed to over an 8-hour period.

The 8-hour MPC assumes that worker exposure typically occurs for an 8-hour period with a 16-hour recovery period. When the worker is exposed for more than eight hours, the 8-hour MPC must be adjusted. This adjustment to the MPC compensates for exposure during longer work shifts by reducing the permissible concentration in proportion to both the increase in exposure time and the decrease in recovery time.

- The MPC for an 8-hour work shift for tremolite and chrysotile asbestos is 0.5 fibres per millilitre of air (f/mL).[1]
- The MPC for a 12-hour shift is reduced by 50% and is 0.25 f/mL.

Special Waste Regulations

A waste permit is not required for unbound asbestos disposal because it is regulated under the Yukon Occupational Health and Safety Regulations. Waste asbestos must be buried at a permitted solid waste disposal facility (SWDF) or commercial dump. Before the project begins confirmation on whether the selected SWDF operator accepts asbestos waste should be completed.

CONTROLS TO PROTECT WORKERS

The summary of anticipated earthwork tasks with the required control methods to protect workers is provided in **Appendix D**.

Since asbestos exposure is linked to lung cancer, the best practice of reducing workplace exposures to levels as low as reasonably achievable (ALARA principle) will be the objective of this ECP. To minimize dust emissions, it is best to evaluate the excavation process itself, the transfer points, and the routes for trucks to determine the ways to reduce dust emissions. For example, this should include, as applicable:

- Water spray of road and transfer points (where roads are disturbed by heavy construction equipment);
- Where possible, enclosure of transfer points;
- Minimization of exposed soil surfaces (cover excavations and trenches, where it is practical to do so); and
- Utilization of wind deflectors (e.g. away from housing, etc.).

Use of respirators as a primary control is not acceptable. Respirators will be used in conjunction with other controls such as water to reduce worker exposure to asbestos, unless air monitoring results suggests otherwise.

Ongoing monitoring of the implemented controls for their effectiveness will be conducted and corrective actions will be applied to correct any identified deficiencies.

The selection of asbestos fibre control measures always begins with the implementation of engineering controls (i.e., controlling the potential release of fibres at the source). In addition to engineering controls, administrative controls are also implemented (to reduce the amount of airborne asbestos fibres released to coming into contact with the worker). As a last line of defense against exposures to airborne asbestos fibres, personal protective equipment is used to minimize workers' exposures.

Should air monitoring results demonstrate that the implemented engineering controls and administrative controls are effective enough to keep airborne asbestos fibre concentrations during earth works below the Yukon Occupational Health and Safety limits, some controls may be reassessed, or altered within the work plan.

1. Engineering

- Erect solid screens or barriers around dusty activities or the site boundary;

[1] The unit measure fibre per cubic centimeter (f/cc) can be converted with no calculation to fibre per milliliter f/ml as one centimeter cubed is equal to one milliliter. For the purposes of this assessment all concentrations will be discussed in f/ml.

- Keep site fencing and barriers clean using wet methods;
- Heavy equipment and light vehicle operator enclosed in the cab, with the windows closed, and either the heat or air-conditioning system equipped with a high efficiency particulate air (HEPA) filter at all times to maintain positive pressure. Where this is not possible, operators may also be instructed to wear the same PPE as the workers in excavation, since dust/asbestos fibres may travel to the inside of the cab (through open windows, or doors that are regularly opened and closed);
- Ensure effective water suppression is used during manual and mechanical earthwork operations whenever possible; hand held sprays can be very effective because water can be directed to where it is needed; manually controlled high volume water suppression systems can produce fine water droplets that effectively bring the dust particles to the ground;
- Minimize drop heights from loading shovels/excavators and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;
- Contain and collect worksite runoff of water or mud. Consideration should be given to collecting worksite runoff into portable setting tanks;
- Cover soil/backfill stockpiles to prevent wind whipping and disturbance;
- If dump trucks are used to move surface/subsurface material, ensure the load is covered to prevent escape during transport;
- Ensure all equipment, including heavy equipment, is sprayed down with water before leaving the worksite to prevent tracking of surface/sub-surface material out of the site; site personnel may want to consider implementing a wheel washing system with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable; and
- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilize surfaces and protect subsurface as soon as practicable.

2. Administrative Controls

- Conduct a preplanning meeting to ensure work is coordinated and dust control is in place;
- When working on a multi-employer site, provide the prime contractor with a copy of the asbestos exposure control plan and respiratory protective equipment code of practice and other safe work procedures. Review the procedures and work schedule with the prime contractor to determine if additional measures are required to reduce worker exposure to asbestos;
- A work perimeter of at least 30 metres or up to the property boundary, where possible, will be established with fencing and signage; the signage will state the following:

Danger

Asbestos

Authorized Personnel Only

Eating, Drinking, and Smoking are Prohibited

- Post warning signs with work schedules around the work area;
- Post the name and contact details of person(s) accountable for air quality;
- Post the name and contact details of person(s) accountable for dust issues on the site boundary;
- Post the regional office contact information;
- The wind speed will be measured by an anemometer, and work will be suspended when wind speeds are above 20 km/hr (based on industry best practices);
- No smoking, eating or drinking in the work area; a separate area must be provided for breaks;
- Complete daily on-site inspection to visually monitor dust release. **Stop work** if excessive dust is observed (i.e., if visibility is reduced, excessive dust is settling on surfaces (more than usual), or if clouds of dust are evident), and record inspection results;
- The waste receptacles and equipment used for the project will be inside the perimeter; and

- When there is no work within the worksite, the gate will be locked.

3. Personal Protective Equipment

- Disposable coveralls to be worn over street clothing where applicable;
- Disposable coveralls must be impervious to penetration by asbestos fibres;
- Disposable coveralls must cover the body and fit snugly at the neck, wrists, and ankles;
- Disposable coveralls must include a head covering;
- Foot coverings must be rubber boots;
- National Institute for Occupational Safety and Health (NIOSH) approved half-face, dual-cartridge respirator with NIOSH P100 (HEPA) filters which will protect the workers up to 1 asbestos f/mL of air;
- All workers required to wear respirators must be clean-shaven;
- All workers must be provided fit testing and training when first provided with the respirator;
- All workers must check the operation and fit of their respirator by completing either a positive or negative pressure/seal test before each use; if the facepiece does not collapse or bulge, then it is not sealed correctly or the valves are leaking; the problem must be corrected and rechecked;
- When the worker notices a notable resistance to breathing, the respirator filters must be replaced; and
- Respirators will be used, cleaned, and stored in accordance with the respiratory protection code of practice.

HOUSEKEEPING

- Dry sweeping and the use of compressed air are **prohibited** for removing dust and debris containing asbestos from inside vehicle cabs, equipment or clothing;
- Work areas and equipment covered by dust will be cleaned at the end of every shift using a HEPA filter vacuum or wet-wiping; and
- Any slurry should be contained and cleaned up to avoid secondary dust exposure hazard.

DECONTAMINATION

At the end of the work-shift and whenever a worker leaves the designated area (e.g. lunch/breaks) the following must be completed:

- Remove the respiratory protective equipment last;
- Before removing coveralls, clean all visible dust from disposable coveralls and foot covers using a HEPA vacuum or wet-wiping;
- Place disposable clothing in a sealable container; label the container to identify its contents as asbestos waste;
- Wet-wipe the respiratory protective equipment before removing; place in clean Ziploc® bag, seal and store in a designated clear area until used again;
- Work areas and equipment covered by dust will be cleaned at the end of every shift using a HEPA filter vacuum or wet-wiping; and
- Any slurry should be contained and cleaned up to avoid secondary dust exposure hazard.

TRAINING

- Training on this ECP will be conducted/presented by the employer or the employer's designate;
- Records of attendance, dates of training, and training material will be documented and retained; and
- Additional training or reference material on asbestos dust exposure will be made available to employees upon request.

ASBESTOS WASTE TRANSPORTATION AND DISPOSAL

- All asbestos waste will be transported and disposed of in accordance with the Yukon Environmental legislation and the Yukon Transportation of Hazardous Materials legislation;
- The waste bins/trailers/truck box must be covered before leaving the worksite to prevent dust from escaping during transport; and
- Before removing asbestos waste containers from the work area, clean the external surfaces by wiping with a damp cloth or using a HEPA vacuum.

AIR MONITORING TO DETERMINE ADEQUACY OF CONTROLS AND COMPLIANCE

- Air monitoring will be completed in accordance with the Yukon OHS legislation;
- Air monitoring will be in accordance to the National Institute for Occupational Safety and Health (NIOSH) Method 7400, Asbestos and Other Fibers by Phase Contrast Microscopy (PCM). This analytical method is the method referenced by Yukon Occupational Health and Safety authority;
- Air monitoring will be conducted in the breathing zone of select workers for the entire work-shift;
- Should air monitoring results demonstrate that the implemented engineering controls and administrative controls are effective enough to keep airborne asbestos fibre concentrations during earth works below 50% the Yukon Occupational Health and Safety limits, some controls may be reassessed, or altered within the work plan.
- If air monitoring results are consistently below 10% the MPC controls may be re-evaluated and modified; and
- Air sample results must be available prior to the start of work the following day.

HEALTH SURVEILLANCE

- Workers must report any symptoms of asbestos exposure to the employer and a healthcare practitioner or physician for investigation.

ANNUAL REVIEW

- This ECP will be reviewed, at least annually, and updated as necessary by the employer, in consultation with the workplace health and safety committee or the worker health and safety representative.

REFERENCES

1. WorkSafeBC Safe Work Practices for Handling Asbestos, 2017 (https://www.worksafebc.com/en/...safety/.../safe-work-practices-for-handling-asbestos)

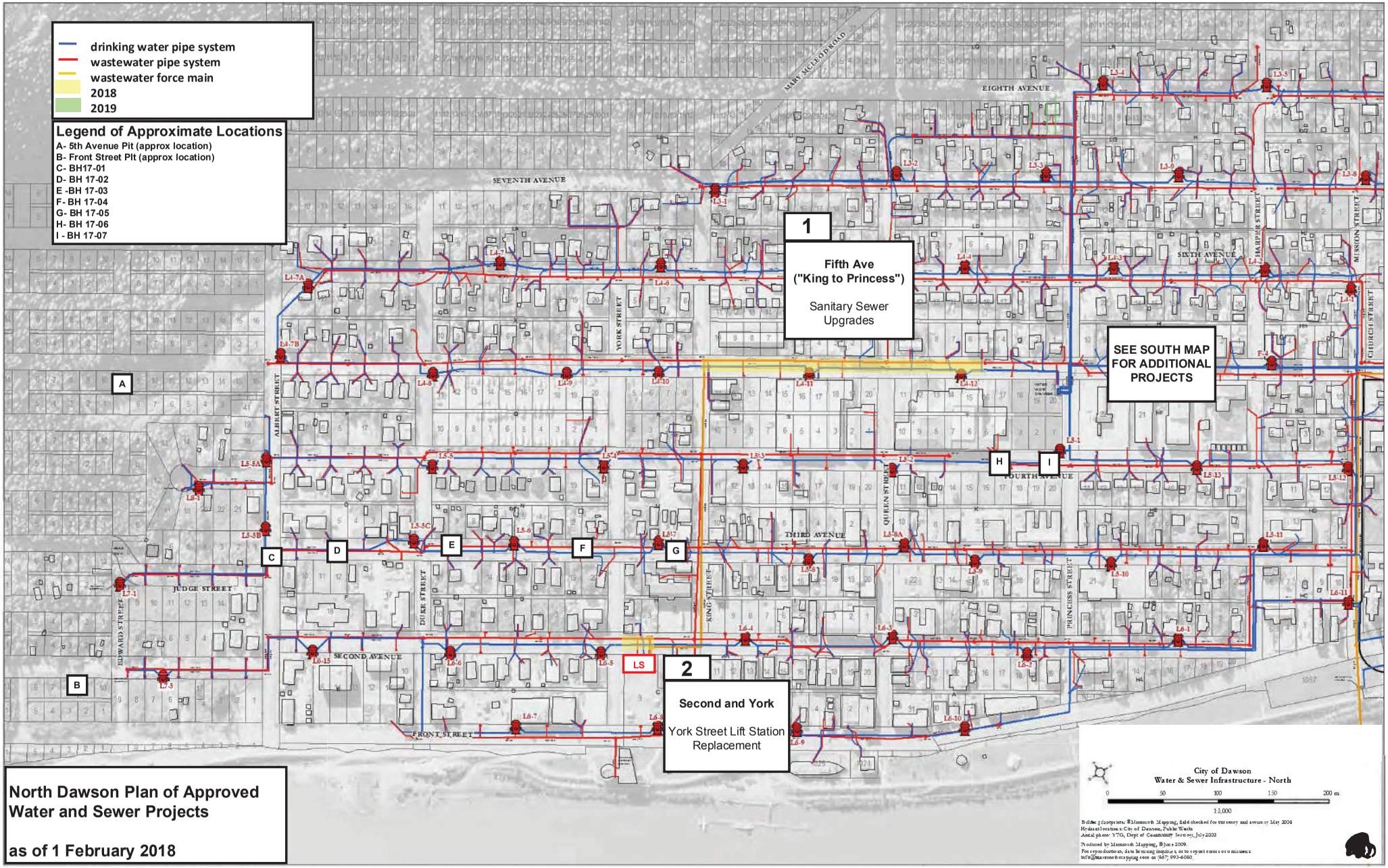
2. Alberta Labour Asbestos Abatement Manual (https://work.alberta.ca/occupational-health-safety/alberta-asbestos-abatement-manual.html)

3. The Yukon Occupational Health Regulations (O.I.C. 1986/164) under the Occupational Health and Safety Act Section 34 to Section 41 (http://www.gov.yk.ca/legislation/regs/oic1986D164.pdf

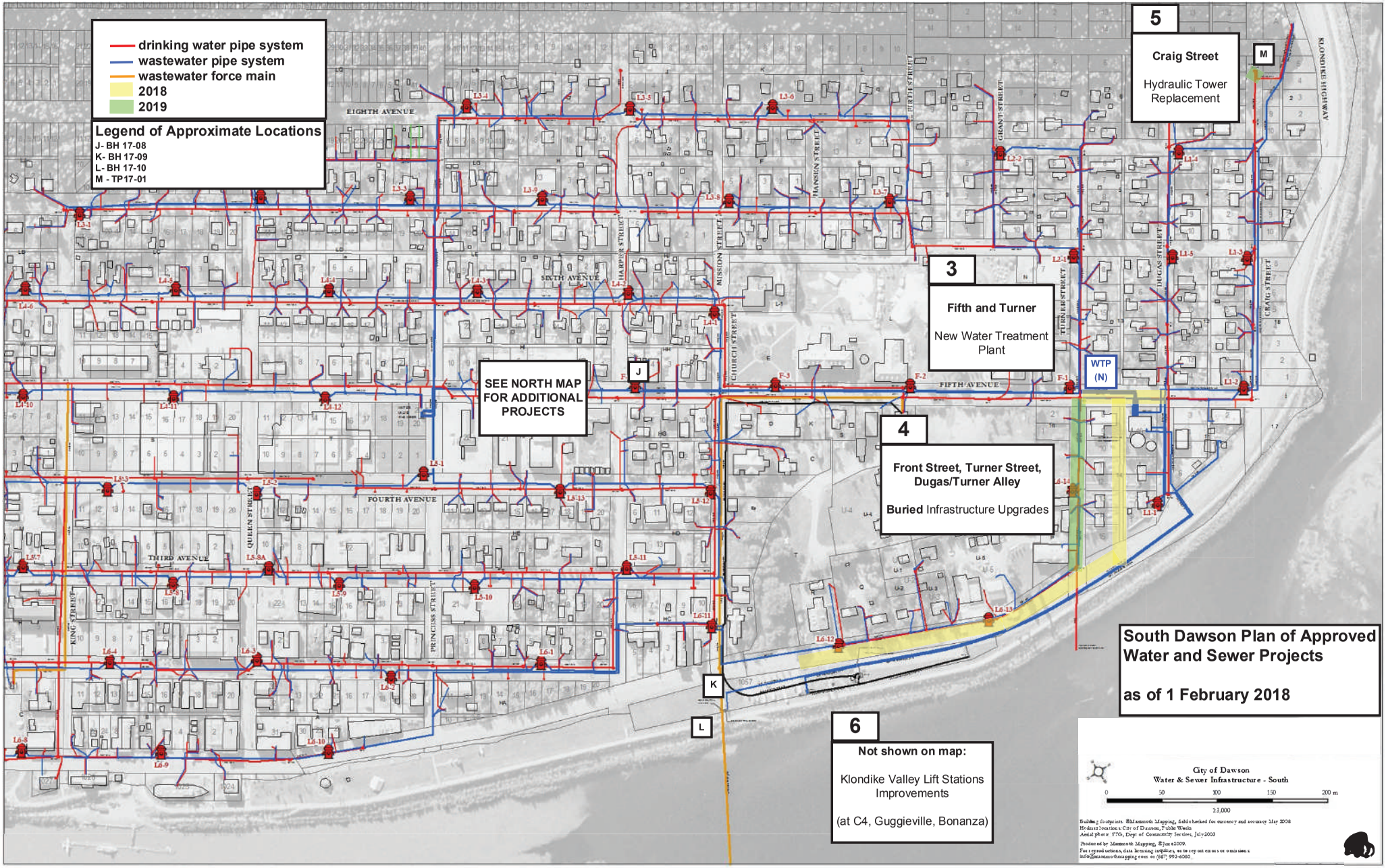
4. U.S Department of Health and Human Services Agency for Toxic Substances and Disease Registry Division of Health Assessment and Consultation, June 2007. Health Consultation Exposure Investigation Final Report Ambler Gravel Pit Ambler, Alaska (https://www.atsdr.cdc.gov/hac/pha/amblergravelpiteijune2007/amblergravelpithcei06282007.pdf

APPENDICES

Appendix A CITY OF DAWSON WATER & SEWER INFRASTRUCTURE – NORTH SCHEMATIC


drinking water pipe system
wastewater pipe system
wastewater force main
2018
2019
Legend of Approximate Locations
A- 5th Avenue Pit (approx location)
B- Front Street Pit (approx location)
C- BH17-01
D- BH 17-02
E -BH 17-03
F- BH 17-04
G- BH 17-05
H- BH 17-06
I - BH 17-07
1
Fifth Ave ("King to Princess")
Sanitary Sewer Upgrades
SEE SOUTH MAP FOR ADDITIONAL PROJECTS
2
Second and York
York Street Lift Station Replacement
LS
SEVENTH AVENUE
EIGHTH AVENUE
SIXTH AVENUE
FOURTH AVENUE
THIRD AVENUE
SECOND AVENUE
FRONT STREET
JUDGE STREET
ALBERT STREET
YORK STREET
DUKE STREET
KING STREET
QUEEN STREET
PRINCESS STREET
HARPER STREET
CHURCH STREET
MISSION STREET
HOWARD STREET
MARY MCLEOD ROAD
City of Dawson
Water & Sewer Infrastructure - North
0 50 100 150 200 m
1:3,000
North Dawson Plan of Approved Water and Sewer Projects
as of 1 February 2018

Appendix B CITY OF DAWSON WATER AND SEWER INFRASTRUCTURE – SOUTH SCHEMATIC


drinking water pipe system
wastewater pipe system
wastewater force main
2018
2019
Legend of Approximate Locations
J- BH 17-08
K- BH 17-09
L- BH 17-10
M - TP17-01
5
Craig Street
Hydraulic Tower Replacement
3
Fifth and Turner
New Water Treatment Plant
4
Front Street, Turner Street, Dugas/Turner Alley
Buried Infrastructure Upgrades
SEE NORTH MAP FOR ADDITIONAL PROJECTS
WTP (N)
6
Not shown on map:
Klondike Valley Lift Stations Improvements
(at C4, Guggieville, Bonanza)
EIGHTH AVENUE
SIXTH AVENUE
FIFTH AVENUE
FOURTH AVENUE
THIRD AVENUE
KING STREET
QUEEN STREET
PRINCESS STREET
CHURCH STREET
MISSION STREET
HARPER STREET
HANSEN STREET
BIRCH STREET
GRANT STREET
TURNER STREET
DUGAS STREET
CRAIG STREET
KLONDIKE HIGHWAY
South Dawson Plan of Approved Water and Sewer Projects
as of 1 February 2018
City of Dawson
Water & Sewer Infrastructure - South
0 50 100 150 200 m
1:3,000

Appendix C SOIL TEST RESULTS COLLECTED DURING GEOTECNICAL DRILLING OCTOBER 2017.

Borehole	Location	Sample No.	Depth (m)	Percent Asbestos[1]	Tremolite Asbestos	Chrysotile Asbestos
BH17-01	3rd and Albert St	ASA1	1	0.11	Y	Y
BH17-02	3rd between Albert St and Duke St.	ASA2	0.2	0.18	Y	Y
BH17-03	3rd and Duke St.	ASA3	0.5	0.22	Y	Y
BH17-04	3rd and York St.	ASA4	1.3	0.21	N	Y
BH17-05	3rd between York St. and King St.	ASA5	0.4	0.37	N	Y
BH17-06	RSS field north end	ASA6	0.8	0.22	Y	Y
BH17-07	RSS field south end	ASA7	0.3	1.4	N	Y
BH17-08	5th and Harper St.	ASA8	0.3	1.36	Y	Y
BH17-09	Grass between dike and Front St, in line with Church St	ASA9	0.4	0.45	Y	Y
BH17-10	Dike in line with Church St.	ASA10	5	<0.01	Y	Y
TP17-01	Craig St. Hill	ASA11	0.2	0.06	Y	Y

[1] Analytical Method Transmission Electron Microscopy (TEM) EPA 600/R-93/116 for presence of asbestos; greater than or equal to 0.1% detectable asbestos in soil, mass of asbestos fibres per total mass of soil sample

Appendix D EARTHWORK TASKS AND CONTROLS

Table 1: Earthwork Tasks and Controls

Tasks	Water Spray		Operator Cab Positive-Pressure with HEPA filter		Disposable Coveralls and Rubber Boots		NIOSH Half-face Respirator with P-100 Filters		Other Controls
Excavation and Trenching									
1. Excavation with operator in closed-cab of excavator: • Material excavated from trench/hole is piled adjacent to the trench/hole; • Pipe placement in trench; • Backfill of trench; and • Loaded into a dump truck and hauled away.	Yes	No[1]	Yes	No[2]	No	Yes[3]	No	Yes[3]	As detailed in Controls to Protect Workers Section of ECP.
2. Hand excavation 3. QA/QC tasks or other tasks involving worker in trench.	Yes	No[1]	No		Yes[4]		Yes[4]		As detailed in Controls to Protect Workers Section of ECP.

Notes:

[1] If water spray not available, then disposable coveralls and respirator required until air-monitoring results below 50% OEL (MPC)
[2] If positive-pressure HEPA cab not available or not maintained, then disposable coveralls and respirator required until air-monitoring results below 50% OEL
[3] If no water spray available, or positive-pressure cab, and if air-monitoring results are above 50% OEL (MPC)
[4] If no water spray available and if air-monitoring results are above 50% OEL (MPC)

Table 1: Earthwork Tasks and Controls

Tasks	Water Spray		Operator Cab Positive-Pressure with HEPA filter	Disposable Coveralls and rubber boots		NIOSH Half-face respirator with P-100 filters		Other Controls
Water/Sewer Pipe Manhole/Lift Station Wet Well Installations								
1. Manual installation of bedding material at the bottom of the trench.	Yes	No[1]	No	Yes[4]		Yes[4]		As detailed in Controls to Protect Workers Section of ECP.
2. Compaction of trench floor with manually-operated compactor. 3. Placement of additional bedding material around pipe and compaction with manually-operated compactor.	Yes	No[1]	No	Yes[4]		Yes[4]		As detailed in Controls to Protect Workers Section of ECP.
4. Compaction of trench backfill with an open-air ride-on packer or a walk-behind packer	Yes	No[1]	No	No	Yes[4]	No	Yes[4]	As detailed in Controls to Protect Workers Section of ECP.

Notes:

[1] If water spray not available, then disposable coveralls and respirator required until air-monitoring results below 50% OEL (MPC)
[2] If positive-pressure HEPA cab not available or not maintained, then disposable coveralls and respirator required until air-monitoring results below 50% OEL
[3] If no water spray available, or positive-pressure cab, and if air-monitoring results are above 50% OEL (MPC)
[4] If no water spray available and if air-monitoring results are above 50% OEL (MPC)

Table 1: Earthwork Tasks and Controls								
Tasks	**Water Spray**		**Operator Cab Positive-Pressure with HEPA filter**	**Disposable Coveralls and rubber boots**		**NIOSH Half-face respirator with P-100 filters**		**Other Controls**
Manhole/Lift Station Wet Well Installation								
1. Placement of formwork and rebar for concrete on top of the gravel in hole	Yes	No[1]	No	No	Yes[4]	No	Yes[3]	As detailed in Controls to Protect Workers Section of ECP.
2. Concrete poured and finished. 3. Wet well is craned in and placed on top of the concrete pad.	No		No	No		No		Consider applicable administrative and engineering controls (e.g. vehicle traffic in work area may create dust so may consider water spray for roads, and all vehicles should be sprayed down when leaving worksite).

Notes:

[1] If water spray not available, then disposable coveralls and respirator required until air-monitoring results below 50% OEL (MPC)
[2] If positive-pressure HEPA cab not available or not maintained, then disposable coveralls and respirator required until air-monitoring results below 50% OEL
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[4] If no water spray available and if air-monitoring results are above 50% OEL (MPC)