



Product Name: UNLEADED GASOLINE
 Revision Date: 01 Oct 2018
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Packing Group: II
 Marine Pollutant: Yes
 Special Provisions: 17, 88, 98, 150
 Footnote: Marine Pollutant designation is applicable only if shipped over water.

LAND (DOT)
 Proper Shipping Name: GASOLINE
 Hazard Class & Division: 3
 ID Number: 1203
 Packing Group: II
 ERG Number: 128
 Label(s): 3
 Transport Document Name: UN1203, GASOLINE, 3, PG II

SEA (IMDG)
 Proper Shipping Name: MOTOR SPIRIT or GASOLINE or PETROL
 Hazard Class & Division: 3
 EMS Number: F-E, S-E
 UN Number: 1203
 Packing Group: II
 Marine Pollutant: No
 Label(s): 3
 Transport Document Name: UN1203, MOTOR SPIRIT or GASOLINE or PETROL, 3, PG II, (-40°C c.c.)

AIR (IATA)
 Proper Shipping Name: MOTOR SPIRIT or GASOLINE or PETROL
 Hazard Class & Division: 3
 UN Number: 1203
 Packing Group: II
 Label(s) / Mark(s): 3
 Transport Document Name: UN1203, GASOLINE, 3, PG II

SECTION 15 REGULATORY INFORMATION

CEPA: All components of this product are either on the Domestic Substance List (DSL) or are exempt. Listed or exempt from listing/notification on the following chemical inventories (May contain substance(s) subject to notification to the EPA Active TSCA inventory prior to import to USA): AICS, DSL, ENCS, KECl, PICCS, TSCA

The Following Ingredients are Cited on the Lists Below:

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| Chemical Name | CAS Number | List Citations |
|---------------|------------|----------------|
| Benzene | 71-43-2 | 6 |
| CUMENE | 96-82-9 | 6 |
| CYCLOHEXANE | 110-82-7 | 6 |
| ETHYL BENZENE | 100-41-4 | 6 |
| n-Hexane | 110-54-3 | 6 |
| Naphthalene | 91-20-3 | 6 |
| Toluene | 108-88-3 | 6 |
| XYLENES | 1330-20-7 | 6 |

1 = TSCA4
 2 = TSCA 5a2
 --REGULATORY LISTS SEARCHED--
 3 = TSCA 5e
 4 = TSCA 6
 5 = TSCA 12b
 6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable
 KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
 H224: Extremely flammable liquid and vapor; Flammable Liquid, Cat 1
 H225: Highly flammable liquid and vapor; Flammable Liquid, Cat 2
 H226: Flammable liquid and vapor; Flammable Liquid, Cat 3
 H302: Harmful if swallowed; Acute Tox Oral, Cat 4
 H303: May be harmful if swallowed; Acute Tox Oral, Cat 5
 H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
 H312: Harmful in contact with skin; Acute Tox Dermal, Cat 4
 H313: Causes skin irritation; Skin Corrosion, Cat 2
 H314: Causes serious eye irritation; Serious Eye Damage/Irr, Cat 2A
 H319: Causes eye irritation; Serious Eye Damage/Irr, Cat 2B
 H332: Harmful if inhaled; Acute Tox Inh, Cat 4
 H335: May cause respiratory irritation; Target Organ Single, Resp Irr
 H336: May cause drowsiness or dizziness; Target Organ Single, Narcotic
 H340 (IB): May cause genetic defects; Germ Cell Mutagenicity, Cat 1B
 H350 (IB): May cause cancer; Carcinogenicity, Cat 1A
 H350 (IB): May cause cancer; Carcinogenicity, Cat 1B
 H351: Suspected of causing cancer; GHS Carcinogenicity, Cat 2
 H361 (D): Suspected of damaging the unborn child; Repro Tox, Cat 2 (Develop)
 H361 (F): Suspected of damaging fertility; Repro Tox, Cat 2 (Fertility)
 H372: Causes damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 1
 H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2
 H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
 H401: Toxic to aquatic life; Acute Env Tox, Cat 2
 H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1
 H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2
 H412: Harmful to aquatic life with long lasting effects; Chronic Env Tox, Cat 3

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:



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Updates made in accordance with implementation of GHS requirements.

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DEK: 500481 (1006754)

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APPENDIX F: Monthly Fuel Tank Inspection

Monthly Fuel Tank Inspection will be performed on IAUDITOR (APP) and is where records will be kept. This form can also be used.



Monthly Tank Inspection Checklist

General Inspection Information:

Inspection Date: _____ Prior Inspection Date: _____
 Inspector Name (print): _____
 Inspector Signature: _____
 Tank Inspected or ID #: _____

Inspection Guidance:

- This checklist is intended as a model. Locally developed checklists are acceptable as long as they are substantially equivalent (as applicable). Inspections of multiple tanks may be captured on one form as long as the tanks are substantially the same.
- For equipment not included in this Standard, follow the manufacturer recommended inspection/testing schedules and procedures.
- Upon discovery of water in the primary tank, secondary containment area, interstice, or spill container, remove promptly or take other corrective action. Inspect the liquid for regulated products or other contaminants and dispose of properly.
- Retain the completed checklists for at least 36 months.
- After severe weather (snow, ice, wind storms) or maintenance (such as coating) that could affect the operation of critical components (normal and emergency vents, valves), an inspection of these components is required as soon as the equipment is safely accessible after the event.

| ITEM | STATUS | Comments/Date Corrected |
|--|--|-------------------------|
| Tanks and Pipes | | |
| Is tank exterior (roof, shell, heads, bottom, concrete, fittings, etc.) free of visible leaks? Note: If 'No', identify tank and describe leak and actions taken | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Is the tank liquid level gauge legible and in good working condition? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Is the area around the tank (concrete surfaces, ground, containment, etc.) free of visible signs of leakage? | <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| Is the primary tank free of water or has another preventative measure been taken? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA | |
| For double-wall or double bottom tanks, is interstitial monitoring equipment (where applicable) in good working condition? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA | |
| For double-wall tanks or double bottom tanks, is interstice free of liquid? Remove the liquid if it is found. If tank product is found, investigate possible leak. | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Equipment on Tank | | |
| Is the spill container (spill bucket) empty, free of visible leaks and in good working condition? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Are piping connections to the tank (valves, fittings, | <input type="checkbox"/> Yes | |

| | |
|--|--|
| pumps, etc.) free of visible leaks? Note: If 'No', identify location and describe leak. | <input type="checkbox"/> No <input type="checkbox"/> NA |
| Do the ladders/platforms/walkways appear to be secure with no sign of severe corrosion or damage? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA |
| Containment | |
| Is the containment free of excess liquid, debris, cracks, corrosion, erosion, fire hazards and other integrity issues? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA |
| Are containment egress pathways clear and any gates/doors operable? | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA |
| Other Conditions | |
| Is the system free of any other conditions that need to be addressed for contained safe operation? | <input type="checkbox"/> Yes <input type="checkbox"/> No |

Additional Comments:

APPENDIX C – REPORTABLE SPILL QUANTITIES

| Substance | Reportable Quantity |
|---|--|
| Explosives Compressed gas (toxic/corrosive) Infectious substances Sewage and wastewater (unless otherwise authorized) Radioactive materials Unknown substances | Any amount |
| Compressed gas (flammable) Compressed gas (non-corrosive, non-flammable) | Any amount of gas from containers with a capacity greater than 100 L |
| Flammable liquid | ≥100 L |
| Flammable solid Substances liable to spontaneous combustion Water-reactant substances | ≥25 kg |
| Oxidizing substances | ≥50 L or 50 kg |
| Organic peroxides Environmentally hazardous substances intended for disposal | ≥1 L or 1 kg |
| Toxic substances | ≥5 L or 5 kg |
| Corrosive substances Miscellaneous products, substances, or organisms | ≥5 L or 5 kg |
| Polychlorinated biphenyl mixtures of 5 ppm or more | ≥0.5 L or 0.5 kg |
| Other contaminants, such as crude oil, drilling fluid, produced water, waste or spent chemicals, used or waste oil, vehicle fluids, wastewater | ≥100 L or 100 kg |
| Sour natural gas (i.e., contains hydrogen sulphide) Sweet natural gas | Uncontrolled release or sustained flow of 10 minutes or more |
| Flammable liquid Vehicle fluid | ≥20 L When released on a frozen waterbody that is being used as a working surface |
| Reported releases or potential releases of any size that: | Any amount |

| Substance | Reportable Quantity |
|--|---------------------|
| <ul style="list-style-type: none">• are near or in an open waterbody;• are near or in a designated sensitive environment or habitat;• pose an imminent threat to human health or safety; or• pose an imminent threat to a listed species at risk or its critical habitat. | |

Table information from :[Report a spill | Environment and Natural Resources \(gov.nt.ca\)](http://gov.nt.ca)

APPENDIX D – NT-NU SPILL REPORT FORM



NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND
OTHER HAZARDOUS MATERIALS



NT-NU 24-HOUR SPILL REPORT LINE

Tel: (867) 920-8130 • Email: spills@gov.nt.ca

REPORT LINE USE ONLY

| | | | | | |
|---|---|--|---|-----------------------------|----------------------|
| A | Report Date: MM DD YY | Report Time: | <input type="checkbox"/> Original Spill Report OR <input type="checkbox"/> Update # _____ to the Original Spill Report | Report Number: | |
| | Occurrence Date: MM DD YY | Occurrence Time: | | | |
| C | Land Use Permit Number (if applicable): | Water Licence Number (if applicable): | | | |
| D | Geographic Place Name or Distance and Direction from the Named Location: | | Region: <input type="checkbox"/> NT <input type="checkbox"/> Nunavut <input type="checkbox"/> Adjacent Jurisdiction or Ocean | | |
| E | Latitude: _____ Degrees _____ Minutes _____ Seconds | | Longitude: _____ Degrees _____ Minutes _____ Seconds | | |
| F | Responsible Party or Vessel Name: | Responsible Party Address or Office Location: | | | |
| G | Any Contractor Involved: | Contractor Address or Office Location: | | | |
| H | Product Spilled: <input type="checkbox"/> Potential Spill | Quantity in Litres, Kilograms or Cubic Metres: | U.N. Number: | | |
| I | Spill Source: | Spill Cause: | Area of Contamination in Square Metres: | | |
| J | Factors Affecting Spill or Recovery: | Describe Any Assistance Required: | Hazards to Persons, Property or Environment: | | |
| K | Additional Information, Comments, Actions Proposed or Taken to Contain, Recover or Dispose of Spilled Product and Contaminated Materials: | | | | |
| L | Reported to Spill Line by: | Position: | Employer: | Location Calling From: | Telephone: |
| M | Any Alternate Contact: | Position: | Employer: | Alternate Contact Location: | Alternate Telephone: |

REPORT LINE USE ONLY

| | | | | | |
|---|----------------------------|---------------|--|------------------|--|
| N | Received at Spill Line by: | Position: | Employer: | Location Called: | Report Line Number: |
| Lead Agency: <input type="checkbox"/> EC <input type="checkbox"/> CCG/TCMSS <input type="checkbox"/> GNWT <input type="checkbox"/> GN <input type="checkbox"/> ILA <input type="checkbox"/> AANDC <input type="checkbox"/> NEB <input type="checkbox"/> Other: _____ | | | Significance: <input type="checkbox"/> Minor <input type="checkbox"/> Major <input type="checkbox"/> Unknown | | File Status: <input type="checkbox"/> Open <input type="checkbox"/> Closed |
| Agency: | | Contact Name: | Contact Time: | Remarks: | |
| Lead Agency: | | | | | |
| First Support Agency: | | | | | |
| Second Support Agency: | | | | | |
| Third Support Agency: | | | | | |

REPORT

Government of Northwest Territories Department of Infrastructure

Hay River Harbour Restoration – Waste Management Plan 2023-8356



MARCH 2023

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LIST OF ABBREVIATIONS

| Abbreviation | Definition |
|--------------|---|
| CCME | Canadian Council of Ministers of the Environment |
| FAL | Canadian Sediment Quality Guidelines for the Protection of Freshwater Aquatic Life |
| GNWT | Government of Northwest Territories |
| INF | Department of Infrastructure |
| MTS | Marine Transportation Services |
| MVLWB | Mackenzie Valley Land and Water Board |
| PEHH | Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health |

1 INTRODUCTION

The Government of Northwest Territories (GNWT) – Department of Infrastructure (INF) retained Associated Environmental Consultants Inc. (Associated) to prepare a waste management plan related to dredging works taking place in the Hay River, near its outlet into Great Slave Lake (Dredge Area A, Figure 1-1), and within the three fingers of the East Channel of the river (Dredge Area B, Figure 1-1). The dredging is proposed to begin July 16, 2023 and continue until September 14, 2023. The waste management plan follows the Mackenzie Valley Land and Water Board’s (MVLWB) Standard Outline for Management Plans (2021), their Guidelines for Developing a Waste Management Plan (2011), and their draft Waste Management Policy (2022).

1.1 Corporate Contact Information

The GNWT-INF is the primary contact for this project and will be working closely with GNWT – Marine Transportation Services (MTS).

| | | | |
|-------------------|--|------------|--|
| Applicant’s Name: | Mark Cronk | | |
| Position: | Director of Design and Technical Services | | |
| Company Name: | Government of Northwest Territories – Department of Infrastructure | | |
| Mailing Address: | 4th floor, Tatsaotjine Building PO Box 1320 5015 – 49th Street | | |
| Community: | Yellowknife | Telephone: | 867-767-9048 ext. 32060 |
| Prov/Terr: | NT | Email: | Mark.Cronk@gov.nt.ca |
| Postal Code: | X1A 2L9 | Other: | |

1.2 Project Description

In 2022, the Hay River experienced unusually high-water levels, resulting in increased sediment being deposited in the Hay River Harbour and Great Slave Lake at the river outfall. The sediment, which has not been regularly maintained since 1997, has begun to fill the Dredge Areas. This has caused an emergency scenario, since the shallow water in the navigation channel poses a risk to boats (i.e., sea barge, Coast Guard, fishing, and recreational vessels) getting stuck in the sediment deposit and not being able to enter or exit the Hay River Harbour. Removing sediment so that boats can travel along the navigation channel. If boats cannot enter or exit the harbour, the supply for essential goods, and fuel for power and heat could be interrupted for up to 12 communities who rely on the sea barge system.

The GNWT-INF has proposed dredging the navigation channel to mechanically excavate a 30 m wide and 2.4 m deep navigation channel for emergency use, to be completed by local contractors in coordination with GNWT-MTS. The excavated sediment from the navigation channel would be loaded onto a barge, allowed to passively dewater, and when the barge is at capacity, the sediment would be offloaded to haul trucks located on shore. The haul trucks would transfer the sediment to GNWT-INF property on Vale Island, using a sealed truck bed to mitigate further dewatering on roads. The sediment would be temporarily stored on Vale Island, contained with 1 m berms, for ongoing passive dewatering. Once moved from the barge to land, the sediment¹ will be considered soil (CCME 1999) and may be made available for public use, if appropriate, or would be transferred to a final management area.

¹ Sediment is unconsolidated material deposited on the bed of a waterbody or in a low spot or depression on land where the water velocity is insufficient to move the material (CCME 1999).

This emergency dredging program will include removal and temporary storage of the following estimated volumes of sediment:

- Dredge Area A: the shipping lanes approaching the outfall to Great Slave Lake to a width of 30 m, dredging 16,000 m³; and
- Dredge Area B: the three fingers in the East Channel, dredging 68,000 m³.

1.3 Regulatory Framework

GNWT-INF is committed to the environment and will be following the required environmental processes to mitigate potential environmental impacts from this project. As part of the regulatory processes, environmental planning and mitigation will form part of the regulatory applications. Anticipated regulatory permits or authorizations, parameters, and regulatory criteria are detailed in the Hay River Harbour Restoration – Monitoring Plan (Associated 2023a). Samples collected in the preliminary assessment and during monitoring efforts will be compared to the following guidelines:

- Water quality samples will be compared to the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life.
- Sediment samples taken from the river or barge will be compared to the CCME Canadian Sediment Quality Guidelines for the Protection of Freshwater Aquatic Life (FAL).
- Soil samples taken once material is deposited on land will be compared to the CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (PEHH) and the soil quality standards in the GNWT Environmental Guideline for Contaminated Site Remediation.



C:\Users\CHENG\OneDrive - ASSOCIATED ENGINEERING GROUP LTD\Desktop\PC\GIS\2023-8356\2023-8356\2023-8356-8356-APRX

SERVICE LAYER CREDITS: WORLD IMAGERY, MAXAR



- LEGEND**
- Dredging Areas
 - Temporary Soil Storage (GNWT)
 - Temporary Soil Storage (Town of Hay River)

AE PROJECT NO. 2023-8356
 SCALE 1:36,000
 COORD. SYSTEM NAD 1983 UTM ZONE 11N
 DATE 2023-03-28
 REV 03
 DRAWN BY SC
 CHECKED BY JB

**FIGURE 1-1
 DREDGING AND PROJECT AREA**

GOVERNMENT OF
 NORTHWEST TERRITORIES-
 DEPARTMENT OF INFRASTRUCTURE

HAY RIVER HARBOUR
 RESTORATION

2 TYPES OF WASTE

The two types of waste being considered are 1) waste generated through construction and 2) sediment from Dredge Areas A and B (Figure 1-1).

As a sediment, the dredged material meets the definition of waste in the draft Waste Management Policy (MVLWB 2022)². Once the sediment is removed from the river and placed on land, it will be considered soil³. Preliminary *in situ* sampling and analysis have been completed to determine whether there are potential contaminants of concern relative to applicable CCME FAL for sediment and SSME soil guidelines for parkland/residential and industrial/commercial land uses, and PEHH. The results from samples collected on January 19, 2023 are shown in Appendix A. These samples were collected from sediment located in Dredge Area A.

A limited Phase I and Phase II environmental site assessment of GNWT-MTS sites was also conducted by others in 2017 (data included in Appendix A). Although Dredge Area B sediment had arsenic and cadmium concentrations that exceeded CCME FAL guidelines, the samples met criteria for CCME soil guidelines for parkland/residential and industrial/commercial land uses (12 mg/kg).

Background metal concentrations for the sediment are not known at this time.

The sediment is characterized as fine-grained sand and silt, and sandy loam in Dredge Areas A and B.

3 METHODS OF WASTE MANAGEMENT

Waste generated by construction will be the responsibility of the contractor awarded the dredging project; however, waste will be disposed of appropriately at an approved waste management facility. The waste management plan will be updated by the contractor (after project award) to provide a list of waste types and specific details about the management methods related to the project.

The proposed approach to managing the sediment is to contain the material during dredging and storage, with the objective of reducing the amount of sediment that enters the water after dredging and setting a minimum distance between the temporary soil storage sites and the watercourses (i.e., source reduction). This will be managed through project sequencing and the erosion and sediment control measures outlined in the Hay River Harbour Restoration – Sediment and Erosion Control Plan (Associated 2023a) and will be monitored as outlined in the Hay River Harbour Restoration – Monitoring Plan (Associated 2023b). The project is expected to be undertaken in the following sequence:

1. The sediment excavated from the dredging areas will be loaded onto a barge and the slurry filtered through geotextile to passively dewater *in situ*.
2. When the barge is at capacity, the sediment will be offloaded from the shore and transferred to Vale Island to passively dewater further at multiple storage sites.
3. At the Vale Island temporary storage sites, the water from the dewatering process will infiltrate onto underlying soils, excess water from the piles (if any) will be directed to sumps, where the water will infiltrate

² <https://mvlwb.com/sites/default/files/2022-02/DRAFT%20LWB%20Waste%20Management%20Policy%20-%20Public%20Review%20-%20Feb%202022.docx>

³ The MVLWB(2022) defines waste as “any substance that, if added to water, would degrade or alter or form part of a process of degradation or alteration of the quality of the water to an extent that is determined to its use by people or by any animal, fish, or plant”.

into the ground. Stockpiles will be approximately 3 m high and more than 30 m from monitoring wells and surface water bodies to mitigate the potential for a direct hydraulic connection to groundwater and surface water.

On Vale Island, the material will be temporarily stockpiled on multiple properties, where it will be considered soil once it is on land (no longer sediment). Stockpiles will be placed in grided cells to manage the locations of where the sediment was dredged. This will allow sampling to be geo-referenced and prevent mixing of potentially different materials. The water captured will be managed through infiltration to the ground (Step 3 in project sequence). Because the material currently meets CCME and PEHH guidelines for soil (Appendix A), it is assumed that once dewatered, it will continue to meet guidelines; however, weekly sampling will be conducted and, if needed, waste management will be adapted as outlined in the monitoring plan (Associated 2023b).

To determine the options for soil reuse, once the soil is dry, it will also be tested for contaminants and physical properties. After the material is dewatered, it will be analyzed as outlined in the monitoring plan (Associated 2023b), and the potential for local reuse in and around the Town of Hay River will be reviewed. If the soil continues to meet guidelines, potential options for reuse include using the soil as fill material to raise land in the local area, as capping material at the solid waste disposal facility, or other purposes to be determined.

If the soil is contaminated at levels greater than background concentrations (which may naturally exceed guidelines), *in situ* remediation options will be explored, including remediation standards, using vegetation for phytoremediation, and routine inspection. If contaminated soil does not meet regulatory requirements, it will be transferred to an approved waste handling facility for treatment.

CLOSURE

This report was prepared for the Government of Northwest Territories – Department of Infrastructure to develop a waste management plan for the emergency works to dredge the Hay River Harbour and manage the dredged material.

The services provided by Associated Environmental Consultants Inc. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practising under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,

Associated Environmental Consultants Inc.

Prepared by:

Reviewed by:

Melanie Piorecky, P.Ag.
Technical Specialist, Reclamation and
Restoration

Jennifer Brown, P.Eng., MEERL
Project Manager



REFERENCES

- Associated Environmental Consultants Inc. (Associated). 2023a. Hay River Harbour Restoration – Sediment and Erosion Control Plan.
- Associated Environmental Consultants Inc. (Associated). 2023b. Hay River Harbour Restoration – Monitoring Plan.
- Canadian Council of Ministers of the Environment (CCME). 2008. Canada-wide standard for petroleum hydrocarbons (PHC) in soil.
- Canadian Council of Ministers of the Environment (CCME). 1999. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Total Particulate Matter and Summary Tables.
- Canadian Council of Ministers of the Environment (CCME). 1997. Canadian Soil Quality Guidelines.
- Mackenzie Valley Land and Water Board (MVLWB). 2011. Guidelines for Developing a Waste Management Plan.
- Mackenzie Valley Land and Water Board (MVLWB). 2021. Standard Outline for Management Plans. Available at: <https://mvlwb.com/sites/default/files/2021-06/LWB%20Standard%20Outline%20for%20Management%20Plans%20-%20Approved%20-%20Jun%2010%2021%200.pdf>
- Mackenzie Valley Land and Water Board (MVLWB). 2022. Waste Management Policy (Draft).

APPENDIX A – PRELIMINARY SEDIMENT SAMPLING RESULTS

Hay River Harbour
Legend for Soil Quality Results

| | |
|-------------------------|--|
| < | Less than reported detection limit |
| CCME Sediment FAL | CCME. Canadian sediment quality guidelines for the protection of freshwater aquatic life. |
| CCME SO CL CS | CCME. Canadian Soil Quality Guidelines; and Canada-Wide Standards for Petroleum Hydrocarbons in Soil - for Commercial Land Use and Coarse-grained Soil. |
| CCME SO CL FS | CCME. Canadian Soil Quality Guidelines; and Canada-Wide Standards for Petroleum Hydrocarbons in Soil - for Commercial Land Use and Fine-grained Soil. |
| CCME SO IL CS | CCME. Canadian Soil Quality Guidelines; and Canada-Wide Standards for Petroleum Hydrocarbons in Soil - for Industrial Land Use and Coarse-grained Soil. |
| CCME SO IL FS | CCME. Canadian Soil Quality Guidelines; and Canada-Wide Standards for Petroleum Hydrocarbons in Soil - for Industrial Land Use and Fine-grained Soil. |
| CCME SO RL/PL CS | CCME. Canadian Soil Quality Guidelines; and Canada-Wide Standards for Petroleum Hydrocarbons in Soil - for Residential/ parkland Land Use and Coarse-grained Soil. |
| CCME SO RL/PL FS | CCME. Canadian Soil Quality Guidelines; and Canada-Wide Standards for Petroleum Hydrocarbons in Soil - for Residential/ parkland Land Use and Fine-grained Soil. |
| N | Narrative type of guideline or standard, or Result Note. |
| NG | No Guideline |
| CCME Sediment FAL | Highlighted value exceeds CCME Sediment FAL |
| CCME SO CL CS | Highlighted value exceeds CCME SO CL CS |
| CCME SO CL FS | Highlighted value exceeds CCME SO CL FS |
| CCME SO IL CS | Highlighted value exceeds CCME SO IL CS |
| CCME SO IL FS | Highlighted value exceeds CCME SO IL FS |
| <u>CCME SO RL/PL CS</u> | Highlighted value exceeds CCME SO RL/PL CS |
| <u>CCME SO RL/PL FS</u> | Highlighted value exceeds CCME SO RL/PL FS |

Hay River Harbour
Soil Quality Results

| Analyte | Unit | Sampling Location | | | | | | | | | | Sample 3 18-Jan-23 BKQ534 Normal | Sample 2 18-Jan-23 BKQ533 Normal | Sample 01-B 18-Jan-23 BKQ532 Duplicate | Sample 01-A 18-Jan-23 BKQ530 Normal | Date Sampled Lab Sample ID | Sample Type | CCME SO IL CS | CCME SO IL FS | CCME SO RUIPLCS | CCME SO RUIPLCS | CCME SO RUIPLCS | SED-019-01 14-Oct-17 | SED-019-02 14-Oct-17 | SED-019-03 14-Oct-17 | SED-019-04 14-Oct-17 | SED-019-05 14-Oct-17 | SED-019-06 14-Oct-17 | | | | |
|----------------------------------|-------|-------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------|---|---|---|--|-------------------------------|-------------|------------------|------------------|--------------------|--------------------|--------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|--------|--------|--------|-------|
| | | CCME SO CL CS | CCME SO CL FS | CCME SO CL FS | CCME SO CL FS | CCME SO CL FS | CCME SO CL FS | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | CCME SO CL CS | CCME SO CL FS | CCME SO CL FS | CCME SO CL FS | CCME SO CL FS | CCME SO CL FS | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,2,4-Trichlorobenzene | mg/kg | 10 | 10 | 10 | 10 | 10 | 10 | 2 | 2 | 2 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | | | | | |
| 1,3,5-Trichlorobenzene | mg/kg | 10 | 10 | 10 | 10 | 10 | 10 | 2 | 2 | 2 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | <0.040 | | | | |
| 1,1,1-Trichloroethane | mg/kg | 50 | 50 | 50 | 50 | 50 | 50 | 5 | 5 | 5 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | | | |
| 1,1,2-Trichloroethane | mg/kg | 50 | 50 | 50 | 50 | 50 | 50 | 5 | 5 | 5 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | <0.020 | | | |
| Trichloroethylene | mg/kg | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | | | |
| Trichlorofluoromethane | mg/kg | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | | | |
| 1,3,5-Trimethylbenzene | mg/kg | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | | |
| Trimethylbenzene (mixed isomers) | mg/kg | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | | |
| Vinyl chloride | mg/kg | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | NG | |
| Metals | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | mg/kg | NG | 40 | 40 | 40 | 40 | 40 | 20 | 20 | 20 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | |
| Arsenic | mg/kg | 5,900 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 6.6 | 6.1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 7 | 6 | 8.2 | 8.6 | 6.9 | 6.1 | 9.6 | 7 | 9.6 | 160 | |
| Barium | mg/kg | NG | 2000 | 2000 | 2000 | 2000 | 2000 | 500 | 500 | 500 | 150 | 130 | 130 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 120 | 170 | 170 | 140 | 100 | 99 | 99 | 100 | 99 | 160 | |
| Beryllium | mg/kg | NG | 8 | 8 | 8 | 8 | 8 | 4 | 4 | 4 | <0.40 | <0.40 | <0.40 | <0.40 | <0.40 | <0.40 | <0.40 | <0.40 | <0.40 | <0.40 | <0.40 | <0.40 | 0.43 | 0.43 | <0.40 | <0.40 | <0.40 | <0.40 | <0.40 | <0.40 | <0.40 | |
| Cadmium | mg/kg | 0.600 | 22 | 22 | 22 | 22 | 22 | 10 | 10 | 10 | 0.3 | 0.21 | 0.23 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.2 | 0.58 | 0.58 | 0.59 | 0.33 | 0.37 | 0.84 | 0.84 | 0.84 | 0.84 | |
| Chromium | mg/kg | 37,300 | 87 | 87 | 87 | 87 | 87 | 64 | 64 | 64 | 7.5 | 5.7 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 8.4 | 5.8 | 11 | 11 | 9.1 | 7.4 | 6 | 6 | 6 | 6 | 8.7 | |
| Chromium (hexavalent) | mg/kg | NG | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 0.4 | 0.4 | 0.4 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | <0.080 | |
| Cobalt | mg/kg | 35,700 | 91 | 91 | 91 | 91 | 91 | 63 | 63 | 63 | 8.3 | 6.4 | 4.7 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 9.1 | 7.3 | 17 | 17 | 15 | 9.9 | 13 | 13 | 21 | 21 | 21 | |
| Copper | mg/kg | 35,000 | 260 | 260 | 260 | 260 | 260 | 140 | 140 | 140 | 4.5 | 3.7 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 5.1 | 4.1 | 8.3 | 7 | 4.8 | 4.7 | 4.7 | 7.7 | 7.7 | 7.7 | 7.7 | |
| Lead | mg/kg | 0.170 | 24 | 24 | 24 | 24 | 24 | 6.6 | 6.6 | 6.6 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | 0.068 | 0.068 | <0.050 | <0.050 | 0.054 | 0.054 | 0.054 | 0.054 | 0.054 | |
| Mercury | mg/kg | NG | 40 | 40 | 40 | 40 | 40 | 10 | 10 | 10 | 0.97 | 0.83 | 0.69 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 1 | 0.78 | 1.4 | 1.4 | 1.3 | 0.92 | 0.83 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Molybdenum | mg/kg | NG | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Nickel | mg/kg | NG | 89 | 89 | 89 | 89 | 89 | 45 | 45 | 45 | 13 | 9.7 | 8.2 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 13 | 11 | 21 | 19 | 13 | 13 | 13 | 21 | 21 | 21 | 21 | 21 |
| Selenium | mg/kg | NG | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 | 1 | 1 | 1 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | 0.66 | 0.66 | 0.65 | <0.50 | <0.50 | 0.88 | 0.88 | 0.88 | 0.88 | |
| Silver | mg/kg | NG | 40 | 40 | 40 | 40 | 40 | 20 | 20 | 20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 | <0.20 |
| Thallium | mg/kg | NG | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | 0.17 | 0.17 | 0.15 | <0.10 | <0.10 | 0.17 | 0.17 | 0.17 | 0.17 | |
| Tin | mg/kg | NG | 300 | 300 | 300 | 300 | 300 | 50 | 50 | 50 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | |
| Uranium | mg/kg | NG | 33 | 33 | 33 | 33 | 33 | 23 | 23 | 23 | 1.2 | 0.95 | 1 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 15 | 11 | 1.2 | 1.2 | 1.3 | 1.1 | 1 | 1 | 1 | 1 | 1 | |
| Vanadium | mg/kg | NG | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 14 | 11 | 9.4 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 15 | 11 | 19 | 16 | 12 | 11 | 11 | 17 | 17 | 17 | 17 | |
| Zinc | mg/kg | 123,000 | 410 ^{2.35} | 410 ^{2.35} | 410 ^{2.35} | 410 ^{2.35} | 410 ^{2.35} | 250 ^{6.35} | 250 ^{6.35} | 250 ^{6.35} | 49 | 35 | 40 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 47 | 43 | 83 | 75 | 50 | 52 | 52 | 82 | 82 | 82 | 82 | |



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| 1. Notes for CCME. Canadian sediment quality guidelines for the protection of freshwater aquatic life. (CCME Sediment FAL) |
| General Notes: |
| The CCME sediment quality guidelines for the protection of freshwater aquatic life provide Interim sediment quality guidelines (ISQGs) and probable effect levels (PELs). The Interim sediment quality guidelines have been used in this report. |
| Note 1.1 for Acenaphthene: |
| Provisional; adoption of marine ISQG developed using the modified NSTP approach. |
| Note 1.2 for Acenaphthylene: |
| Provisional; adoption of marine ISQG developed using the modified NSTP approach. |
| Note 1.3 for Anthracene: |
| Provisional; adoption of marine ISQG developed using the modified NSTP approach. |
| Note 1.4 for Dibenz[a,h]anthracene: |
| Provisional; adoption of marine ISQG developed using the modified NSTP approach. |
| Note 1.5 for Fluorene: |
| Provisional; adoption of marine ISQG developed using the modified NSTP approach. |
| Note 1.6 for 2-Methylnaphthalene: |
| Provisional; adoption of marine ISQG developed using the modified NSTP approach. |
| Note 1.7 for Naphthalene: |
| Provisional; adoption of marine ISQG developed using the modified NSTP approach. |
| 2. Notes for CCME. Canadian Soil Quality Guidelines; and Canada-Wide Standards for Petroleum Hydrocarbons in Soil - for Commercial Land Use and Coarse-grained Soil. (CCME SO CL CS) |
| General Notes: |
| There are different guidelines based on site-specific factors for some analytes. The most stringent guidelines were used. |
| Note 2.1 for Benzene: |
| The guideline for benzene is 0.030 mg/kg for the following: <ul style="list-style-type: none"> • Surface soil ($\leq 1.5\text{m}$) with coarse soil texture, and based on a lifetime incremental cancer risk of 1 in 100,000 (10-5). • Subsoil ($> 1.5\text{m}$) with coarse soil texture, and based on a lifetime incremental cancer risk of 1 in 100,000 (10-5). • Surface soil ($\leq 1.5\text{m}$) with coarse soil texture, and based on a lifetime incremental cancer risk of 1 in 1,000,000 (10-6). • Subsoil ($> 1.5\text{m}$) with coarse soil texture, and based on a lifetime incremental cancer risk of 1 in 1,000,000 (10-6). |
| Note 2.2 for Ethylbenzene: |
| The guideline for ethylbenzene is 0.082 mg/kg for the following: <ul style="list-style-type: none"> • Surface soil ($\leq 1.5\text{m}$) with coarse soil texture • Subsoil ($> 1.5\text{m}$) with coarse soil texture |
| Note 2.3 for F1 (CCME): (C6-C10) (less BTEX): |
| This Tier 1 Level is for coarse, surface soil; and includes protection of potable groundwater. The standard for F1 excludes benzene, toluene, ethylbenzene and xylenes. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil. / The most stringent guideline was used in this report. |
| Note 2.4 for F2 (C10-C16): |
| This Tier 1 Level is for coarse, surface soil. "Coarse" means coarse-textured soil having a median grain size of $> 75 \mu\text{m}$ as defined by the American Society for Testing and Materials. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil. |
| Note 2.5 for F3 (C16-C34): |
| This Tier 1 Level is for coarse, surface soil. "Coarse" means coarse-textured soil having a median grain size of $> 75 \mu\text{m}$ as defined by the American Society for Testing and Materials. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil. |
| Note 2.6 for F4 (CCME): ($> \text{C34-C50}$): |
| This Tier 1 Level is for coarse, surface soil. "Coarse" means coarse-textured soil having a median grain size of $> 75 \mu\text{m}$ as defined by the American Society for Testing and Materials. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil. |
| Note 2.7 for Toluene: |
| The guideline for toluene is 0.37 mg/kg for the following: <ul style="list-style-type: none"> • Surface soil ($\leq 1.5\text{m}$) with coarse soil texture • Subsoil ($> 1.5\text{m}$) with coarse soil texture |

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| <p>Note 2.8 for Xylene:</p> <p>The guideline for xylenes is 11 mg/kg for the following:</p> <ul style="list-style-type: none"> • Surface soil (≤1.5m) with coarse soil texture • Subsoil (>1.5m) with coarse soil texture |
| <p>Note 2.9 for Acenaphthene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected.</p> <p>Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects.</p> <p>The environmental Soil Quality Guideline for Acenaphthene is 0.28 mg/kg based on non-carcinogenic effects (from Table 2 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 2.10 for Acenaphthylene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected.</p> <p>Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects.</p> <p>The environmental Soil Quality Guideline for Acenaphthylene is 320 mg/kg based on non-carcinogenic effects (from Table 2 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 2.11 for Anthracene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected.</p> <p>Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects.</p> <p>The environmental Soil Quality Guideline for Anthracene is 32 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 2.12 for Benz[a]anthracene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected.</p> <p>Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects.</p> <p>The environmental Soil Quality Guideline for Benz[a]anthracene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 2.13 for Benzo[a]pyrene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected.</p> <p>Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects.</p> <p>The environmental Soil Quality Guideline for Benzo[a]pyrene is 72 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 2.14 for Benzo[g,h,i]perylene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected.</p> <p>Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects.</p> <p>An environmental Soil Quality Guideline for Benzo[g,h,i]perylene based on non-carcinogenic effects is not available in Table 1 and 2 of CCME PAHs Factsheet 2010.</p> |
| <p>Note 2.15 for Benzo[k]fluoranthene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected.</p> <p>Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects.</p> <p>The environmental Soil Quality Guideline for Benzo[k]fluoranthene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |

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| Note 2.16 for Chrysene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. An environmental Soil Quality Guideline for Chrysene based on non-carcinogenic effects is not available in Table 1 and 2 of CCME PAHs Factsheet 2010. |
| Note 2.17 for Dibenz[a,h]anthracene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Dibenz[a,h]anthracene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 2.18 for Fluoranthene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Fluoranthene is 180 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 2.19 for Fluorene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Fluorene is 0.25 mg/kg based on non-carcinogenic effects (from Table 2 of CCME PAHs Factsheet 2010). |
| Note 2.20 for IACR (CCME): |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. |
| Note 2.21 for Indeno[1,2,3-cd]pyrene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Indeno[1,2,3-cd]pyrene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 2.22 for Naphthalene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Naphthalene is 0.013 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |

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| <p>Note 2.23 for Carcinogenic PAHs (as B(a)P TPE):</p> <p>Guideline for B(A)P Total Potency Equivalent is 0.6 mg/kg based on an incremental lifetime cancer risk (ILCR) of 1 in 1,000,000 (10-6). Guideline for B(A)P Total Potency Equivalent is 5.3 mg/kg based on an incremental lifetime cancer risk (ILCR) of 1 in 100,000 (10-5). Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. For soil contaminated with coal tar or creosote mixtures, the calculated Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) concentration for soil samples should be multiplied by a safety factor of 3 prior to comparison with the guideline to account for carcinogenic potential of alkylated and other PAHs present for which a Potency Equivalence Factor (PEF) does not currently exist, but which are likely to contribute to mixture carcinogenic potential. / The most stringent guideline was used in this report.</p> |
| <p>Note 2.24 for Phenanthrene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Phenanthrene is 0.046 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 2.25 for Pyrene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Pyrene is 100 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 2.26 for Zinc:</p> <p>Reference: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health; Factsheet for Zinc, 2018. Data are sufficient and adequate to calculate guidelines for human health and environmental health. Therefore, the soil quality guideline is the lower of the two and supersedes the 1999 soil quality guideline and the 1991 interim remediation criteria for soil.</p> |
| <p>3. Notes for CCME. Canadian Soil Quality Guidelines; and Canada-Wide Standards for Petroleum Hydrocarbons in Soil - for Commercial Land Use and Fine-grained Soil. (CCME SO CL FS)</p> |
| <p>General Notes:</p> <p>There are different guidelines based on site-specific factors for some analytes. The most stringent guidelines were used.</p> |
| <p>Note 3.1 for Benzene:</p> <p>The guideline for benzene is 0.0068 mg/kg for the following:</p> <ul style="list-style-type: none"> • Surface soil ($\leq 1.5\text{m}$) with fine soil texture, and based on a lifetime incremental cancer risk of 1 in 100,000 (10-5). • Subsoil ($> 1.5\text{m}$) with fine soil texture, and based on a lifetime incremental cancer risk of 1 in 100,000 (10-5). • Surface soil ($\leq 1.5\text{m}$) with fine soil texture, and based on a lifetime incremental cancer risk of 1 in 1,000,000 (10-6). • Subsoil ($> 1.5\text{m}$) with fine soil texture, and based on a lifetime incremental cancer risk of 1 in 1,000,000 (10-6). |
| <p>Note 3.2 for Ethylbenzene:</p> <p>The guideline for ethylbenzene is 0.018 mg/kg for the following:</p> <ul style="list-style-type: none"> • Surface soil ($\leq 1.5\text{m}$) with fine soil texture • Subsoil ($> 1.5\text{m}$) with fine soil texture |
| <p>Note 3.3 for F1 (CCME): (C6-C10) (less BTEX):</p> <p>This Tier 1 Level is for fine, surface soil and includes protection of potable groundwater. The standard for F1 excludes benzene, toluene, ethylbenzene and xylenes. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil. / The most stringent guideline was used in this report.</p> |
| <p>Note 3.4 for F2 (C10-C16):</p> <p>This Tier 1 Level is for fine, surface soil and includes protection of potable groundwater. "Fine" means fine-textured soil having a median grain size of $< 75 \mu\text{m}$ as defined by the American Society for Testing and Materials. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil. / The most stringent standard was used in this report.</p> |
| <p>Note 3.5 for F3 (C16-C34):</p> <p>This Tier 1 Level is for fine, surface soil. "Fine" means fine-textured soil having a median grain size of $< 75 \mu\text{m}$ as defined by the American Society for Testing and Materials. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil.</p> |

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| <p>Note 3.6 for F4 (CCME): (>C34-C50):</p> <p>This Tier 1 Level is for fine, surface soil. "Fine" means fine-textured soil having a median grain size of <75 µm as defined by the American Society for Testing and Materials. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil.</p> |
| <p>Note 3.7 for Toluene:</p> <p>The guideline for toluene is 0.08 mg/kg for the following:</p> <ul style="list-style-type: none"> • Surface soil (≤1.5m) with fine soil texture • Subsoil (>1.5m) with fine soil texture |
| <p>Note 3.8 for Xylene:</p> <p>The guideline for xylenes is 2.4 mg/kg for the following:</p> <ul style="list-style-type: none"> • Surface soil (≤1.5m) with fine soil texture • Subsoil (>1.5m) with fine soil texture |
| <p>Note 3.9 for Acenaphthene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Acenaphthene is 0.28 mg/kg based on non-carcinogenic effects (from Table 2 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 3.10 for Acenaphthylene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Acenaphthylene is 320 mg/kg based on non-carcinogenic effects (from Table 2 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 3.11 for Anthracene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Anthracene is 32 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 3.12 for Benz[a]anthracene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Benzo[a]anthracene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 3.13 for Benzo[a]pyrene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Benzo[a]pyrene is 72 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 3.14 for Benzo[g,h,i]perylene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. An environmental Soil Quality Guideline for Benzo[g,h,i]perylene based on non-carcinogenic effects is not available in Table 1 and 2 of CCME PAHs Factsheet 2010.</p> |

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| Note 3.15 for Benzo[k]fluoranthene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Benzo[k]fluoranthene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 3.16 for Chrysene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. An environmental Soil Quality Guideline for Chrysene based on non-carcinogenic effects is not available in Table 1 and 2 of CCME PAHs Factsheet 2010. |
| Note 3.17 for Dibenz[a,h]anthracene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Dibenz[a,h]anthracene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 3.18 for Fluoranthene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Fluoranthene is 180 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 3.19 for Fluorene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Fluorene is 0.25 mg/kg based on non-carcinogenic effects (from Table 2 of CCME PAHs Factsheet 2010). |
| Note 3.20 for IACR (CCME): |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. |
| Note 3.21 for Indeno[1,2,3-cd]pyrene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Indeno[1,2,3-cd]pyrene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 3.22 for Naphthalene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Naphthalene is 0.013 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |

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| <p>Note 3.23 for Carcinogenic PAHs (as B(a)P TPE):</p> <p>Guideline for B(A)P Total Potency Equivalent is 0.6 mg/kg based on an incremental lifetime cancer risk (ILCR) of 1 in 1,000,000 (10-6). Guideline for B(A)P Total Potency Equivalent is 5.3 mg/kg based on an incremental lifetime cancer risk (ILCR) of 1 in 100,000 (10-5). Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. For soil contaminated with coal tar or creosote mixtures, the calculated Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) concentration for soil samples should be multiplied by a safety factor of 3 prior to comparison with the guideline to account for carcinogenic potential of alkylated and other PAHs present for which a Potency Equivalence Factor (PEF) does not currently exist, but which are likely to contribute to mixture carcinogenic potential. / The most stringent guideline was used in this report.</p> |
| <p>Note 3.24 for Phenanthrene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Phenanthrene is 0.046 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 3.25 for Pyrene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Pyrene is 100 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 3.26 for Zinc:</p> <p>Reference: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health; Factsheet for Zinc, 2018. Data are sufficient and adequate to calculate guidelines for human health and environmental health. Therefore, the soil quality guideline is the lower of the two and supersedes the 1999 soil quality guideline and the 1991 interim remediation criteria for soil.</p> |
| <p>4. Notes for CCME. Canadian Soil Quality Guidelines; and Canada-Wide Standards for Petroleum Hydrocarbons in Soil - for Industrial Land Use and Coarse-grained Soil. (CCME SO IL CS)</p> |
| <p>General Notes:</p> <p>There are different guidelines based on site-specific factors for some analytes. The most stringent guidelines were used.</p> |
| <p>Note 4.1 for Benzene:</p> <p>The guideline for benzene is 0.030 mg/kg for the following:</p> <ul style="list-style-type: none"> • Surface soil with coarse soil texture, and based on a lifetime incremental cancer risk of 1 in 100,000 (10-5). • Subsoil with coarse soil texture, and based on a lifetime incremental cancer risk of 1 in 100,000 (10-5). • Surface soil with coarse soil texture, and based on a lifetime incremental cancer risk of 1 in 1,000,000 (10-6). • Subsoil with coarse soil texture, and based on a lifetime incremental cancer risk of 1 in 1,000,000 (10-6). |
| <p>Note 4.2 for Ethylbenzene:</p> <p>The guideline for ethylbenzene is 0.082 mg/kg for the following:</p> <ul style="list-style-type: none"> • Surface soil with coarse soil texture • Subsoil with coarse soil texture |
| <p>Note 4.3 for F1 (CCME): (C6-C10) (less BTEX):</p> <p>This Tier 1 Level is for coarse, surface soil and includes protection of potable groundwater. The standard for F1 excludes benzene, toluene, ethylbenzene and xylenes. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil. / The most stringent guideline was used in this report.</p> |
| <p>Note 4.4 for F2 (C10-C16):</p> <p>This Tier 1 Level is for coarse, surface soil. "Coarse" means coarse-textured soil having a median grain size of >75 µm as defined by the American Society for Testing and Materials. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil.</p> |
| <p>Note 4.5 for F3 (C16-C34):</p> <p>This Tier 1 Level is for coarse, surface soil. "Coarse" means coarse-textured soil having a median grain size of >75 µm as defined by the American Society for Testing and Materials. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil.</p> |

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| <p>Note 4.6 for F4 (CCME): (>C34-C50):</p> <p>This Tier 1 Level is for coarse, surface soil. "Coarse" means coarse-textured soil having a median grain size of >75 µm as defined by the American Society for Testing and Materials. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil.</p> |
| <p>Note 4.7 for Toluene:</p> <p>The guideline for toluene is 0.37 mg/kg for the following:</p> <ul style="list-style-type: none"> • Surface soil with coarse soil texture • Subsoil with coarse soil texture |
| <p>Note 4.8 for Xylene:</p> <p>The guideline for xylenes is 11 mg/kg for the following:</p> <ul style="list-style-type: none"> • Surface soil with coarse soil texture • Subsoil with coarse soil texture |
| <p>Note 4.9 for Acenaphthene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Acenaphthene is 0.28 mg/kg based on non-carcinogenic effects (from Table 2 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 4.10 for Acenaphthylene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Acenaphthylene is 320 mg/kg based on non-carcinogenic effects (from Table 2 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 4.11 for Anthracene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Anthracene is 32 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 4.12 for Benz[a]anthracene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Benzo[a]anthracene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 4.13 for Benzo[a]pyrene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Benzo[a]pyrene is 72 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 4.14 for Benzo[g,h,i]perylene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. An environmental Soil Quality Guideline for Benzo[g,h,i]perylene based on non-carcinogenic effects is not available in Table 1 and 2 of CCME PAHs Factsheet 2010.</p> |

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| Note 4.15 for Benzo[k]fluoranthene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Benzo[k]fluoranthene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 4.16 for Chrysene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. An environmental Soil Quality Guideline for Chrysene based on non-carcinogenic effects is not available in Table 1 and 2 of CCME PAHs Factsheet 2010. |
| Note 4.17 for Dibenz[a,h]anthracene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Dibenz[a,h]anthracene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 4.18 for Fluoranthene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Fluoranthene is 180 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 4.19 for Fluorene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Fluorene is 0.25 mg/kg based on non-carcinogenic effects (from Table 2 of CCME PAHs Factsheet 2010). |
| Note 4.20 for IACR (CCME): |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. |
| Note 4.21 for Indeno[1,2,3-cd]pyrene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Indeno[1,2,3-cd]pyrene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 4.22 for Naphthalene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Naphthalene is 0.013 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |

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| <p>Note 4.23 for Carcinogenic PAHs (as B(a)P TPE):</p> <p>Guideline for B(A)P Total Potency Equivalent is 0.6 mg/kg based on an incremental lifetime cancer risk (ILCR) of 1 in 1,000,000 (10-6). Guideline for B(A)P Total Potency Equivalent is 5.3 mg/kg based on an incremental lifetime cancer risk (ILCR) of 1 in 100,000 (10-5). Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. For soil contaminated with coal tar or creosote mixtures, the calculated Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) concentration for soil samples should be multiplied by a safety factor of 3 prior to comparison with the guideline to account for carcinogenic potential of alkylated and other PAHs present for which a Potency Equivalence Factor (PEF) does not currently exist, but which are likely to contribute to mixture carcinogenic potential. / The most stringent guideline was used in this report.</p> |
| <p>Note 4.24 for Phenanthrene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Phenanthrene is 0.046 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 4.25 for Pyrene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Pyrene is 100 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 4.26 for Zinc:</p> <p>Reference: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health; Factsheet for Zinc, 2018. Data are sufficient and adequate to calculate guidelines for human health and environmental health. Therefore, the soil quality guideline is the lower of the two and supersedes the 1999 soil quality guideline and the 1991 interim remediation criteria for soil.</p> |
| <p>5. Notes for CCME. Canadian Soil Quality Guidelines; and Canada-Wide Standards for Petroleum Hydrocarbons in Soil - for Industrial Land Use and Fine-grained Soil. (CCME SO IL FS)</p> |
| <p>General Notes:</p> <p>There are different guidelines based on site-specific factors for some analytes. The most stringent guidelines were used.</p> |
| <p>Note 5.1 for Benzene:</p> <p>The guideline for benzene is 0.0068 mg/kg for the following:</p> <ul style="list-style-type: none"> • Surface soil with fine soil texture, and based on a lifetime incremental cancer risk of 1 in 100,000 (10-5). • Subsoil with fine soil texture, and based on a lifetime incremental cancer risk of 1 in 100,000 (10-5). • Surface soil with fine soil texture, and based on a lifetime incremental cancer risk of 1 in 1,000,000 (10-6). • Subsoil with fine soil texture, and based on a lifetime incremental cancer risk of 1 in 1,000,000 (10-6). |
| <p>Note 5.2 for Ethylbenzene:</p> <p>The guideline for ethylbenzene is 0.018 mg/kg for the following:</p> <ul style="list-style-type: none"> • Surface soil with fine soil texture • Subsoil with fine soil texture |
| <p>Note 5.3 for F1 (CCME): (C6-C10) (less BTEX):</p> <p>This Tier 1 Level is for fine, surface soil and includes protection of potable groundwater. The standard for F1 excludes benzene, toluene, ethylbenzene and xylenes. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil. / The most stringent guideline was used in this report.</p> |
| <p>Note 5.4 for F2 (C10-C16):</p> <p>This Tier 1 Level is for fine, surface soil and includes protection of potable groundwater. "Fine" means fine-textured soil having a median grain size of <75 µm as defined by the American Society for Testing and Materials. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil. / The most stringent guideline was used in this report.</p> |
| <p>Note 5.5 for F3 (C16-C34):</p> <p>This Tier 1 Level is for fine, surface soil. "Fine" means fine-textured soil having a median grain size of <75 µm as defined by the American Society for Testing and Materials. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil.</p> |

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| <p>Note 5.6 for F4 (CCME): (>C34-C50):</p> <p>This Tier 1 Level is for fine, surface soil. "Fine" means fine-textured soil having a median grain size of <75 µm as defined by the American Society for Testing and Materials. Reference: Canadian Council of Ministers of the Environment, Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, 2008. Table 1 - Summary of Tier 1 Levels for surface soil.</p> |
| <p>Note 5.7 for Toluene:</p> <p>The guideline for toluene is 0.08 mg/kg for the following:</p> <ul style="list-style-type: none"> • Surface soil with fine soil texture • Subsoil with fine soil texture |
| <p>Note 5.8 for Xylene:</p> <p>The guideline for xylenes is 2.4 mg/kg for the following:</p> <ul style="list-style-type: none"> • Surface soil with fine soil texture • Subsoil with fine soil texture |
| <p>Note 5.9 for Acenaphthene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Acenaphthene is 0.28 mg/kg based on non-carcinogenic effects (from Table 2 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 5.10 for Acenaphthylene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Acenaphthylene is 320 mg/kg based on non-carcinogenic effects (from Table 2 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 5.11 for Anthracene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Anthracene is 32 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 5.12 for Benz[a]anthracene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Benzo[a]anthracene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 5.13 for Benzo[a]pyrene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Benzo[a]pyrene is 72 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010).</p> |
| <p>Note 5.14 for Benzo[g,h,i]perylene:</p> <p>Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. An environmental Soil Quality Guideline for Benzo[g,h,i]perylene based on non-carcinogenic effects is not available in Table 1 and 2 of CCME PAHs Factsheet 2010.</p> |

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| Note 5.15 for Benzo[k]fluoranthene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Benzo[k]fluoranthene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 5.16 for Chrysene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. An environmental Soil Quality Guideline for Chrysene based on non-carcinogenic effects is not available in Table 1 and 2 of CCME PAHs Factsheet 2010. |
| Note 5.17 for Dibenz[a,h]anthracene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Dibenz[a,h]anthracene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 5.18 for Fluoranthene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Fluoranthene is 180 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 5.19 for Fluorene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Fluorene is 0.25 mg/kg based on non-carcinogenic effects (from Table 2 of CCME PAHs Factsheet 2010). |
| Note 5.20 for IACR (CCME): |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. |
| Note 5.21 for Indeno[1,2,3-cd]pyrene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Indeno[1,2,3-cd]pyrene is 10 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |
| Note 5.22 for Naphthalene: |
| Assess the hazard to human health from carcinogenic effects of PAHs by doing steps 1 and 2. Step 1 is: Calculate a Benzo[a]pyrene Total Potency Equivalents (B[a]P TPE) to ensure that humans are protected from direct contact with contaminated soil. Step 2 is: Calculate the Index of Additive Cancer Risk (IACR) to ensure that potable water resources are protected. Assess the hazard to environmental health from non-carcinogenic effects of PAHs by doing step 3. Step 3 is: Compare PAHs individually to the appropriate environmental Soil Quality Guideline which were developed based on non-carcinogenic effects. The environmental Soil Quality Guideline for Naphthalene is 0.013 mg/kg based on non-carcinogenic effects (from Table 1 of CCME PAHs Factsheet 2010). |