Ministry of Environment and Climate Change Strategy

TECHNICAL GUIDANCE 14
ON CONTAMINATED SITES

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Operation of Soil Treatment Facilities for the Bioremediation of Hydrocarbon Contaminated Soil

Introduction

Concentrations of hydrocarbon constituents in excavated soils can be effectively reduced through biodegradation. Bioremediation technology is a controlled process which involves constructing cells, piles or rows of contaminated soils and stimulating microbial activity within the soils through aeration and/or the addition of nutrients and moisture.

Protocol 15, "Soil Treatment Facility Design and Operation for Bioremediation of Hydrocarbon Contaminated Soil" imposes minimum requirements for the design, operation and maintenance of soil treatment facilities. This guidance document augments Protocol 15 by providing recommendations relating to the operation of these facilities and describing when a discharge authorization may be required during their operation.

Facility operation

Protocol 15 specifies that the management of a soil treatment facility must ensure the optimal biodegradation of contaminants and the integrity of the works. Table 1 outlines levels of key environmental parameters recommended to be maintained, to maximize the remediation potential of a soil treatment facility.

In addition to the minimum requirements imposed under Protocol 15, the following recommendations should also be considered on a case by case basis. Note that they may not be applicable to all areas of the province.

- Turn the soil monthly or install aeration piping to provide adequate aeration.
- Collect soil samples quarterly during the treatment process. Sampling at this frequency is useful in order to inform the adjustment of cell conditions to promote maximum biological activity. Soil samples should be analyzed for appropriate indicator parameters including, but not limited to pH, temperature, moisture, microbial counts, contaminant concentrations, and nutrient levels.
- Consider preparing and implementing a contingency plan for excessive leachate generated in areas with high precipitation. Having holding tanks available onsite is one way such a plan could be put into effect.

Soil management

Independent remediation requirements

Soil, before and after treatment, must be managed appropriately in accordance with the *Environmental Management Act* (EMA) and its regulations. Bioremediation activities trigger the independent remediation notification requirements of EMA. For more information, refer to the Land Remediation Section's key topic, "Independent Remediation".

Soil quality characterization

Soil quality should be adequately characterized as described in Protocol 19, "Site Investigation and Reporting" before placement of soil into a soil treatment facility. Hazardous waste may not be placed in a soil treatment facility unless the facility is registered as required under the Hazardous Waste Regulation.

Note

When transferring soil from a dump truck to a soil treatment facility, excess liquid within the soil should be collected and disposed of to minimize leachate generation.

Waste Discharge authorizations

"Contaminated site contaminant management" is a prescribed activity defined under Schedule 1 of the Waste Discharge Regulation (WDR). Based on this definition, relocation of waste soil into a soil treatment facility requires authorization under WDR. Alternatively, relocation of waste soil can be authorized under an Approval in Principle.

Refer to the ministry's Waste Discharge Authorizations webpage for more information.

Final disposition options for treated soil

When contaminated and waste soil is successfully treated, there are various options for disposition of uncontaminated and non-waste soil. They include, for example, the reuse of treated soil as backfill at the source or treatment site, disposal at an authorized facility or reuse at another location.

The relocation of soil is regulated to ensure that soil is moved and deposited only at appropriate locations.

The ministry must be notified before relocating non-waste soil (soil from land on which commercial or industrial CSR Schedule 2 uses occurred and that meets the land use standards that apply to the receiving site). Sites receiving high volumes of non-waste soil (>20,000 m^3) must be registered and have a soil management plan. For more information refer to the Land Remediation Section's "Soil Relocation" webpage.

This guidance does not contain and should not be construed as legal advice. Current legislation and regulations should be consulted for complete contaminated sites legal requirements.

For more information, please direct enquiries to remediationFAQs@gov.bc.ca

Table 1: Recommended levels of key environmental parameters

Parameter	Recommended Operating Level	Additional Information
Microbe populations	Variable	Microbial populations can be raised via blending the soil with cultured micro-organisms or animal manure. Bioaugmentation may not be necessary.
Oxygen	Variable	Added via turning or aeration piping
pH	6 ≤pH≤ 8	pH can be raised by adding lime or lowered by adding elemental sulphur
Soil temperature	10 - 45°C	Soil temperature can be maintained by covering the facility or through warm air injection
Moisture content	40 – 85 % of field capacity 10 – 30 % by weight	Moisture, including recycled leachate may be added through irrigation piping or spraying.
Nutrient levels	carbon:nitrogen:phosphorus ratio 100:10:1	Nutrients may be added via fertilizer