



October 22, 2004

RRD OPERATIONAL MEMORANDUM NO. 2

SUBJECT: SAMPLING AND ANALYSIS – ATTACHMENT 2
SOIL LEACHING METHODS

Key definitions for terms used in this document:

NREPA:	The Natural Resources and Environmental Protection Act, 1994 PA 451, as amended
Part 201:	Part 201, Environmental Remediation, of NREPA
Part 211:	Part 211, Underground Storage Tank Regulations, of NREPA
Part 213:	Part 213, Leaking Underground Storage Tanks, of NREPA
MDEQ:	Michigan Department of Environmental Quality
RRD:	Remediation and Redevelopment Division
Criteria or criterion:	Includes the cleanup criteria for Part 201 and the Risk-Based Screening Levels as defined in Part 213 and R 299.5706a(4)
Facility:	Includes “facility” as defined by Part 201 and “site” as defined by Part 213
Leachate:	Specific aqueous solutions are used to evaluate the risks due to hazardous substances in soils as a result of the leaching of the substances into surface waters, groundwater, and drinking waters. The term “leachate”, as used in this guidance, refers to those solutions after the leaching process is completed.

PURPOSE

This attachment to RRD Operational Memorandum No. 2 provides specifications for designated methods to evaluate the capability of the soil to leach hazardous substances, for site assessment, site investigation and response activities under Part 201, Part 211, and Part 213. Designated methods include those specified in R 299.5722(3)(a) and alternate leaching methods identified in this document.

Generic cleanup criteria for groundwater and soil have been developed pursuant to Sections 20120a(1) and 21304a of NREPA (see RRD Operational Memorandum No. 1). These criteria are the risk-based values the department has determined to be protective of the public health, safety, or welfare and the environment. To assure that soils do not pose a threat of aquifer contamination, the concentration of a hazardous substance in soil must be below that which produces a concentration in soil leachate that is equal to the most restrictive applicable groundwater criteria. Leach testing is not required to demonstrate compliance with applicable criteria if soil concentrations do not exceed the applicable generic criteria (see RRD Operational Memorandum No. 1, Residential and Commercial I Soil and Industrial and Commercial II, III, and IV Soil tables, Groundwater protection columns). If the leachate concentration generated by background soils, or the background groundwater concentration is greater than the generic criteria, the background concentration shall be used in place of the risk-based value as the cleanup criterion. Background soils and background groundwater concentrations must represent background conditions not impacted by a release at, or regionally proximate to, the facility. RRD Operational Memorandum No. 4 provides guidance on establishing background concentrations.

If concentrations exceed applicable generic criteria additional leach testing may be conducted to demonstrate compliance for soils. Leachable concentrations must be determined by a method that best represents in-situ conditions. Methods the MDEQ has designated as acceptable soil



leachate methods are identified in R 299.5722(3)(a) as the toxicity characteristic leaching procedure (TCLP), and the synthetic precipitation leaching procedure (SPLP). Further details concerning these procedures are provided in Table 1.

Alternative methods accepted by the MDEQ to simulate conditions at the facility are also provided in Table 1. Proposals for use of other standard methods may be made to the MDEQ for consideration. If contaminants in the soils have the potential to be characteristically hazardous (based on the 20X rule), then TCLP testing must be conducted to determine the applicability of Part 111, Hazardous Waste Management, of NREPA (Part 111) and the associated administrative rules.

When soil leachate analysis methods are relied upon, analysis of samples of those soils must also be conducted, following an appropriate available method, to determine concentrations of contaminants in the soils prior to leaching. Soil sample analysis results must be provided with the leachate data. Soil sample collection and preservation specifications for volatiles analysis may require that different collection methods be used to obtain samples appropriate for both leachate and soil analyses. Additional guidance on sample collection and preservation specifications for volatiles is available in RRD Operational Memorandum No. 2, Attachment 6.

Soils which exceed the TCLP regulatory levels must be managed according to Part 111.

Questions regarding this document should be directed to Mr. A. Ralph Curtis at 517-373-8389, curtisar@michigan.gov.

The following documents are rescinded with the issuance of this attachment:

- Environmental Response Division, Operational Memorandum 12, Alternate Soil Leaching Procedures, dated January 5, 1995.
- Storage Tank Division Operational Memorandum 14, Analytical Parameters and Methods, Sample Handling, and Preservation for Petroleum Releases, Table 3 Acceptable Soil Leaching Procedures for Evaluating the Mobility of Specific Contaminants in Soil, dated June 12, 1998.

APPENDAGE

Designated Soil Leaching Methods

This memorandum and its attachments are intended to provide direction and guidance to foster consistent application of Part 201, Part 211, and Part 213 and the associated administrative rules. This document is not intended to convey any rights to any parties or create any duties or responsibilities under the law. This document and matters addressed herein are subject to revision.

DESIGNATED SOIL LEACHING METHODS

1. Toxicity Characteristic Leaching Procedure (TCLP) EPA Method 1311. Use buffered acetic acid solutions at pH 2.88 or 4.93 for leaching soils to determine the concentrations of metals, semi volatiles, pesticides, PCBs, and volatiles that can be leached. This method is not acceptable for leaching soils to determine the concentrations of cyanides, sulfides, and hexavalent chromium that can be leached.
2. Synthetic Precipitation Leaching Procedure (SPLP) EPA Method 1312. Use Extraction Fluid #1, H₂SO₄ & HNO₃ solutions at pH 4.20, for leaching soils to determine the concentrations of metals, semi volatiles, pesticides, and PCBs that can be leached. Use Extraction Fluid #3, reagent water, for leaching soils to determine the concentrations of cyanides, sulfides, volatiles, and hexavalent chromium that can be leached.
3. ASTM Neutral Leach Procedure, ASTM D3987-85. Use reagent water for leaching soils to determine the concentrations of semi volatiles, pesticides, PCBs, cyanide, sulfides, and hexavalent chromium that can be leached. This method is not acceptable for leaching soils to determine the concentrations of metals and volatiles that can be leached. This procedure provides for reporting the leachable contaminant levels in terms of the weight of the soil (mg/Kg). However, in order to use this soil leaching procedure for the purpose of evaluating contaminant mobility and potential impact on groundwater, leachable contaminant levels must be reported in terms of the volume of the leaching fluid, in ug/L units. This requirement must be conveyed to the lab prior to sample analysis.
4. ASTM D5233-92 ASTM Single Batch. Use buffered acetic acid solutions at pH 2.88 or 4.93, to leach soils and determine the concentrations of metals, semi volatiles, pesticides, and PCBs that can be leached. The method is not acceptable for leaching soils to determine the concentrations of volatiles, cyanides, sulfides, and hexavalent chromium that can be leached. The method is useful for large particle-sized materials. Any monolith subject to this method must also be evaluated with ASTM D4842-89 to evaluate freeze-thaw effects.

Soil Collection for Determining Volatiles Leachable to Groundwater.

To evaluate leaching of volatiles from soils, using the appropriate methods above, the MDEQ requires a specific sample collection and preservation procedure. A syringe-type coring device, documented to be effective for retaining the volatiles that are to be analyzed, is used to collect a 25 gm (± 3 gm) soil sample. The sample must be weighed in the field by subtracting the device weight from the weight of the device with the soil. Exposing the soil to the environment to obtain the weight either in the field or in the laboratory to is not acceptable. The sample must be frozen immediately whenever feasible, otherwise the sample must be cooled to 4° C ($\pm 2^\circ$), and transferred to the laboratory. The soil must be extruded from the syringe-type coring device directly into the leaching fluid within 48-hours of collection. After completion of the leaching procedure, an aliquot of leachate must be immediately collected and preserved as a volatile organic water sample. If large sample sizes are required, multiple coring devices should be used.