October 22, 2004

RRD OPERATIONAL MEMORANDUM NO. 2

SUBJECT: SAMPLING AND ANALYSIS – ATTACHMENT 3
INDOOR AIR DESIGNATED METHODS AND TARGET DETECTION LIMITS

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 213:	Part 213, Leaking Underground Storage Tanks, of NREPA
MDEQ:	Michigan Department of Environmental Quality
RRD:	Remediation and Redevelopment Division
U.S. EPA:	United States Environmental Protection Agency
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
Response Actions:	Includes "response activities" as defined by Part 201 and "corrective action" as defined by Part 213

PURPOSE

This attachment to RRD Operational Memorandum No. 2 provides guidance for Target Detection Limits (TDLs) and designated methods judged capable of achieving the TDLs for acceptable indoor air concentrations. Acceptable indoor air concentrations were generated as part of the calculation used to establish groundwater and soil volatilization to indoor air cleanup criteria. Representative indoor air sampling may be used to evaluate whether there is a current unacceptable exposure that requires mitigation for due care or interim response activities at a facility. Indoor air sampling is not appropriate for evaluating compliance with soil or groundwater cleanup criteria. This document must be used in coordination with the guidance on indoor air sampling provided in RRD Operational Memorandum No. 4.

This attachment establishes analytical target detection limits for hazardous substances and designates available analytical methods that are capable of achieving the target detection limits to facilitate gathering the information necessary for the department to determine compliance with the applicable provisions of Part 201, or Part 213.

TARGET DETECTION LIMITS AND AVAILABLE METHODS

Table 1 provides TDLs for hazardous substances with established acceptable indoor air concentrations. These TDLs were derived by reviewing the low-level capabilities of state laboratories and methods published by government agencies and referenced in this document. Laboratory reporting limits should be equal to or less than these reporting limits to evaluate indoor air exposure risks.

Analytical methods judged capable of achieving the TDLs are specified in Table 1. Other validated and published methods from nationally recognized organizations can also be used, provided the TDLs in Table 1 are met. Organizations that publish such methods include the American Society for Testing and Materials (ASTM), National Institute for Occupational Safety and Health, (NIOSH) and the U.S. EPA. Modifications of methods are acceptable if method

performance documentation that demonstrates adequate performance is available and provided to the MDEQ.

The methods specified in this document were published in the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), by the Office of Research and Development of the U.S. EPA. The method titles are included with the source documentation listed in Table 1.

INDOOR AIR CONTAMINANT LIST

Indoor air sampling should not be evaluated without adequate site characterization to evaluate the soil and groundwater contaminants that exceed volatilization to indoor air cleanup criteria. All contaminants identified in the site characterization which exceed generic residential cleanup criteria are contaminants of concern. Table 1 does not include all contaminants that can be measured by the designated methods. When reporting analyses for indoor air, the laboratory should report the identified contaminants of concern and any additional contaminants that are routinely analyzed and reported to clients. Contaminants of concern and the capabilities of candidate laboratories must be reviewed when selecting a laboratory as a laboratory may or may not routinely analyze for all contaminants specified in Table 1.

RESULT REPORTING

The TDLs need to be achieved to evaluate whether there is a current unacceptable exposure that requires mitigation for due care or interim response activities at a facility. Levels below the TDL may be required to evaluate ambient air conditions within the immediate vicinity of the building. The laboratory's reporting levels for specific samples will be dependent upon the air volume collected. Careful planning is required during the sampling phase to ensure valid data is obtained for evaluation of both the indoor as well as ambient air if required.

Concentrations of contaminants in air are reported in units such as micrograms of contaminant per cubic meter of air and micrograms of contaminant per liter of air: Units of micrograms of contaminant per liter of air are equivalent to parts per billion of contaminant in the air on a volume basis, and are abbreviated as PPBV.

- Results must be appropriately coded to indicate the confidence of the data. Results with no codes are meant to be quantitative and within the accuracy and precision routinely achieved for the method.
- Results must be reported with the actual calculated reporting limit determined from the capabilities of the method and the volume of air used.
- Results for compounds detected below the laboratory reporting limits must be reported and coded to indicate estimated data.

Questions about this memorandum attachment should be directed to: A. Ralph Curtis, Laboratory Specialist, Remediation and Redevelopment Division, Toxicology Unit, Phone: 517-373-8389, FAX: 517-241-9581, Email: curtisar@michigan.gov.

APPENDAGE:

Table 1 – Target Detection Limits, Designated Analytical Methods, and Source Documents

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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

Table 1. Target Detection Limits, Designated Analytical Methods, and Source Documents

Polychlorinated Biphenyls	CAS	TDL (PPBV)	Designated Methods
Polychlorinated biphenyls (PCBs) [1]	1336363	0.02	TO-10A
Aroclor 1016	12674112	------	TO-10A
Aroclor 1221	11104282	------	TO-10A
Aroclor 1232	11141165	------	TO-10A
Aroclor 1242	53469219	------	TO-10A
Aroclor 1248	12672296	------	TO-10A
Aroclor 1254	11097691	------	TO-10A
Aroclor 1260	11096825	------	TO-10A
Aroclor 1262	37324235	------	TO-10A
Aroclor 1268	11100144	------	TO-10A
Pesticides			
Aldrin	309002	0.002	TO-10A
Chlordane [2]	57749	0.1	TO-10A
Chlordane, trans	5103719	0.04	TO-10A
Chlordane, cis	5103742	0.04	TO-10A
Chlorpyrifos, ethyl	2921882	1	TO-10A
Dieldrin	60571	0.003	TO-10A
Heptachlor	76448	0.01	TO-10A
Hexachlorobenzene	118741	0.03	TO-10A
Hexachlorocyclopentadiene	77474	0.01	TO-10A
alpha-Hexachlorocyclohexane	319846	0.007	TO-10A
Tris(2,3-dibromopropyl) phosphate	126727	0.02	TO-10A
Polycyclic Aromatic Hydrocarbons			
Acenaphthene	83329	100	TO-13
Acenaphthylene	208968	20	TO-13
Anthracene	120127	500	TO-13
Fluoranthene	206440	80	TO-13
Fluorene	86737	80	TO-13
Naphthalene	91203	2	TO-13
Phenanthrene	85018	0.05	TO-13
Pyrene	129000	50	TO-13
Mercury Vapor and Particulates			
Mercury, Total	7439976	0.2	Various [3]

Table 1. Target Detection Limits, Designated Analytical Methods, and Source Documents

Polar/Non-Polar Organic Compounds	CAS	TDL(PPBV)	Designated Methods
Acetone	67641	3000	TO-11A TO-17 TO-15A
Acetonitrile	75058	30	TO-15A TO-17
Acetophenone	98862	300	TO-15A
Acetaldehyde	75070	5	TO-11A TO-15A
Acrolein	107028	0.01	TO-15A TO-17
Acrylonitrile	107131	0.2	TO-15A TO-17
Azobenzene	103333	0.4	TO-13
Benzene	71432	1	TO-15A TO-17
Benzyl Chloride	100447	0.2	TO-15A TO-17
Bis(2-chloroethyl)ether	111444	0.04	TO-13 TO-15A TO-17
Bromobenzene	108861	4	TO-1
Bromodichloromethane	75274	0.3	TO-15A TO-17
Bromoform	75252	10	TO-15A TO-17
Bromomethane	74839	3	TO-15A TO-17
2-Butanone	78933	500	TO-15A TO-17
n-Butyl acetate	123864	4000	TO-17
t-Butyl alcohol	75650	1000	TO-17
Carbon disulfide	75150	400	TO-15A TO-17
Carbon tetrachloride	56235	0.5	TO-15A TO-17
Chlorobenzene	108907	40	TO-15A TO-17
Chloroethane	75003	5000	TO-15A TO-17
Chloroform	67663	5	TO-15A TO-17
Chloromethane	74873	20	TO-15A TO-17
2-Chlorotoluene	95498	40	TO-15A TO-17
Cyclohexanone	108941	500	TO-17
Decabromodiphenyl ether	1163195	20	TO-17
Dibromochloromethane	124481	0.5	TO-15A TO-17
1,2-Dibromo-3-chloropropane	96128	0.1	TO-15A TO-17
1,2-Dichlorobenzene	95501	800	TO-13 TO-15 TO-17
1,4-Dichlorobenzene	106467	2	TO-13 TO-15 TO-17
Dichlorodifluoromethane	75718	20,000	TO-15A TO-17
1,1-Dichloroethane	75343	300	TO-15A TO-17
1,2-Dichloroethane	107062	0.5	TO-15A TO-17
1,1-Dichloroethylene	75354	0.3	TO-15A TO-17
1,2-Dichloroethylene, cis	156592	20	TO-15A TO-17
1,2-Dichloroethylene, trans	156605	40	TO-15A TO-17

Table 1. Target Detection Limits, Designated Analytical Methods, and Source Documents

Polar/Non-Polar Organic Compounds	CAS	TDL(PPBV)	Designated Methods
1,2-Dichloropropane	78875	2	TO-15A TO-17
1,3-Dichloropropene	542756	3	TO-15A TO-17
Diethyl ether	60297	7000	TO-15A
Di-isopropyl ether	108203	200	TO-15A TO-17
Epichlorohydrin	106898	0.5	TO-15A TO-17
Ethylbenzene	100414	40	TO-15A TO-17
Ethylene dibromide	106934	0.06	TO-15A TO-17
Ethyl(tert)butylether	637923	200	TO-15A TO-17
Formaldehyde	50000	0.5	TO-11A TO-15A
Hexachloroethane	67721	2	TO-13 TO-15A TO-17
Hexachlorobutadiene	87683	0.5	TO-13 TO-15A TO-17
2-Hexanone	591786	20	TO-15A TO-17
Isobutyl alcohol	78831	800	TO-15A TO-17
Isopropylbenzene	98828	50	TO-15A TO-17
Methyl(tert)butylether	1634044	2000	TO-15A TO-17
Methyl alcohol	67561	2000	TO-15A TO-17
Methylene chloride	75092	30	TO-15A TO-17
4-Methyl-2-pentanone	108101	1000	TO-15A TO-17
Naphthalene	91203	2	TO-13 TO-17
Nitrobenzene	98953	0.4	TO-13 TO-15A TO-17
Pentane	109660	9000	TO-17
Pentachloronitrobenzene	82688	3	TO-17
Pyridine	110861	2	TO-17
Styrene	100425	20	TO-15A TO-17
Tertiaryamylmethylether	994058	30	TO-15A TO-17
1,1,2,2-Tetrachloroethane	79345	0.2	TO-15A TO-17
1,1,1,2-Tetrachloroethane	630206	2	TO-15A TO-17
Tetrachloroethylene	127184	20	TO-15A TO-17
Tetrahydrofuran	109999	3000	TO-1
1,1,2-Trichloro-1,2,2-trifluoroethane	76131	40,000	TO-15A TO-17
1,2,4-Trichlorobenzene	120821	200	TO-13 TO-15A TO-17
1,1,1-Trichloroethane	71556	500	TO-15A TO-17
1,1,2-Trichloroethane	79005	0.8	TO-15A TO-17
Trichloroethylene	79016	7	TO-15A TO-17
Trichlorofluoromethane	75694	30,000	TO-15A TO-17

Table 1. Target Detection Limits, Designated Analytical Methods, and Source Documents

Polar/Non-Polar Organic Compounds	CAS	TDL(PPBV)	Designated Methods
1,2,4-Trimethylbenzene	95636	700	TO-15
1,3,5-Trimethylbenzene	108678	700	TO-15
Toluene	108883	200	TO-15A TO-17
Vinyl acetate	108054	100	TO-15A TO-17
Vinyl chloride	75014	3	TO-15A TO-17
Xylenes	1330207	2000	TO-15A TO-17

Footnotes:

1. The term Polychlorinated bipenyls (PCBs) refers to the total concentration of Aroclors found at the site. The Aroclors must be summed and reported as total PCBs. The Aroclors analyzed are listed without TDLs. The individual TDLs for these Aroclors must be sufficiently low that the reporting limit for PCBs can be met.
2. The concentrations of the trans and cis isomers must be summed and reported as Chlordane. Other procedures for summing concentrations of appropriate compounds may be used.
3. There are many instruments available to measure mercury vapor and particulates. Each instrument has instructions provided by the manufacturer. The appropriate method, or instructions for the use of the instrument, is dependent upon the specific instrument used.

Source Documents for Indoor Air Measurements

All of the following methods are from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, Center for Environmental Research Information, Office of Research and Development, U.S. EPA, Cincinnati, OH 45268, January 1999 (http://www.epa.gov/ttn/amtic/files/ambient/airtox/tocomp99.pdf):

Method TO-10A: Determination of Pesticides and Polychlorinated Biphenyls in Ambient Using Low Volume Polyurethane Foam (PUF) Sampling Followed by Gas Chromatographic/Multi-Detector Detection (GC/MD).

Method TO-11A: Determination of Formaldehyde in Ambient Adsorbent Cartridge Followed by High Performance Liquid Chromatography (HPLC).

Method TO-13A: Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air Using Gas Chromatography/Mass Spectrometry (GC/MS).

Method TO-15: Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by GC/MS.

Method TO-17: Determination of VOCs in Ambient Air Using Active Sampling on to Sorbent Tubes.