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May 12, 2011

Mr. Shaminder Chawla
New York City Office of Environmental Remediation
City Brownfield Cleanup Program
% Zach Schreiber
100 Gold Street, 2nd Floor
New York, NY 10038

Re: 11CBCP009X, 11CBCP010X and 10EHAZ276X
2477 Third Avenue
Remedial Action Work Plan (RAWP) Stipulation List

Dear Mr. Chawla:

AKRF hereby submits a Remedial Action Work Plan (RAWP) Stipulation List for the subject site to the New York City Office of Environmental Remediation (NYCOER) on behalf of Jiten, LLC. This letter serves as an addendum to the RAWP to stipulate additional content, requirements and procedures that will be followed during the site remediation. The contents of this list are added to the RAWP and will supersede the content in the RAWP where there is a conflict in purpose or intent. The additional requirements/procedures include the following:

Stipulation List

Remedial Investigation

1. Revised Tables 1, 2B and 2C are attached in Addendum 1.
2. A map indicating End Point Sampling Locations is attached as Addendum 2. Post Remedial samples mean end-point samples. Revised Figures including Lot 5 (Site B) are attached.
3. The quality assurance/quality control program for collection of end point samples for this remedial action will include the following provisions:
    - New York State ELAP certified labs will be utilized for chemical analysis.
    - Data summary tables will be prepared that include all data entries (including non-detect results) and will be presented in the Remedial Action Report (RAR).
    - Full chain of custody for analytical samples will be maintained and forms will be reported in the RAR.
    - Collection of QA/QC samples including field blanks, trip blanks, lab blanks and field duplicates will be incorporated. These samples will include field blanks, field duplicates,

and trip blanks at a frequency of one sample per 20 field samples collected. The field blanks will be analyzed for:

- Full list volatile organic compounds (VOCs) by EPA Method 8260
- Full list semi-volatile organic compounds (SVOCs) by EPA Method 8270
- Target Analyte List (TAL) metals
- Pesticides/PCBs by EPA Method 8081/8082

The trip blanks will be analyzed for VOCs only. The laboratory will conduct internal lab blank analysis as per ELAP requirements.

4. The remedial action for Site A will apply Track 1 SCOs. A Site Management Plan is not required for Track 1 clean-up. A Site Management Plan will be required for Site B. A Site Management Plan for Site B will address Soil Vapor System management on Site A.
5. Up to date plans are included in Addendum 3 with the final site development plan, including plans for the sub-grade, which were omitted in the RAWP.
6. A vapor barrier will be installed under the entire building. The vapor barrier will consist of Grace Preprufe 300R below the foundation slab including all elevator pit sidewalls and slab, and will be used in conjunction with 160 R on sidewalls to grade. An SSDS system will be installed beneath the hotel lobby.
7. The plan for excavation for Site A is is to excavate the entire site to approximately 8 feet below grade, with an extra 3 to 4 feet excavated in the areas of pile caps. Excavation will start on the northwestern end of the site and continue towards the southeast. It is intended that all soil will be directly loaded onto trucks for off-site disposal. Any soil not able to be directly loaded onto trucks will be temporarily stockpiled in accordance with Appendix 3 of the RAWP.
8. Any dewatering on Site A will be performed with prior approval of DEC with respect to remedial action on adjacent Lot 11.
9. All soil/fill removed from Site A and Site B will be managed as regulated material and will be disposed of at permitted disposal facilities. OER will be notified of the facilities to be used for disposal prior to start of the remedial construction. If there is a change to this plan that will render the use of excavated material in a non-regulated manner, OER will be notified prior to implementation.
10. Site B will be paved with n approximately 4-inch gravel layer covered with approximately 3-inch layer of asphalt.
11. The criterion attached in Addendum 4 will be utilized if a petroleum-containing tank or vessel is identified during the remedial action or subsequent redevelopment excavation activities. All petroleum spills will be reported to the NYSDEC hotline as required by applicable laws and regulations. This contingency plan is designed for heating oil tanks and other small or moderately sized storage vessels. If larger tanks, such as gasoline storage tanks are identified, OER will be notified before this criterion is utilized.
12. Backfill soil quality limits applicable to Site A, if any, are Track 1 SCOs. Any soils intended for reuse will be segregated, sampled and approved by OER before backfilling.
13. Signage for the project will include a sturdy placard mounted on the property line at the primary construction entrance to the property that includes the NYC BCP Fact Sheet announcing the remedial action. The fact sheet will be laminated and permanently affixed to the placard. The Fact Sheet will be visible and legible on the public right-of-way and will be posted in the immediate vicinity of building and other permits.

14. A CD containing the final RAWP including this approved Stipulation List will be placed in the library that provides the primary public repository for project documents.
15. Original signed certification of the RAWP is included in Addendum 5.
16. The ToxFaqs for all known contaminants are attached in Addendum 6.
17. A remedial design document providing the design specifications of the cover slab in section for the hotel are included in Appendix 5 of the RAWP.
18. NYSDEC approval will be obtained prior to transport and disposal of soil from Site A to the adjacent site (Lot 11) in the NYS BCP.
19. The final QHHEA is included in Section 4.6 of the RAWP.
20. Section 5.5 Community Air Monitoring: Continuous VOC and particulate monitoring will be performed during any ground intrusive activities. This is required per the NYSDOH generic CAMP.

Sincerely,
AKRF Engineering, P.C.

Michelle Lapin, P.E.
President

cc: D. Pisani - OER
Z. Schreiber – OER
D. Cervino – Golub and Isabel, P.C.

ADDENDUM 1

REVISED TABLES 1, 2B AND 2C FROM AKRF'S MARCH 2011

Table 1A
2477 Third Ave.
Bronx, NY
2009 Subsurface (Phase II) Investigation Soil Analytical Results
Volatile Organic Compounds

Client ID Lab Sample ID Date Sampled Dilution mg/kg	NYSDEC Part 375 Unrestricted mg/kg	NYSDEC Part 375 Commercial mg/kg	SB-1 (8'-9') L0901109-01 1/27/2009 1	SB-2 (6'-7') L0901109-02 1/27/2009 1	SB-3 (6'-7') L0901109-04 1/27/2009 1	SB-4 (7'-8') L0901109-05 1/27/2009 1	SB-5 (9'-10') L0901109-06 1/27/2009 400	SB-6 (9'-10') L0901109-03 1/27/2009 400	SB-7 (6'-7') L0901109-07 1/27/2009 1	SB-8 (8'-9') L0901109-08 1/27/2009 1
1,1,1,2-Tetrachloroethane	NS	NS	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
1,1,1-Trichloroethane	0.68	500	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
1,1,2,2-Tetrachloroethane	NS	NS	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
1,1,2-Trichloroethane	NS	NS	0.0046 U	0.0043 U	0.0046 U	0.0045 U	1.8 U	1.9 U	0.0045 U	0.0045 U
1,1-Dichloroethane	0.27	240	0.0046 U	0.0043 U	0.0046 U	0.0045 U	1.8 U	1.9 U	0.0045 U	0.0045 U
1,1-Dichloroethene	0.33	500	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
1,1-Dichloropropene	NS	NS	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
1,2,3-Trichlorobenzene	NS	NS	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
1,2,3-Trichloropropane	NS	NS	0.03 U	0.029 U	0.031 U	0.03 U	12 U	12 U	0.03 U	0.03 U
1,2,4,5-Tetramethylbenzene	NS	NS	0.012 U	0.011 U	0.012 U	0.012 U	9.3	5.1	0.012 U	0.012 U
1,2,4-Trichlorobenzene	NS	NS	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
1,2,4-Trimethylbenzene	3.6	190	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
1,2-Dibromo-3-chloropropane	NS	NS	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
1,2-Dibromoethane	NS	NS	0.012 U	0.011 U	0.012 U	0.012 U	4.9 U	5 U	0.012 U	0.012 U
1,2-Dichlorobenzene	1.1	500	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
1,2-Dichloroethane	0.02	30	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
1,2-Dichloropropane	NS	NS	0.011 U	0.01 U	0.011 U	0.01 U	4.3 U	4.4 U	0.01 U	0.01 U
1,3,5-Trimethylbenzene	8.4	190	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
1,3-Dichlorobenzene	2.4	280	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
1,3-Dichloropropane	NS	NS	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
1,4-Dichlorobenzene	1.8	130	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
1,4-Diethylbenzene	NS	NS	0.012 U	0.011 U	0.012 U	0.012 U	4.9 U	5 U	0.012 U	0.012 U
2,2-Dichloropropane	NS	NS	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
2-Butanone	0.12	500	0.03 U	0.029 U	0.031 U	0.03 U	12 U	12 U	0.03 U	0.03 U
2-Hexanone	NS	NS	0.03 U	0.029 U	0.031 U	0.03 U	12 U	12 U	0.03 U	0.03 U
4-Ethyltoluene	NS	NS	0.012 U	0.011 U	0.012 U	0.012 U	4.9 U	5 U	0.012 U	0.012 U
4-Methyl-2-pentanone	NS	NS	0.03 U	0.029 U	0.031 U	0.03 U	12 U	12 U	0.03 U	0.03 U
Acetone	0.05	500	0.063	0.029 U	0.12	0.03 U	12 U	12 U	0.03 U	0.03 U
Acrylonitrile	NS	NS	0.03 U	0.029 U	0.031 U	0.03 U	12 U	12 U	0.03 U	0.03 U
Benzene	0.06	44	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
Bromobenzene	NS	NS	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
Bromochloromethane	NS	NS	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
Bromodichloromethane	NS	NS	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
Bromoform	NS	NS	0.012 U	0.011 U	0.012 U	0.012 U	4.9 U	5 U	0.012 U	0.012 U
Bromomethane	NS	NS	0.0061 U	0.0057 U	0.0062 U	0.006 U	2.5 U	2.5 U	0.006 U	0.006 U
Carbon disulfide	NS	NS	0.03 U	0.029 U	0.031 U	0.03 U	12 U	12 U	0.03 U	0.03 U
Carbon tetrachloride	0.76	22	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
Chlorobenzene	1.1	500	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
Chloroethane	NS	NS	0.0061 U	0.0057 U	0.0062 U	0.006 U	2.5 U	2.5 U	0.006 U	0.006 U
Chloroform	0.37	350	0.0046 U	0.0043 U	0.0046 U	0.0045 U	1.8 U	1.9 U	0.0045 U	0.0045 U
Chloromethane	NS	NS	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
cis-1,2-Dichloroethene	0.25	500	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
cis-1,3-Dichloropropene	NS	NS	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
Dibromochloromethane	NS	NS	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
Dibromomethane	NS	NS	0.03 U	0.029 U	0.031 U	0.03 U	12 U	12 U	0.03 U	0.03 U
Dichlorodifluoromethane	NS	NS	0.03 U	0.029 U	0.031 U	0.03 U	12 U	12 U	0.03 U	0.03 U
Ethylbenzene	1	390	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
Hexachlorobutadiene	NS	NS	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
Isopropylbenzene	NS	NS	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
Methyl tert butyl ether	0.93	500	0.0061 U	0.0057 U	0.0062 U	0.006 U	2.5 U	2.5 U	0.006 U	0.006 U
Methylene chloride	0.05	500	0.03 U	0.029 U	0.031 U	0.03 U	12 U	12 U	0.03 U	0.03 U
Naphthalene	12	500	0.22	0.014 U	0.015 U	0.017	6.2 U	6.2 U	0.015 U	0.015 U
n-Butylbenzene	12	500	0.003 U	0.0029 U	0.0031 U	0.003 U	2.1	1.2 U	0.003 U	0.003 U
n-Propylbenzene	3.9	500	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
o-Chlorotoluene	NS	NS	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
o-Xylene	0.26	500	0.0061 U	0.0057 U	0.0062 U	0.006 U	2.5 U	2.5 U	0.006 U	0.006 U
p/m-Xylene	0.26	500	0.0061 U	0.0057 U	0.0062 U	0.006 U	2.5 U	2.5 U	0.006 U	0.006 U
p-Chlorotoluene	NS	NS	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
p-Isopropyltoluene	NS	NS	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
sec-Butylbenzene	11	500	0.003 U	0.0029 U	0.0031 U	0.003 U	2	1.2 U	0.003 U	0.003 U
Styrene	NS	NS	0.0061 U	0.0057 U	0.0062 U	0.006 U	2.5 U	2.5 U	0.006 U	0.006 U
tert-Butylbenzene	5.9	500	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
Tetrachloroethene	1.3	150	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
Toluene	0.7	500	0.0046 U	0.0043 U	0.0046 U	0.0045 U	1.8 U	1.9 U	0.0045 U	0.0045 U
trans-1,2-Dichloroethene	0.19	500	0.0046 U	0.0043 U	0.0046 U	0.0045 U	1.8 U	1.9 U	0.0045 U	0.0045 U
trans-1,3-Dichloropropene	NS	NS	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
Trichloroethene	0.47	200	0.003 U	0.0029 U	0.0031 U	0.003 U	1.2 U	1.2 U	0.003 U	0.003 U
Trichlorofluoromethane	NS	NS	0.015 U	0.014 U	0.015 U	0.015 U	6.2 U	6.2 U	0.015 U	0.015 U
Vinyl acetate	NS	NS	0.03 U	0.029 U	0.031 U	0.03 U	12 U	12 U	0.03 U	0.03 U
Vinyl chloride	0.02	13	0.0061 U	0.0057 U	0.0062 U	0.006 U	2.5 U	2.5 U	0.006 U	0.006 U

Table 1B
2477 Third Avenue
Bronx, New York
2011 Remedial Investigation Soil Analytical Results
Volatile Organic Compounds

Client ID	NYSDEC	NYSDEC	SB-9(0-2)	SB-10(0-2)	SB-11(0-2)	SB-12(0-2)	SB-13(0-2)	SB-14(0-2)	SB-15(0-2)
Lab Sample ID	Part 375	Part 375	L1102299-01	L1102299-02	L1102299-03	L1102299-04	L1102299-05	L1102299-06	L1102299-07
Date Sampled	Unrestricted	Commercial	17-FEB-11	17-FEB-11	17-FEB-11	17-FEB-11	17-FEB-11	17-FEB-11	17-FEB-11
Dilution			1	1	1	1	1	1	1
Analyte	mg/Kg	mg/Kg							
1,1,1,2-Tetrachloroethane	NS	NS	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
1,1,1-Trichloroethane	0.68	500	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
1,1,2,2-Tetrachloroethane	NS	NS	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
1,1,2-Trichloroethane	NS	NS	0.0044 U	0.0045 U	0.0044 U	0.0044 U	0.0043 U	0.0045 U	0.0041 U
1,1-Dichloroethane	0.27	240	0.0044 U	0.0045 U	0.0044 U	0.0044 U	0.0043 U	0.0045 U	0.0041 U
1,1-Dichloroethene	0.33	500	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
1,1-Dichloropropene	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
1,2,3-Trichlorobenzene	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
1,2,3-Trichloropropane	NS	NS	0.029 U	0.03 U	0.029 U	0.029 U	0.029 U	0.03 U	0.027 U
1,2,4,5-Tetramethylbenzene	NS	NS	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U
1,2,4-Trichlorobenzene	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
1,2,4-Trimethylbenzene	3.6	190	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
1,2-Dibromo-3-chloropropane	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
1,2-Dibromoethane	NS	NS	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U
1,2-Dichlorobenzene	1.1	500	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
1,2-Dichloroethane	0.02	30	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
1,2-Dichloropropane	NS	NS	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0095 U
1,3,5-Trimethylbenzene	8.4	190	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
1,3-Dichlorobenzene	2.4	280	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
1,3-Dichloropropane	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
1,4-Dichlorobenzene	1.8	130	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
1,4-Diethylbenzene	NS	NS	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U
2,2-Dichloropropane	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
2-Butanone	0.12	500	0.029 U	0.03 U	0.029 U	0.029 U	0.029 U	0.03 U	0.027 U
2-Hexanone	NS	NS	0.029 U	0.03 U	0.029 U	0.029 U	0.029 U	0.03 U	0.027 U
4-Ethyltoluene	NS	NS	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U
4-Methyl-2-pentanone	NS	NS	0.029 U	0.03 U	0.029 U	0.029 U	0.029 U	0.03 U	0.027 U
Acetone	0.05	500	0.029 U	0.03 U	0.029 U	0.029 U	0.029 U	0.03 U	0.027 U
Acrylonitrile	NS	NS	0.029 U	0.03 U	0.029 U	0.029 U	0.029 U	0.03 U	0.027 U
Benzene	0.06	44	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
Bromobenzene	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
Bromochloromethane	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
Bromodichloromethane	NS	NS	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
Bromoform	NS	NS	0.012 U	0.012 U	0.012 U	0.012 U	0.011 U	0.012 U	0.011 U
Bromomethane	NS	NS	0.0059 U	0.006 U	0.0059 U	0.0058 U	0.0057 U	0.006 U	0.0054 U
Carbon disulfide	NS	NS	0.029 U	0.03 U	0.029 U	0.029 U	0.029 U	0.03 U	0.027 U
Carbon tetrachloride	0.76	22	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
Chlorobenzene	1.1	500	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
Chloroethane	NS	NS	0.0059 U	0.006 U	0.0059 U	0.0058 U	0.0057 U	0.006 U	0.0054 U
Chloroform	0.37	350	0.0044 U	0.0045 U	0.0044 U	0.0044 U	0.0043 U	0.0045 U	0.0041 U
Chloromethane	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
cis-1,2-Dichloroethene	0.25	500	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
cis-1,3-Dichloropropene	NS	NS	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
Dibromochloromethane	NS	NS	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
Dibromomethane	NS	NS	0.029 U	0.03 U	0.029 U	0.029 U	0.029 U	0.03 U	0.027 U
Dichlorodifluoromethane	NS	NS	0.029 U	0.03 U	0.029 U	0.029 U	0.029 U	0.03 U	0.027 U
Ethyl ether	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
Ethylbenzene	1	390	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
Hexachlorobutadiene	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
Isopropylbenzene	NS	NS	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
Methyl tert butyl ether	0.93	500	0.0059 U	0.006 U	0.0059 U	0.0058 U	0.0057 U	0.006 U	0.0054 U
Methylene chloride	0.05	500	0.029 U	0.03 U	0.029 U	0.029 U	0.029 U	0.03 U	0.027 U
Naphthalene	12	500	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
n-Butylbenzene	12	500	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
n-Propylbenzene	3.9	500	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
o-Chlorotoluene	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
o-Xylene	0.26	500	0.0059 U	0.006 U	0.0059 U	0.0058 U	0.0057 U	0.006 U	0.0054 U
p/m-Xylene	0.26	500	0.0059 U	0.006 U	0.0059 U	0.0058 U	0.0057 U	0.006 U	0.0054 U
p-Chlorotoluene	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
p-Isopropyltoluene	NS	NS	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
sec-Butylbenzene	11	500	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
Styrene	NS	NS	0.0059 U	0.006 U	0.0059 U	0.0058 U	0.0057 U	0.006 U	0.0054 U
tert-Butylbenzene	5.9	500	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
Tetrachloroethene	1.3	150	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
Toluene	0.7	500	0.0044 U	0.0045 U	0.0044 U	0.0044 U	0.0043 U	0.0045 U	0.0041 U
trans-1,2-Dichloroethene	0.19	500	0.0044 U	0.0045 U	0.0044 U	0.0044 U	0.0043 U	0.0045 U	0.0041 U
trans-1,3-Dichloropropene	NS	NS	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
trans-1,4-Dichloro-2-butene	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
Trichloroethene	0.47	200	0.0029 U	0.003 U	0.0029 U	0.0029 U	0.0029 U	0.003 U	0.0027 U
Trichlorofluoromethane	NS	NS	0.015 U	0.015 U	0.015 U	0.014 U	0.014 U	0.015 U	0.014 U
Vinyl acetate	NS	NS	0.029 U	0.03 U	0.029 U	0.029 U	0.029 U	0.03 U	0.027 U
Vinyl chloride	0.02	13	0.0059 U	0.006 U	0.0059 U	0.0058 U	0.0057 U	0.006 U	0.0054 U

Table 1C
2477 Third Ave.
Bronx, NY
2009 Subsurface (Phase II) Investigation Soil Analytical Results
Semi-Volatile Organic Compounds

Client ID Lab Sample ID Date Sampled Dilution mg/kg	NYSDEC Part 375 Unrestricted	NYSDEC Part 375 Commercial mg/kg	SB-1 (8'-9') L0901109-01 1/27/2009 10	SB-2 (6'-7') L0901109-02 1/27/2009 1	SB-3 (6'-7') L0901109-04 1/27/2009 1	SB-4 (7'-8') L0901109-05 1/27/2009 1	SB-5 (9'-10') L0901109-06 1/27/2009 1	SB-6 (9'-10') L0901109-03 1/27/2009 1	SB-7 (6'-7') L0901109-07 1/27/2009 1	SB-8 (8'-9') L0901109-08 1/27/2009 1
1,2,4,5-Tetrachlorobenzene	NS	NS	16 U	1.5 U	1.6 U	1.6 U	1.6 U	1.7 U	1.6 U	1.6 U
1,2,4-Trichlorobenzene	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
1,2-Dichlorobenzene	1.1	500	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
1,3-Dichlorobenzene	2.4	280	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
1,4-Dichlorobenzene	1.8	130	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
2,4,5-Trichlorophenol	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
2,4,6-Trichlorophenol	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
2,4-Dichlorophenol	NS	NS	8.1 U	0.77 U	0.82 U	0.79 U	0.82 U	0.83 U	0.79 U	0.79 U
2,4-Dimethylphenol	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
2,4-Dinitrophenol	NS	NS	16 U	1.5 U	1.6 U	1.6 U	1.6 U	1.7 U	1.6 U	1.6 U
2,4-Dinitrotoluene	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
2,6-Dinitrotoluene	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
2-Chloronaphthalene	NS	NS	0.65 U	0.015 U	0.016 U	0.079 U	0.016 U	0.083 U	0.016 U	0.016 U
2-Chlorophenol	NS	NS	4.9 U	0.46 U	0.49 U	0.48 U	0.49 U	0.5 U	0.48 U	0.48 U
2-Methylnaphthalene	NS	NS	0.65 U	0.015 U	0.016 U	0.52	0.016 U	0.083 U	0.016 U	0.016 U
2-Methylphenol	0.33	500	4.9 U	0.46 U	0.49 U	0.48 U	0.49 U	0.5 U	0.48 U	0.48 U
2-Nitroaniline	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
2-Nitrophenol	NS	NS	16 U	1.5 U	1.6 U	1.6 U	1.6 U	1.7 U	1.6 U	1.6 U
3,3'-Dichlorobenzidine	NS	NS	8.1 U	0.77 U	0.82 U	0.79 U	0.82 U	0.83 U	0.79 U	0.79 U
3-Methylphenol/4-Methylphenol	0.33	500	4.9 U	0.46 U	0.49 U	0.48 U	0.49 U	0.5 U	0.48 U	0.48 U
3-Nitroaniline	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
4,6-Dinitro-o-cresol	NS	NS	16 U	1.5 U	1.6 U	1.6 U	1.6 U	1.7 U	1.6 U	1.6 U
4-Bromophenyl phenyl ether	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
4-Chloroaniline	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
4-Chlorophenyl phenyl ether	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
4-Nitroaniline	NS	NS	5.7 U	0.54 U	0.58 U	0.56 U	0.58 U	0.58 U	0.56 U	0.56 U
4-Nitrophenol	NS	NS	8.1 U	0.77 U	0.82 U	0.79 U	0.82 U	0.83 U	0.79 U	0.79 U
Acenaphthene	20	500	0.65 U	0.015 U	0.016 U	1.4	0.06	0.4	0.016 U	0.016 U
Acenaphthylene	100	500	0.65 U	0.015 U	0.016 U	0.46	0.016 U	0.083 U	0.016 U	0.016 U
Acetophenone	NS	NS	16 U	1.5 U	1.6 U	1.6 U	1.6 U	1.7 U	1.6 U	1.6 U
Anthracene	100	500	0.65 U	0.015 U	0.043	3.4	0.016 U	0.083 U	0.016 U	0.016 U
Benzo(a)anthracene	1	5.6	0.65 U	0.015 U	0.17	7.5	0.031	0.083 U	0.016 U	0.016 U
Benzo(a)pyrene	1	1	0.65 U	0.015 U	0.37	5.9	0.02	0.083 U	0.016 U	0.016 U
Benzo(b)fluoranthene	1	5.6	0.65 U	0.015 U	0.36	7.4	0.025	0.083 U	0.016 U	0.016 U
Benzo(ghi)perylene	100	500	0.65 U	0.015 U	0.42	3.6	0.016 U	0.083 U	0.016 U	0.016 U
Benzo(k)fluoranthene	0.8	56	0.65 U	0.015 U	0.1	2.2	0.016 U	0.083 U	0.016 U	0.016 U
Benzoic Acid	NS	NS	41 U	3.8 U	4.1 U	4 U	4.1 U	4.2 U	4 U	4 U
Benzyl Alcohol	NS	NS	8.1 U	0.77 U	0.82 U	0.79 U	0.82 U	0.83 U	0.79 U	0.79 U
Biphenyl	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
Bis(2-chloroethoxy)methane	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
Bis(2-chloroethyl)ether	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
Bis(2-chloroisopropyl)ether	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
Bis(2-Ethylhexyl)phthalate	NS	NS	8.1 U	0.77 U	0.82 U	0.79 U	0.82 U	0.83 U	0.79 U	0.79 U
Butyl benzyl phthalate	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
Carbazole	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
Chrysene	1	56	1.9	0.015 U	0.22	9	0.071	0.083 U	0.016 U	0.016 U
Dibenzo(a,h)anthracene	0.33	0.56	0.65 U	0.015 U	0.12	0.95	0.016 U	0.083 U	0.016 U	0.016 U
Dibenzofuran	7	350	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
Diethyl phthalate	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
Dimethyl phthalate	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
Di-n-butylphthalate	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
Di-n-octylphthalate	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
Fluoranthene	100	500	0.65 U	0.015 U	0.27	15	0.04	0.12	0.016 U	0.016 U
Fluorene	30	500	0.65 U	0.015 U	0.016 U	1.4	0.019	0.083 U	0.016 U	0.016 U
Hexachlorobenzene	0.33	6	2.6 U	0.061 U	0.066 U	0.32 U	0.066 U	0.33 U	0.063 U	0.063 U
Hexachlorobutadiene	NS	NS	1.6 U	0.038 U	0.041 U	0.2 U	0.041 U	0.21 U	0.04 U	0.04 U
Hexachlorocyclopentadiene	NS	NS	8.1 U	0.77 U	0.82 U	0.79 U	0.82 U	0.83 U	0.79 U	0.79 U
Hexachloroethane	NS	NS	2.6 U	0.061 U	0.066 U	0.32 U	0.066 U	0.33 U	0.063 U	0.063 U
Indeno(1,2,3-cd)Pyrene	0.5	5.6	0.65 U	0.015 U	0.22	2.8	0.016 U	0.083 U	0.016 U	0.016 U
Isophorone	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
Naphthalene	12	500	0.65 U	0.015 U	0.016 U	0.65	0.016 U	0.083 U	0.016 U	0.016 U
Nitrobenzene	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
NitrosoDiPhenylAmine(NDPA)/DPA	NS	NS	12 U	1.1 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
n-Nitrosodi-n-propylamine	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
P-Chloro-M-Cresol	NS	NS	4.1 U	0.38 U	0.41 U	0.4 U	0.41 U	0.42 U	0.4 U	0.4 U
Pentachlorophenol	0.8	6.7	2.6 U	0.061 U	0.066 U	0.32 U	0.066 U	0.33 U	0.063 U	0.063 U
Phenanthrene	100	500	0.65 U	0.015 U	0.23	16	0.016 U	0.083 U	0.016 U	0.016 U
Phenol	0.33	500	5.7 U	0.54 U	0.58 U	0.56 U	0.58 U	0.58 U	0.56 U	0.56 U
Pyrene	100	500	0.65 U	0.015 U	0.29	16	0.065	0.3	0.016 U	0.016 U

SVOCs SIM - mg/kg

2-Chloronaphthalene	NS	NS	0.65 U	0.015 U	0.016 U	0.079 U	0.016 U	0.083 U	0.016 U	0.016 U
2-Methylnaphthalene	NS	NS	0.65 U	0.015 U	0.016 U	0.52	0.016 U	0.083 U	0.016 U	0.016 U
Acenaphthene	20	500	0.65 U	0.015 U	0.016 U	1.4	0.08	0.4	0.016 U	0.016 U
Acenaphthylene	100	500	0.65 U	0.015 U	0.016 U	0.46	0.016 U	0.083 U	0.016 U	0.016 U
Anthracene	100	500	0.65 U	0.015 U	0.043	3.4	0.016 U	0.083 U	0.016 U	0.016 U
Benzo(a)anthracene	1	5.6	0.65 U	0.015 U	0.17	7.5	0.031	0.083 U	0.016 U	0.016 U
Benzo(a)pyrene	1	1	0.65 U	0.015 U	0.37	5.9	0.02	0.083 U	0.016 U	0.016 U
Benzo(b)fluoranthene	1	5.6	0.65 U	0.015 U	0.36	7.4	0.025	0.083 U	0.016 U	0.016 U
Benzo(ghi)perylene	100	500	0.65 U	0.015 U	0.42	3.6	0.016 U	0.083 U	0.016 U	0.016 U
Benzo(k)fluoranthene	0.8	56	0.65 U	0.015 U	0.1	2.2	0.016 U	0.083 U	0.016 U	0.016 U
Chrysene	1	56	1.9	0.015 U	0.22	9	0.071	0.083 U	0.016 U	0.016 U
Dibenzo(a,h)anthracene	0.33	0.56	0.65 U	0.015 U	0.12	0.95	0.016 U	0.083 U	0.016 U	0.016 U
Fluoranthene	100	500	0.65 U	0.015 U	0.27	15	0.04	0.12	0.016 U	0.016 U
Fluorene	30	500	0.65 U	0.015 U	0.016 U	1.4	0.019	0.083 U	0.016 U	0.016 U
Hexachlorobenzene	0.33	6	2.6 U	0.061 U	0.066 U	0.32 U	0.066 U	0.33 U	0.063 U	0.063 U
Hexachlorobutadiene	NS	NS	1.6 U	0.038 U	0.041 U	0.2 U	0.041 U	0.21 U	0.04 U	0.04 U
Hexachloroethane	NS	NS	2.6 U	0.061 U	0.066 U	0.32 U	0.066 U	0.33 U	0.063 U	0.063 U
Indeno(1,2,3-cd)Pyrene	0.5	5.6	0.65 U	0.015 U	0.22	2.8	0.016 U	0.083 U	0.016 U	0.016 U
Naphthalene	12	500	0.65 U	0.015 U	0.016 U	0.65	0.016 U	0.083 U	0.016 U	0.016 U
Pentachlorophenol	0.8	6.7	2.6 U	0.061 U	0.066 U	0.32 U	0.066 U	0.33 U	0.063 U	0.063 U
Phenanthrene	100	500	0.65 U	0.015 U	0.23	16	0.016 U	0.083 U	0.016 U	0.016 U
Pyrene	100	500	0.65 U	0.015 U	0.29	16	0.065	0.3	0.016 U	0.016 U

Table 1D
2477 Third Avenue
Bronx, New York
2011 Remedial Investigation Soil Analytical Results
Semi-Volatile Organic Compounds

Client ID	NYSDEC	NYSDEC	SB-9(0-2)	SB-10(0-2)	SB-11(0-2)	SB-12(0-2)	SB-13(0-2)	SB-14(0-2)	SB-15(0-2)
Lab Sample ID	Part 375	Part 375	L1102299-01	L1102299-02	L1102299-03	L1102299-04	L1102299-05	L1102299-06	L1102299-07
Date Sampled	Unrestricted	Commercial	2/17/2011	2/17/2011	2/17/2011	2/17/2011	2/17/2011	2/17/2011	2/17/2011
Dilution			2	5	5	1	5	5	1
SVOCs - mg/kg	mg/kg	mg/kg							
1,2,4,5-Tetrachlorobenzene	NS	NS	1.5 U	4 U	3.9 U	0.77 U	3.8 U	3.8 U	0.71 U
1,2,4-Trichlorobenzene	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
1,2-Dichlorobenzene	1.1	500	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
1,3-Dichlorobenzene	2.4	280	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
1,4-Dichlorobenzene	1.8	130	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
2,4,5-Trichlorophenol	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
2,4,6-Trichlorophenol	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
2,4-Dichlorophenol	NS	NS	0.76 U	2 U	2 U	0.38 U	1.9 U	1.9 U	0.36 U
2,4-Dimethylphenol	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
2,4-Dinitrophenol	NS	NS	1.5 U	4 U	3.9 U	0.77 U	3.8 U	3.8 U	0.71 U
2,4-Dinitrotoluene	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
2,6-Dinitrotoluene	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
2-Chlorophenol	NS	NS	0.46 U	1.2 U	1.2 U	0.23 U	1.1 U	1.2 U	0.21 U
2-Methylphenol	0.33	500	0.46 U	1.2 U	1.2 U	0.23 U	1.1 U	1.2 U	0.21 U
2-Nitroaniline	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
2-Nitrophenol	NS	NS	1.5 U	4 U	3.9 U	0.77 U	3.8 U	3.8 U	0.71 U
3,3'-Dichlorobenzidine	NS	NS	0.76 U	2 U	2 U	0.38 U	1.9 U	1.9 U	0.36 U
3-Methylphenol/4-Methylphenol	0.33	500	0.46 U	1.2 U	1.2 U	0.23 U	1.1 U	1.2 U	0.21 U
3-Nitroaniline	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
4,6-Dinitro-o-cresol	NS	NS	1.5 U	4 U	3.9 U	0.77 U	3.8 U	3.8 U	0.71 U
4-Bromophenyl phenyl ether	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
4-Chloroaniline	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
4-Chlorophenyl phenyl ether	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
4-Nitroaniline	NS	NS	0.54 U	1.4 U	1.4 U	0.27 U	1.3 U	1.3 U	0.25 U
4-Nitrophenol	NS	NS	0.76 U	2 U	2 U	0.38 U	1.9 U	1.9 U	0.36 U
Acetophenone	NS	NS	1.5 U	4 U	3.9 U	0.77 U	3.8 U	3.8 U	0.71 U
Benzoic Acid	NS	NS	3.8 U	10 U	9.8 U	1.9 U	9.4 U	9.6 U	1.8 U
Benzyl Alcohol	NS	NS	0.76 U	2 U	2 U	0.38 U	1.9 U	1.9 U	0.36 U
Biphenyl	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
Bis(2-chloroethoxy)methane	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
Bis(2-chloroethyl)ether	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
Bis(2-chloroisopropyl)ether	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
Bis(2-Ethylhexyl)phthalate	NS	NS	0.76 U	2 U	2 U	0.38 U	1.9 U	1.9 U	0.36 U
Butyl benzyl phthalate	NS	NS	0.38 U	1 U	0.98 U	0.19 U	4.6	0.96 U	0.18 U
Carbazole	NS	NS	0.38 U	1 U	2.7	0.28	0.94 U	0.96 U	0.18 U
Dibenzofuran	7	350	0.38 U	1 U	4	0.23	0.94 U	0.96 U	0.18 U
Diethyl phthalate	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
Dimethyl phthalate	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
Di-n-butylphthalate	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
Di-n-octylphthalate	NS	NS	0.38 U	1 U	0.98 U	0.19 U	3.8	0.96 U	0.18 U
Hexachlorocyclopentadiene	NS	NS	0.76 U	2 U	2 U	0.38 U	1.9 U	1.9 U	0.36 U
Isophorone	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
Nitrobenzene	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
NitrosoDiPhenylAmine(NDPA)/DPA	NS	NS	1.1 U	3 U	2.9 U	0.58 U	2.8 U	2.9 U	0.54 U
n-Nitrosodi-n-propylamine	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
P-Chloro-M-Cresol	NS	NS	0.38 U	1 U	0.98 U	0.19 U	0.94 U	0.96 U	0.18 U
Phenol	0.33	500	0.54 U	1.4 U	1.4 U	0.27 U	1.3 U	1.3 U	0.25 U
SVOCs SIM - mg/kg									
Dilution			10	20	20	5	20	20	1
2-Chloronaphthalene	NS	NS	0.076 U	0.16 U	0.16 U	0.038 U	0.15 U	0.15 U	0.0071 U
2-Methylnaphthalene	NS	NS	0.26	0.16 U	2.5	0.12	0.15 U	0.2	0.0071 U
Acenaphthene	20	500	0.085	0.37	0.36	0.34	0.15 U	0.68	0.0071 U
Acenaphthylene	100	500	0.081	0.71	3.1	0.041	0.41	0.15 U	0.0071 U
Anthracene	100	500	0.28	1.4	1.5	0.96	0.36	2.7	0.0071 U
Benzo(a)anthracene	1	5.6	1.5	5	5.9	1.3	1.4	7.1	0.0071 U
Benzo(a)pyrene	1	1	1.4	3.9	5.7	1	1.4	4.7	0.0071 U
Benzo(b)fluoranthene	1	5.6	1.8	5.2	9	1.2	1.9	5.4	0.0071 U
Benzo(ghi)perylene	100	500	0.9	2.1	3.8	0.58	0.98	3.1	0.0071 U
Benzo(k)fluoranthene	0.8	56	0.7	1.9	3.4	0.37	0.58	2.5	0.0071 U
Chrysene	1	56	1.4	4.6	7.3	1.2	1.3	5.8	0.0071 U
Dibenzo(a,h)anthracene	0.33	0.56	0.35	0.93	1.2	0.17	0.45	1.2	0.0071 U
Fluoranthene	100	500	2.6	9.3	23	2.9	2.4	13	0.0071 U
Fluorene	30	500	0.076 U	0.44	2.4	0.27	0.15 U	0.84	0.0071 U
Hexachlorobenzene	0.33	6	0.31 U	0.64 U	0.63 U	0.15 U	0.6 U	0.62 U	0.028 U
Hexachlorobutadiene	NS	NS	0.19 U	0.4 U	0.39 U	0.096 U	0.38 U	0.38 U	0.018 U
Hexachloroethane	NS	NS	0.31 U	0.64 U	0.63 U	0.15 U	0.6 U	0.62 U	0.028 U
Indeno(1,2,3-cd)Pyrene	0.5	5.6	0.84	2.2	3.7	0.52	0.95	2.6	0.0071 U
Naphthalene	12	500	0.1	0.26	6.5	0.26	0.15 U	0.41	0.0071 U
Pentachlorophenol	0.8	6.7	0.31 U	0.64 U	0.63 U	0.15 U	0.6 U	0.62 U	0.028 U
Phenanthrene	100	500	1.4	5.3	14	2.6	1.3	10	0.0071 U
Pyrene	100	500	2.3	8	14	2.6	2.3	13	0.0071 U

Table 1E
2477 Third Ave.
Bronx, NY
2009 Subsurface (Phase II) Investigation Soil Analytical Results
Metals

Client ID Lab Sample ID Date Sampled mg/kg	NYSDEC Part 375 Unrestricted mg/kg	NYSDEC Part 375 Commercial mg/kg	Eastern USA Soil Background	SB-1 (8'-9') L0901109-01 1/27/2009	SB-2 (6'-7') L0901109-02 1/27/2009	SB-3 (6'-7') L0901109-04 1/27/2009	SB-4 (7'-8') L0901109-05 1/27/2009	SB-5 (9'-10') L0901109-06 1/27/2009	SB-6 (9'-10') L0901109-03 1/27/2009	SB-7 (6'-7') L0901109-07 1/27/2009	SB-8 (8'-9') L0901109-08 1/27/2009
Aluminum	NS	NS	33,000	5,800	8,200	7,600	6,000	7,200	6,000	9,500	5,900
Antimony	NS	NS	NS	2.9 U	2.8 U	2.8 U	2.9 U	3 U	2.9 U	2.9 U	2.9 U
Arsenic	13	16	3 – 12	0.87	0.56 U	6.4	3.6	2.9	1.1	2.3	2
Barium	350	400	15 – 600	23	43	**360**	**500**	24	28	35	79
Beryllium	7.2	590	0 – 1.75	0.29	0.31	0.52	0.41	0.42	0.34	0.43	0.37
Cadmium	2.5	9.3	0.1 – 1	0.58 U	0.56 U	1.6	0.58 U	0.6 U	0.58 U	0.59 U	0.58 U
Calcium	NS	NS	130 – 35,000	850	800	**56,000**	24,000	1,200	2,000	2,000	1,100
Chromium	30	1,500	1.5 – 40	9.3	14	18	12	12	11	21	12
Cobalt	NS	NS	2.5 – 60	5	4.3	6.2	8.6	6	5.4	8	6.4
Copper	50	270	1 – 50	10	7.1	**63**	21	14	16	15	12
Iron	NS	NS	2,000 – 550,000	9,900	13,000	15,000	13,000	16,000	15,000	19,000	13,000
Lead	63	1,000	200 – 500 (2)	3.4	3.5	**140**	**82**	4.8	9.5	7.5	12
Magnesium	NS	NS	100 – 5,000	2,500	2,500	**6,600**	4,000	3,200	2,900	3,400	2,600
Manganese	1,600	10,000	50 – 5,000	78	78	320	550	170	390	200	120
Mercury	0.18	2.8	0.001 – 0.2	0.1 U	0.09 U	**1.1**	0.15	0.09 U	0.09 U	0.1 U	0.1
Nickel	30	310	0.5 – 25	**34**	12	21	16	14	13	14	12
Potassium	NS	NS	8,500 – 43,000	810	890	1,100	920	1,100	980	1,000	730
Selenium	3.9	1,500	0.1 – 3.9	2.9 U	2.8 U	2.8 U	2.9 U	3 U	2.9 U	2.9 U	2.9 U
Silver	2	1,500	NS	0.58 U	0.56 U	1.3	0.58 U	0.6 U	0.58 U	0.59 U	0.58 U
Sodium	NS	NS	6,000 – 8,000	120 U	110 U	320	170	120 U	120 U	120 U	120 U
Thallium	NS	NS	NS	2.9 U	2.8 U	2.8 U	2.9 U	3 U	2.9 U	2.9 U	2.9 U
Vanadium	NS	NS	1 – 300	12	14	38	17	14	12	21	11
Zinc	109	10,000	9 – 50	29	27	**1,000**	**200**	43	**54**	45	**79**

Table 1F
2477 Third Avenue
Bronx, New York
2011 Remedial Investigation Soil Analytical Results
Metals

Client ID Lab Sample ID Date Sampled Dilution mg/kg	NYSDEC Part 375 Unrestricted mg/kg	NYSDEC Part 375 Commercial mg/kg	Eastern USA Soil Background mg/kg	SB-9(0-2) L1102299-01 2/17/2011	SB-10(0-2) L1102299-02 2/17/2011	SB-11(0-2) L1102299-03 2/17/2011	SB-12(0-2) L1102299-04 2/17/2011	SB-13(0-2) L1102299-05 2/17/2011	SB-14(0-2) L1102299-06 2/17/2011	SB-15(0-2) L1102299-07 2/17/2011
Aluminum	NS	NS	33,000	6,400	9,600	5,600	5,200	7,100	10,000	1,200
Antimony	NS	NS	NS	4.5 U	2.3	4.2 U	3.9 U	4.3 U	4.2 U	4.3 U
Arsenic	13	16	3 – 12	6.1	7.2	5.3	5.7	5.8	2.4	2.2
Barium	350	400	15 – 600	**590**	300	**1,000**	**610**	130	35	27
Beryllium	7.2	590	0 – 1.75	1.2	0.8	0.56	0.48	0.53	0.62	0.43 U
Cadmium	2.5	9.3	0.1 – 1	**5.7**	0.47 U	**5.1**	0.78	0.86 U	0.85 U	0.85 U
Calcium	NS	NS	130 – 35,000	24,000	55,000	29,000	62,000	13,000	980	240
Chromium	30	1,500	1.5 – 40	22	19	17	13	14	13	8.5
Cobalt	NS	NS	2.5 – 60	7.4	6.7	6.2	4.2	5.3	5.7	80
Copper	50	270	1 – 50	**94**	**64**	**180**	**120**	**69**	11	**93**
Iron	NS	NS	2,000 – 550,000	16,000	26,000	10,000	8,800	14,000	15,000	52,000
Lead	63	1,000	200 – 500 (2)	**640**	**150**	**460**	**460**	**200**	11	33
Magnesium	NS	NS	100 – 5,000	12,000	5,100	3,800	11,000	7,400	3,100	190
Manganese	1,600	10,000	50 – 5,000	300	1,500	300	390	290	330	**2,100**
Mercury	0.18	2.8	0.001 – 0.2	**0.27**	**1.6**	**0.8**	0.12	**0.43**	**0.79**	0.08 U
Nickel	30	310	0.5 – 25	**49**	21	12	**70**	**190**	14	**100**
Potassium	NS	NS	8,500 – 43,000	1,600	1,100	970	900	1,200	1,100	280
Selenium	3.9	1,500	0.1 – 3.9	1.8 U	0.94 U	1.7 U	1.6 U	1.7 U	1.7 U	1.7
Silver	2	1,500	NS	2	0.47 U	0.84 U	0.78 U	0.86 U	0.85 U	0.85 U
Sodium	NS	NS	6,000 – 8,000	410	1,200	650	480	200	170 U	210
Thallium	NS	NS	NS	1.8 U	0.94 U	1.7 U	1.6 U	1.7 U	1.7 U	1.7 U
Vanadium	NS	NS	1 – 300	240	24	20	17	24	16	19
Zinc	109	10,000	9 – 50	**740**	**250**	**550**	**440**	**160**	31	76

Table 1G
2477 Third Ave.
Bronx, NY
2009 Subsurface (Phase II) Investigation Soil Analytical Results
Pesticides

Client ID Lab Sample ID Date Sampled Dilution Pesticides - mg/kg	NYSDEC Part 375 Unrestricted mg/kg	NYSDEC Part 375 Commercial mg/kg	SB-1 (8'-9') L0901109-01 1/27/2009 1	SB-2 (6'-7') L0901109-02 1/27/2009 1	SB-3 (6'-7') L0901109-04 1/27/2009 1	SB-4 (7'-8') L0901109-05 1/27/2009 5	SB-5 (9'-10') L0901109-06 1/27/2009 1	SB-6 (9'-10') L0901109-03 1/27/2009 1	SB-7 (6'-7') L0901109-07 1/27/2009 1	SB-8 (8'-9') L0901109-08 1/27/2009 1
4,4'-DDD	0.0033	92	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.0161	0.00417 U	0.00397 U	0.00397 U
4,4'-DDE	0.0033	62	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00753	0.00417 U	0.00397 U	0.00397 U
4,4'-DDT	0.0033	47	0.00406 U	0.00383 U	0.0206 U	0.0222	0.0302	0.00417 U	0.00397 U	0.00397 U
Aldrin	0.005	0.68	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U
Alpha-BHC	0.02	3.4	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U
Beta-BHC	0.036	3	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U
Chlordane	0.094	24	0.0406 U	0.0383 U	0.206 U	0.0397 U	0.0412 U	0.0417 U	0.0397 U	0.0397 U
Delta-BHC	0.04	500	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U
Dieldrin	0.005	1.4	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U
Endosulfan I	2.4	NS	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U
Endosulfan II	2.4	NS	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U
Endosulfan sulfate	2.4	NS	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U
Endrin	0.014	89	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U
Endrin ketone	NS	NS	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U
Heptachlor	0.042	15	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U
Heptachlor epoxide	NS	NS	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U
Lindane	0.1	9.2	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U
Methoxychlor	NS	NS	0.0163 U	0.0153 U	0.0823 U	0.0159 U	0.0165 U	0.0167 U	0.0159 U	0.0159 U
trans-Chlordane	NS	NS	0.00406 U	0.00383 U	0.0206 U	0.00397 U	0.00412 U	0.00417 U	0.00397 U	0.00397 U

Table 1H
2477 Third Avenue
Bronx, New York
2011 Remedial Investigation Soil Analytical Results
Polychlorinated Biphenyls

Client ID Lab Sample ID Date Sampled Dilution Polychlorinated Biphenyls - mg/kg	NYSDEC Part 375 Unrestricted mg/kg	NYSDEC Part 375 Commercial mg/kg	SB-9(0-2) L1102299-01 2/17/2011 1	SB-10(0-2) L1102299-02 2/17/2011 1	SB-11(0-2) L1102299-03 2/17/2011 1	SB-12(0-2) L1102299-04 2/17/2011 1	SB-13(0-2) L1102299-05 2/17/2011 1	SB-14(0-2) L1102299-06 2/17/2011 1	SB-15(0-2) L1102299-07 2/17/2011 1
Aroclor 1016	0.1	1	0.0388 U	0.0408 U	0.0371 U	0.0383 U	0.036 U	0.0378 U	0.0352 U
Aroclor 1221	0.1	1	0.0388 U	0.0408 U	0.0371 U	0.0383 U	0.036 U	0.0378 U	0.0352 U
Aroclor 1232	0.1	1	0.0388 U	0.0408 U	0.0371 U	0.0383 U	0.036 U	0.0378 U	0.0352 U
Aroclor 1242	0.1	1	0.0388 U	0.0408 U	**0.619**	0.0383 U	0.036 U	0.0378 U	0.0352 U
Aroclor 1248	0.1	1	0.0388 U	0.0408 U	0.0371 U	0.0383 U	0.036 U	0.0378 U	0.0352 U
Aroclor 1254	0.1	1	0.0388 U	0.0408 U	0.0371 U	0.0383 U	0.036 U	0.0378 U	0.0352 U
Aroclor 1260	0.1	1	0.0388 U	**0.188**	0.0371 U	0.0383 U	0.0391	0.0378 U	0.0352 U

Table 1l
2477 Third Avenue
Bronx, New York
2011 Remedial Investigation Soil Analytical Results
Pesticides

Client ID Lab Sample ID Date Sampled Dilution Polychlorinated Biphenyls - mg/kg	NYSDEC Part 375 Unrestricted mg/kg	NYSDEC Part 375 Commercial mg/kg	SB-9(0-2) L1102299-01 2/17/2011 10	SB-10(0-2) L1102299-02 2/17/2011 10	SB-11(0-2) L1102299-03 2/17/2011 10	SB-12(0-2) L1102299-04 2/17/2011 10	SB-13(0-2) L1102299-05 2/17/2011 10	SB-14(0-2) L1102299-06 2/17/2011 10	SB-15(0-2) L1102299-07 2/17/2011 1
4,4'-DDD	**0.0033**	**92**	0.0188 U	0.0197 U	**0.0228**	0.0188 U	0.0185 U	**0.0702**	0.0017 U
4,4'-DDE	**0.0033**	**62**	0.0188 U	0.0197 U	**0.0194**	0.0188 U	0.0185 U	**0.0482**	0.0017 U
4,4'-DDT	**0.0033**	**47**	0.0352 U	**0.0476**	**0.0852**	**0.0543**	0.0347 U	**0.31**	0.00319 U
Aldrin	**0.005**	**0.68**	0.0188 U	0.0197 U	0.0192 U	0.0188 U	0.0185 U	0.0197 U	0.0017 U
Alpha-BHC	**0.02**	**3.4**	0.00783 U	0.00821 U	0.00801 U	0.00785 U	0.0077 U	0.00822 U	0.000709 U
Beta-BHC	**0.036**	**3**	0.0188 U	0.0197 U	0.0192 U	0.0188 U	0.0185 U	0.0197 U	0.0017 U
Chlordane	**0.094**	**24**	0.153 U	0.16 U	**0.189**	0.153 U	0.15 U	**0.23**	0.0138 U
Delta-BHC	**0.04**	**500**	0.0188 U	0.0197 U	0.0192 U	0.0188 U	0.0185 U	0.0197 U	0.0017 U
Dieldrin	**0.005**	**1.4**	0.0117 U	0.0123 U	**0.0526**	0.0118 U	0.0116 U	**0.0497**	0.00148
Endosulfan I	**2.4**	**NS**	0.0188 U	0.0197 U	0.0192 U	0.0188 U	0.0185 U	0.0197 U	0.0017 U
Endosulfan II	**2.4**	**NS**	0.0188 U	0.0197 U	0.0192 U	0.0188 U	0.0185 U	0.0197 U	0.0017 U
Endosulfan sulfate	**2.4**	**NS**	0.00783 U	0.00821 U	0.00801 U	0.00785 U	0.0077 U	0.00822 U	0.000709 U
Endrin	**0.014**	**89**	0.00783 U	0.00821 U	0.00801 U	0.00785 U	0.0077 U	0.00822 U	0.000709 U
Endrin ketone	**NS**	**NS**	0.0188 U	0.0197 U	0.0192 U	0.0188 U	0.0185 U	0.0197 U	0.0017 U
Heptachlor	**0.042**	**15**	0.00939 U	0.00985 U	0.00962 U	0.00942 U	0.00924 U	0.00986 U	0.000851 U
Heptachlor epoxide	**NS**	**NS**	0.0352 U	0.0369 U	0.0361 U	0.0353 U	0.0347 U	0.037 U	0.00319 U
Lindane	**0.1**	**9.2**	0.00783 U	0.00821 U	0.00801 U	0.00785 U	0.0077 U	0.00822 U	0.000709 U
Methoxychlor	**NS**	**NS**	0.0352 U	0.0369 U	0.0361 U	0.0353 U	0.0347 U	0.037 U	0.00319 U
Toxaphene	**NS**	**NS**	0.352 U	0.369 U	0.361 U	0.353 U	0.347 U	0.37 U	0.0319 U
trans-Chlordane	**NS**	**NS**	0.0235 U	0.0246 U	0.024 U	0.0236 U	0.0231 U	0.0313	0.00213 U

Table 2B
2477 Third Ave.
Bronx, NY
2009 Subsurface (Phase II) Investigation Groundwater Analytical Results
Semi-Volatile Organic Compounds

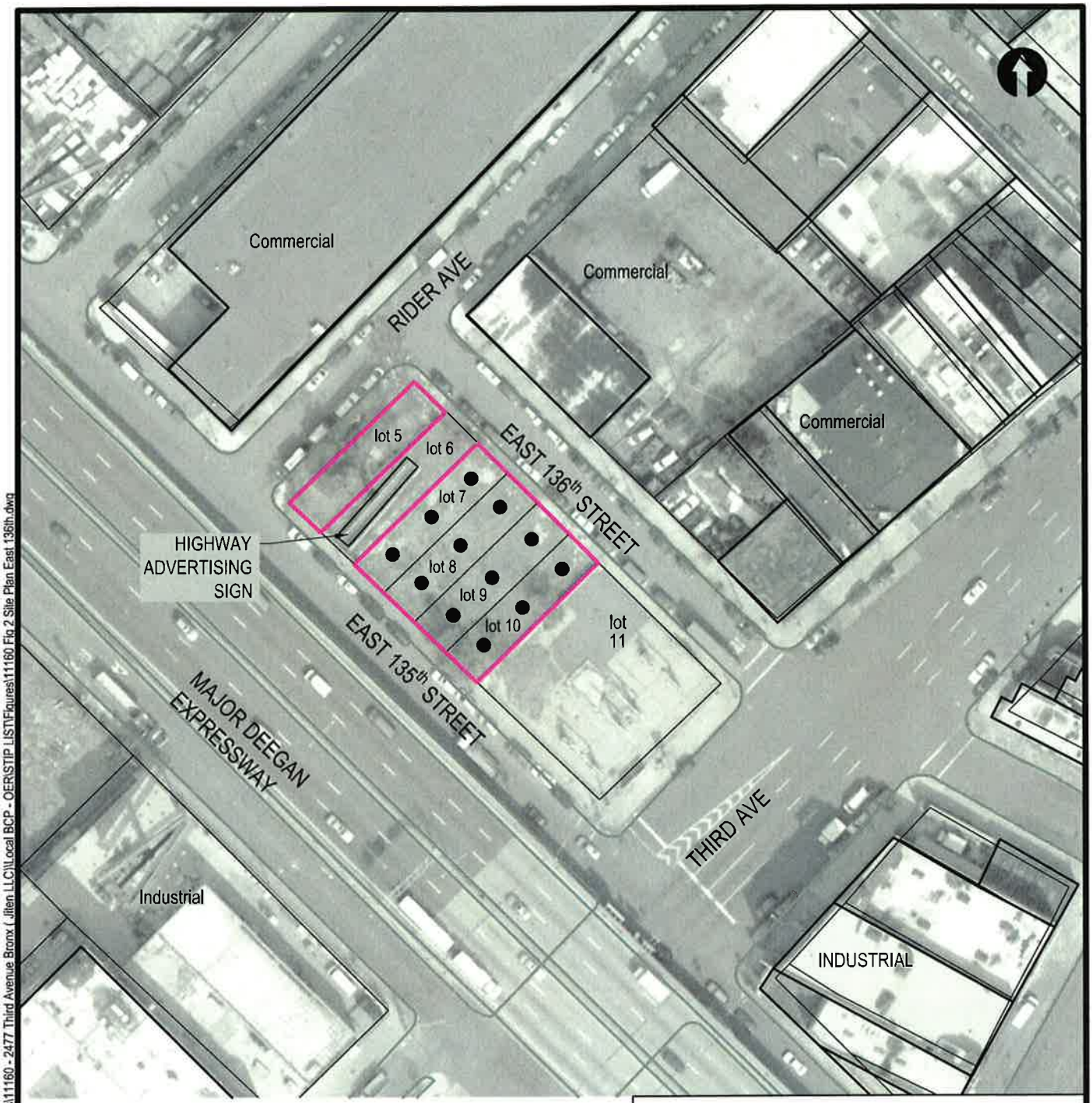
Client ID Lab Sample ID Date Sampled µg/L	NYSDEC Class GA Ambient Standard µg/L	MW-1 L0901107-01 1/27/2009	MW-2 L0901107-02 1/27/2009	MW-3 L0901107-03 1/27/2009	MW-6 L0901107-04 1/27/2009	MW-8 L0901107-05 1/27/2009	FB-1 L0901107-07 1/28/2009
1,2,4,5-Tetrachlorobenzene	5	20 U	20 U	20 U	20 U	20 U	20 U
1,2,4-Trichlorobenzene	5	5 U	4.9 U	5 U	5 U	5 U	5 U
1,2-Dichlorobenzene	3	5 U	4.9 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	3	5 U	4.9 U	5 U	5 U	5 U	5 U
1,4-Dichlorobenzene	3	5 U	4.9 U	5 U	5 U	5 U	5 U
2,4,5-Trichlorophenol	NS	5 U	4.9 U	5 U	5 U	5 U	5 U
2,4,6-Trichlorophenol	NS	5 U	4.9 U	5 U	5 U	5 U	5 U
2,4-Dichlorophenol	5	10 U	9.8 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	50	10 U	9.8 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	10	30 U	29 U	30 U	30 U	30 U	30 U
2,4-Dinitrotoluene	5	6 U	5.9 U	6 U	6 U	6 U	6 U
2,6-Dinitrotoluene	5	5 U	4.9 U	5 U	5 U	5 U	5 U
2-Chloronaphthalene	10	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Chlorophenol	NS	6 U	5.9 U	6 U	6 U	6 U	6 U
2-Methylnaphthalene	NS	0.32	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Methylphenol	NS	6 U	5.9 U	6 U	6 U	6 U	6 U
2-Nitroaniline	5	5 U	4.9 U	5 U	5 U	5 U	5 U
2-Nitrophenol	NS	20 U	20 U	20 U	20 U	20 U	20 U
3,3'-Dichlorobenzidine	5	50 U	49 U	50 U	50 U	50 U	50 U
3-Methylphenol/4-Methylphenol	NS	6 U	5.9 U	6 U	6 U	6 U	6 U
3-Nitroaniline	5	5 U	4.9 U	5 U	5 U	5 U	5 U
4,6-Dinitro-o-cresol	NS	20 U	20 U	20 U	20 U	20 U	20 U
4-Bromophenyl phenyl ether	NS	5 U	4.9 U	5 U	5 U	5 U	5 U
4-Chloroaniline	5	5 U	4.9 U	5 U	5 U	5 U	5 U
4-Chlorophenyl phenyl ether	NS	5 U	4.9 U	5 U	5 U	5 U	5 U
4-Nitroaniline	5	7 U	6.8 U	7 U	7 U	7 U	7 U
4-Nitrophenol	NS	10 U	9.8 U	10 U	10 U	10 U	10 U
Acenaphthene	20	0.2 U	0.2 U	0.2 U	3.4	0.2 U	0.2 U
Acenaphthylene	NS	0.2 U	0.2 U	0.2 U	1.3	0.2 U	0.2 U
Acetophenone	NS	20 U	20 U	20 U	20 U	20 U	20 U
Anthracene	50	0.22	0.2 U	0.2 U	0.72	0.2 U	0.2 U
Benzo(a)anthracene	NS	0.27	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Benzo(a)pyrene	ND	**0.21**	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Benzo(b)fluoranthene	0.002	**0.28**	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Benzo(ghi)perylene	NS	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Benzo(k)fluoranthene	0.002	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Benzoic Acid	NS	50 U	49 U	50 U	50 U	50 U	50 U
Benzyl Alcohol	NS	10 U	9.8 U	10 U	10 U	10 U	10 U
Biphenyl	5	5 U	4.9 U	5 U	5 U	5 U	5 U
Bis(2-chloroethoxy)methane	5	5 U	4.9 U	5 U	5 U	5 U	5 U
Bis(2-chloroethyl)ether	1	5 U	4.9 U	5 U	5 U	5 U	5 U
Bis(2-chloroisopropyl)ether	NS	5 U	4.9 U	5 U	5 U	5 U	5 U
Bis(2-Ethylhexyl)phthalate	5	5 U	4.9 U	5 U	5 U	5 U	5 U
Butyl benzyl phthalate	50	5 U	4.9 U	5 U	5 U	5 U	5 U
Carbazole	NS	5 U	4.9 U	5 U	5 U	5 U	5 U
Chrysene	0.002	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Dibenzo(a,h)anthracene	NS	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Dibenzofuran	NS	5 U	4.9 U	5 U	5 U	5 U	5 U
Diethyl phthalate	50	5 U	4.9 U	5 U	5 U	5 U	5 U
Dimethyl phthalate	50	5 U	4.9 U	5 U	5 U	5 U	5 U
Di-n-butylphthalate	50	5 U	4.9 U	5 U	5 U	5 U	5 U
Di-n-octylphthalate	50	5 U	4.9 U	5 U	5 U	5 U	5 U
Fluoranthene	50	0.56	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Fluorene	50	0.2 U	0.2 U	0.2 U	0.31	0.2 U	0.2 U
Hexachlorobenzene	0.04	0.8 U	0.78 U	0.8 U	0.8 U	0.8 U	0.8 U
Hexachlorobutadiene	0.5	0.5 U	0.49 U	0.5 U	0.5 U	0.5 U	0.5 U
Hexachlorocyclopentadiene	5	30 U	29 U	30 U	30 U	30 U	30 U
Hexachloroethane	5	0.8 U	0.78 U	0.8 U	0.8 U	0.8 U	0.8 U
Indeno(1,2,3-cd)Pyrene	0.002	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Isophorone	50	5 U	4.9 U	5 U	5 U	5 U	5 U
Naphthalene	10	2.2	0.2 U	0.36	0.2	0.2 U	0.2 U
Nitrobenzene	0.4	5 U	4.9 U	5 U	5 U	5 U	5 U
NitrosoDiPhenylAmine(NDPA)/DPA	50	15 U	15 U	15 U	15 U	15 U	15 U
n-Nitrosodi-n-propylamine	NS	5 U	4.9 U	5 U	5 U	5 U	5 U
P-Chloro-M-Cresol	NS	5 U	4.9 U	5 U	5 U	5 U	5 U
Pentachlorophenol	NS	1.1	0.78 U	0.8 U	0.8 U	0.8 U	0.8 U
Phenanthrene	50	0.79	0.2 U	0.2 U	0.74	0.23	0.2 U
Phenol	NS	7 U	6.8 U	7 U	7 U	7 U	7 U
Pyrene	50	0.48	0.2 U	0.2 U	0.24	0.2 U	0.2 U

Table 2C
2477 Third Ave.
Bronx, NY
2009 Subsurface (Phase II) Investigation Groundwater Analytical Results
Metals - Total and Dissolved

Client ID Lab Sample ID Date Sampled Total - µg/L	NYSDEC Class GA mbient Standa µg/L	MW-1 L0901107-01 1/27/2009	MW-2 L0901107-02 1/27/2009	MW-3 L0901107-03 1/27/2009	MW-6 L0901107-04 1/27/2009	MW-8 L0901107-05 1/27/2009	FB-1 L0901107-07 1/28/2009
Aluminum	NS	20,000	970	14,000	5,900	7,000	100 U
Antimony	3	50 U	50 U	50 U	50 U	50 U	50 U
Arsenic	25	23	5 U	5	5 U	5 U	5 U
Barium	1000	308	129	141	226	92	10 U
Beryllium	3	5 U	5 U	5 U	5 U	5 U	5 U
Cadmium	5	5 U	5 U	5 U	5 U	5 U	5 U
Calcium	NS	190,000	120,000	230,000	380,000	90,000	100
Chromium	50	50	10 U	40	10	10	10 U
Cobalt	NS	20 U	20 U	20 U	20 U	20 U	20 U
Copper	200	142	10 U	118	17	16	10 U
Iron	300+	**52,000**	**5,300**	**26,000**	**15,000**	**15,000**	100
Lead	25	**273**	10 U	21	14	13	10 U
Magnesium	35000	22,000	17,000	23,000	**54,000**	18,000	100 U
Manganese	300+	**830**	**604**	**611**	**404**	**819**	10 U
Mercury	0.7	**1.3**	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	100	**130**	25 U	27	25 U	25 U	25 U
Potassium	NS	11,000	17,000	15,000	19,000	13,000	2,500 U
Selenium	10	10 U	10 U	10 U	10 U	10 U	10 U
Silver	50	7 U	7 U	7 U	7 U	7 U	7 U
Sodium	20000	**26,000**	**100,000**	**57,000**	20,000	**36,000**	2,000 U
Thallium	0.5	20 U	20 U	20 U	20 U	20 U	20 U
Vanadium	NS	44	10 U	39	11	14	10 U
Zinc	2000	276	50 U	108	67	149	50 U
Dissolved							
Aluminum	NS	100 U	100 U	NA	100 U	NA	NA
Antimony	3	50 U	50 U	NA	50 U	NA	NA
Arsenic	25	5 U	5 U	NA	5 U	NA	NA
Barium	1000	47	123	NA	172	NA	NA
Beryllium	3	5 U	5 U	NA	5 U	NA	NA
Cadmium	5	5 U	5 U	NA	5 U	NA	NA
Calcium	NS	150,000	120,000	NA	380,000	NA	NA
Chromium	50	10 U	10 U	NA	10 U	NA	NA
Cobalt	NS	20 U	20 U	NA	20 U	NA	NA
Copper	200	12	10 U	NA	10 U	NA	NA
Iron	300+	50 U	**4,000**	NA	**340**	NA	NA
Lead	25	10 U	10 U	NA	10 U	NA	NA
Magnesium	35000	15,000	17,000	NA	**54,000**	NA	NA
Manganese	300+	111	**581**	NA	295	NA	NA
Mercury	0.7	0.2 U	0.2 U	NA	0.2 U	NA	NA
Nickel	100	25 U	25 U	NA	25 U	NA	NA
Potassium	NS	8,400	17,000	NA	19,000	NA	NA
Selenium	10	10 U	10 U	NA	10 U	NA	NA
Silver	50	7 U	7 U	NA	7 U	NA	NA
Sodium	20000	**25,000**	**100,000**	NA	**21,000**	NA	NA
Thallium	0.5	20 U	20 U	NA	20 U	NA	NA
Vanadium	NS	10 U	10 U	NA	10 U	NA	NA
Zinc	2000	50 U	50 U	NA	50 U	NA	NA

ADDENDUM 2

MAP OF END POINT SAMPLING LOCATIONS



2477 THIRD AVENUE

BRONX, NEW YORK

PROPOSED ENDPOINT SAMPLES

AKRF

Environmental Consultants

440 Park Avenue South, New York, N.Y. 10016

DATE	5.11.11
PROJECT No.	11160
SCALE	as shown
FIGURE	2

© 2011 AKRF, Inc. Environmental Consultants M:\AKRF Project Files\11160 - 2477 Third Avenue Bronx (Jilen LLC)\Local BCP - OER\STIP LIST\Figures\11160 Fig 2 Site Plan East 136th.dwg

ADDENDUM 3

FINAL SITE DEVELOPMENT PLANS

FINAL SITE DEVELOPMENT PLANS

The proposed future use of the Sites will consist of a four-story hotel and associated parking on Site A (old Lots 7 through 11), and an at grade paved lot on Site B (Lot 5). The current zoning designation is MX-13 (mixed use). The proposed use is consistent with existing zoning for the property. The entire two Sites are vacant, therefore, no demolition will be required for construction. Although remedial actions for old Lot 11 are not addressed in this RAWP because that site is enrolled in the NYS BCP, they are discussed here for clarity about the development project as a whole. The proposed hotel development on Site A will comprise the entire footprint of old Lots 7 through 11 of the Site. Development of Site B (Lot 5) will not include excavation or the construction of any structures/buildings. Site B would be paved.

The proposed development on Site A would include a subgrade level on Tax Lots 7, 8, 9 and a portion of Lot 10. The subgrade level will encompass approximately 8,500 square feet of space, including meeting rooms, fitness room, laundry room, break room, locker room, compactor room, storage room and mechanical rooms. This subgrade level will be partially underground, constructed approximately six to seven feet below grade and extend to approximately four to five feet above grade.

The first floor will comprise approximately 3,000 square feet of hotel lobby space (approximately 50% over Lot 10 and 50% over Lot 11), including offices, seating areas, the registration desk, an elevator, and two stairwells. Approximately 70% of the eastern portion of this lobby will be constructed on a slab-on-grade (no subgrade level). The remainder of the first floor will encompass approximately 15,000 square feet of parking areas that will be open to the exterior. Because the subgrade level extends four to five feet above grade, the portion of the first floor parking areas located over the subgrade level will be constructed approximately four to five feet above exterior grade and, therefore, four to five feet above the southeastern portion of the first floor located on Lot 11. To access the elevated parking area, a ramp will be constructed on the south side of the hotel lobby, which connects the two levels of the first floor parking areas. The overhanging second through fourth floors will comprise the hotel guest rooms. The architectural plans for the proposed development, including elevation plans, are provided in Appendix 5.The development at Site A would involve excavation of the entire old Lots 7 through Lot 10 to approximately 8 feet below existing grade for the construction of the subgrade level, with an additional 3 to 4 feet of excavation in the areas of the pile caps. It should be noted that although not all of Lot 10 will require subgrade construction, the entire lot will be excavated and backfilled with certified clean fill to achieve the Track 1 program objectives (further described in Section 4.2 of the RAWP). The proposed development will also include planting 15 trees along the sidewalks surrounding the hotel property. The trees will be planted in approximately 25-square foot openings in the sidewalk.

The development at Site B would not involve any excavation. Paved parking at grade is proposed.

Lot 11, currently in the state BCP and not addressed in this RAWP, would be excavated to approximately four feet below grade for construction of the foundation and installation of utilities. No subgrade levels will be constructed on Lot 11.

ADDENDUM 4

GENERIC PROCEDURES FOR MANAGEMENT OF UNDERGROUND STORAGE TANKS IDENTIFIED UNDER THE NYC BCP

GENERIC PROCEDURES FOR MANAGEMENT OF UNDERGROUND STORAGE TANKS IDENTIFIED UNDER THE NYC BCP

Prior to Tank removal, the following procedures should be followed:

- Remove all fluid to its lowest draw-off point.
- Drain and flush piping into the tank.
- Vacuum out the "tank bottom" consisting of water product and sludge.
- Dig down to the top of the tank and expose the upper half.
- Remove the fill tube and disconnect the fill, gauge, product, vent lines and pumps. Cap and plug open ends of lines.
- Temporarily plug all tank openings, complete the excavation, remove the tank and place it in a secure location.
- Render the tank safe and check the tank atmosphere to ensure that petroleum vapors have been satisfactorily purged from the tank.
- Clean tank or remove to storage yard for cleaning.
- If the tank is to be moved, it must be transported by licensed waste transporter. Plug and cap all holes prior to transport leaving a 1/8 inch vent hole located at the top of the tank during transport.
- After cleaning, the tank must be made acceptable for disposal at a scrap yard, cleaning the tanks interior with a high pressure rinse and cutting the tank in several pieces.

During the tank and pipe line removal, the following field observations should be made and recorded:

- A description and photographic documentation of the tank and pipe line condition (pitting, holes, staining, leak points, evidence of repairs, etc.).
- Examination of the excavation floor and sidewalls for physical evidence of contamination (odor, staining, sheen, etc.).
- Periodic field screening (through bucket return) of the floor and sidewalls of the excavation, with a calibrated photoionization detector (PID).

IMPACTED SOIL EXCAVATION METHODS

The excavation of the impacted soil will be performed following the removal of the existing tanks. Soil excavation will be performed in accordance with the procedures described under Section 5.5 of Draft DER-10 as follows:

- A description and photographic documentation of the excavation.
- Examination of the excavation floor and sidewalls for physical evidence of contamination (odor, staining, sheen, etc.).
- Periodic field screening (through bucket return) of the floor and sidewalls of the excavation, with calibrated photoionization detector (PID).

Final excavation depth, length, and width will be determined in the field, and will depend on the horizontal and vertical extent of contaminated soils as identified through physical examination (PID

response, odor, staining, etc.). Collection of verification samples will be performed to evaluate the success of the removal action as specified in this document.

The following procedure will be used for the excavation of impacted soil (as necessary and appropriate):

- Wear appropriate health and safety equipment as outlined in the Health and Safety Plan.
- Prior to excavation, ensure that the area is clear of utility lines or other obstructions. Lay plastic sheeting on the ground next to the area to be excavated.
- Using a rubber-tired backhoe or track mounted excavator, remove overburden soils and stockpile, or dispose of, separate from the impacted soil.
- If additional UST's are discovered, the NYSDEC will be notified and the best course of action to remove the structure should be determined in the field. This may involve the continued trenching around the perimeter to minimize its disturbance.
- If physically contaminated soil is present (e.g., staining, odors, sheen, PID response, etc.) an attempt will be made to remove it, to the extent not limited by the site boundaries or the bedrock surface. If possible, physically impacted soil will be removed using the backhoe or excavator, segregated from clean soils and overburden, and staged on separated dedicated plastic sheeting or live loaded into trucks from the disposal facility. Removal of the impacted soils will continue until visibly clean material is encountered and monitoring instruments indicate that no contaminants are present.
- Excavated soils which are temporarily stockpiled on-site will be covered with tarp material while disposal options are determined. Tarp will be checked on a daily basis and replaced, repaired or adjusted as needed to provide full coverage. The sheeting will be shaped and secured in such a manner as to drain runoff and direct it toward the interior of the property.
- Once the site representative and regulatory personnel are satisfied with the removal effort, verification of confirmatory samples will be collected from the excavation in accordance with DER-10.

ADDENDUM 5

ORIGINAL SIGNED CERTIFICATION OF THE RAWP

CERTIFICATION

I, Michelle Lapin, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 2477 Third Avenue Lot A and Lot B sites in the Bronx, New York Site (Site number TBD).

I certify that this Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

Michelle Lapin

Name

073934

NYS PE License Number

Signature

5-11-11

Date

ADDENDUM 6

TOXFAQS FOR CONTAMINANTS OF CONCERN

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ARSENIC
CAS # 7440-38-2

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occurs mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found at 1,014 of the 1,598 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Organic arsenic compounds are used as pesticides, primarily on cotton plants.

What happens to arsenic when it enters the environment?

- ❑ Arsenic cannot be destroyed in the environment. It can only change its form.
- ❑ Arsenic in air will settle to the ground or is washed out of the air by rain.
- ❑ Many arsenic compounds can dissolve in water.
- ❑ Fish and shellfish can accumulate arsenic, but the arsenic in fish is mostly in a form that is not harmful.

How might I be exposed to arsenic?

- ❑ Eating food, drinking water, or breathing air containing arsenic.
- ❑ Breathing contaminated workplace air.
- ❑ Breathing sawdust or burning smoke from wood treated with arsenic.
- ❑ Living near uncontrolled hazardous waste sites containing arsenic.
- ❑ Living in areas with unusually high natural levels of arsenic in rock.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs. Ingesting high levels of inorganic arsenic can result in death. Lower levels of arsenic can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the

appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Organic arsenic compounds are less toxic than inorganic arsenic compounds. Exposure to high levels of some organic arsenic compounds may cause similar effects as inorganic arsenic.

How likely is arsenic to cause cancer?

Several studies have shown that inorganic arsenic can increase the risk of lung cancer, skin cancer, bladder cancer, liver cancer, kidney cancer, and prostate cancer. The World Health Organization (WHO), the Department of Health and Human Services (DHHS), and the EPA have determined that inorganic arsenic is a human carcinogen.

How can arsenic affect children?

We do not know if exposure to arsenic will result in birth defects or other developmental effects in people. Birth defects have been observed in animals exposed to inorganic arsenic.

It is likely that health effects seen in children exposed to high amounts of arsenic will be similar to the effects seen in adults.

How can families reduce the risk of exposure to arsenic?

❑ If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
❑ If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.

Is there a medical test to show whether I've been exposed to arsenic?

There are tests to measure the level of arsenic in blood, urine, hair, or fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict how the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or canceled many uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration has set limits of 10 µg arsenic per cubic meter of workplace air (10 µg/m³) for 8 hour shifts and 40 hour work weeks.

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Arsenic. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

BARIUM AND COMPOUNDS

CAS # 7440-39-3

Division of Toxicology and Environmental Medicine ToxFAQs™ August 2007

This fact sheet answers the most frequently asked health questions (FAQs) about barium and barium compounds. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to barium occurs mostly in the workplace or from drinking contaminated water. Ingesting drinking water containing levels of barium above the EPA drinking water guidelines for relatively short periods of time can cause gastrointestinal disturbances and muscle weakness. Ingesting high levels for a long time can damage the kidneys. Barium and barium compounds have been found in at least 798 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is barium?

Barium is a silvery-white metal which exists in nature only in ores containing mixtures of elements. It combines with other chemicals such as sulfur or carbon and oxygen to form barium compounds.

Barium compounds are used by the oil and gas industries to make drilling muds. Drilling muds make it easier to drill through rock by keeping the drill bit lubricated. They are also used to make paint, bricks, ceramics, glass, and rubber.

Barium sulfate is sometimes used by doctors to perform medical tests and to take x-rays of the gastrointestinal tract.

What happens to barium when it enters the environment?

- Barium gets into the air during the mining, refining, and production of barium compounds, and from the burning of coal and oil.
- The length of time that barium will last in air, land, water, or sediments depends on the form of barium released.
- Barium compounds, such as barium sulfate and barium carbonate, which do not dissolve well in water, can last a long time in the environment.
- Barium compounds, such as barium chloride, barium nitrate, or barium hydroxide, that dissolve easily in water usually do not last in these forms for a long time in the environment. The barium in these compounds that is dissolved in water quickly combines with sulfate or carbonate that are naturally found in water and become the longer lasting forms (barium sulfate and barium carbonate).
- Fish and aquatic organisms can accumulate barium.

How might I be exposed to barium?

- Ingesting small amounts present in your food and water or breathing air containing very low levels of barium.
- Living in areas with unusually high natural levels of barium in the drinking water.
- Working in a job that involves barium production or use.
- Living or working near waste sites where barium has been disposed of.

How can barium affect my health?

The health effects of the different barium compounds depend on how well the compound dissolves in water or in the stomach contents. Barium compounds that do not dissolve well, such as barium sulfate, are not generally harmful.

BARIUM AND COMPOUNDS
CAS # 7440-39-3

Barium has been found to potentially cause gastrointestinal disturbances and muscular weakness when people are exposed to it at levels above the EPA drinking water standards for relatively short periods of time. Some people who eat or drink amounts of barium above background levels found in food and water for a short period may experience vomiting, abdominal cramps, diarrhea, difficulties in breathing, increased or decreased blood pressure, numbness around the face, and muscle weakness. Eating or drinking very large amounts of barium compounds that easily dissolve can cause changes in heart rhythm or paralysis and possibly death. Animals that drank barium over long periods had damage to the kidneys, decreases in body weight, and some died.

How likely is barium to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified barium as to its carcinogenicity. The EPA has determined that barium is not likely to be carcinogenic to humans following ingestion and that there is insufficient information to determine whether it will be carcinogenic to humans following inhalation exposure.

How can barium affect children?

We do not know whether children will be more or less sensitive than adults to barium toxicity. A study in rats that swallowed barium found a decrease in newborn body weight; we do not know if a similar effect would be seen in humans.

How can families reduce the risks of exposure to barium?

The greatest potential source of barium exposure is through food and drinking water. However, the amount of barium in foods and drinking water are typically too low to be of concern.

Is there a medical test to determine whether I've been exposed to barium?

There is no routine medical test to determine whether you have been exposed to barium. Doctors can measure barium in body tissues and fluids, such as bones, blood, urine, and feces, using very complex instruments. These tests cannot be used to predict the extent of the exposure or potential health effects.

The geometric mean barium level measured in the U.S. general population aged 6 and older is reported by the Centers for Disease Control and Prevention (CDC) as 1.44 µg/g creatinine (measured in urine).

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2.0 milligrams of barium per liter of drinking water (2.0 mg/L), which is the same as 2 ppm.

The Occupational Safety and Health Administration (OSHA) has set Permissible Exposure Limits (PELs) of 0.5 milligrams of soluble barium compounds per cubic meter of workplace air (0.5 mg/m^3) for 8 hour shifts and 40 hour work weeks. The OSHA limits for barium sulfate dust are 15 mg/m^3 of total dust and 5 mg/m^3 for respirable fraction.

The National Institute for Occupational Safety and Health (NIOSH) has set Recommended Exposure Limits (RELs) of 0.5 mg/m^3 for soluble barium compounds. The NIOSH has set RELs of 10 mg/m^3 (total dust) for barium sulfate and 5 mg/m^3 (respirable fraction).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Barium and Compounds (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

BENZENE
CAS # 71-43-2

Agency for Toxic Substances and Disease Registry ToxFAQs September 1997

This fact sheet answers the most frequently asked health questions (FAQs) about benzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Benzene is a widely used chemical formed from both natural processes and human activities. Breathing benzene can cause drowsiness, dizziness, and unconsciousness; long-term benzene exposure causes effects on the bone marrow and can cause anemia and leukemia. Benzene has been found in at least 813 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is benzene?

(Pronounced bĕn/zēn′)

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is widely used in the United States; it ranks in the top 20 chemicals for production volume. Some industries use benzene to make other chemicals which are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

What happens to benzene when it enters the environment?

- Industrial processes are the main source of benzene in the environment.
- Benzene can pass into the air from water and soil.
- It reacts with other chemicals in the air and breaks down within a few days.
- Benzene in the air can attach to rain or snow and be carried back down to the ground.
- It breaks down more slowly in water and soil, and can pass through the soil into underground water.
- Benzene does not build up in plants or animals.

How might I be exposed to benzene?

- Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
- Indoor air generally contains higher levels of benzene from products that contain it such as glues, paints, furniture wax, and detergents.
- Air around hazardous waste sites or gas stations will contain higher levels of benzene.
- Leakage from underground storage tanks or from hazardous waste sites containing benzene can result in benzene contamination of well water.
- People working in industries that make or use benzene may be exposed to the highest levels of it.
- A major source of benzene exposures is tobacco smoke.

How can benzene affect my health?

Breathing very high levels of benzene can result in death, while high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

The major effect of benzene from long-term (365 days or longer) exposure is on the blood. Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

Some women who breathed high levels of benzene for many months had irregular menstrual periods and a decrease in the size of their ovaries. It is not known whether benzene exposure affects the developing fetus in pregnant women or fertility in men.

Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

How likely is benzene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that benzene is a known human carcinogen. Long-term exposure to high levels of benzene in the air can cause leukemia, cancer of the blood-forming organs.

Is there a medical test to show whether I've been exposed to benzene?

Several tests can show if you have been exposed to benzene. There is test for measuring benzene in the breath; this test must be done shortly after exposure. Benzene can also be measured in the blood, however, since benzene disappears rapidly from the blood, measurements are accurate only for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites can be measured in the urine. However, this test must be done shortly after exposure and is not a reliable indicator of how much benzene you have been exposed to, since the metabolites may be present in urine from other sources.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum permissible level of benzene in drinking water at 0.005 milligrams per liter (0.005 mgL). The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit of 1 part of benzene per million parts of air (1 ppm) in the workplace during an 8-hour workday, 40-hour workweek.

Glossary

Anemia: A decreased ability of the blood to transport oxygen.

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Chromosomes: Parts of the cells responsible for the development of hereditary characteristics.

Metabolites: Breakdown products of chemicals.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Benzene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Centers for Disease Control and Prevention
Your Online Source for Credible Health Information

Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

Coal tar pitch volatiles

Synonyms & Trade Names: Synonyms vary depending upon the specific compound (e.g., pyrene, phenanthrene, acridine, chrysene, anthracene & benzo(a)pyrene). [Note: NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products.]

CAS No. 65996-93-2	RTECS No. GF8655000 (/niosh-rtecs/GF841098.html)	DOT ID & Guide: 2713 153 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=153) (acridine)
	Conversion	IDLH: Ca [80 mg/m3] See: 65996932 (/niosh/idlh/65996932.html)
Exposure Limits NIOSH REL : Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction) See Appendix A (nengapdxa.html) See Appendix C (nengapdxc.html) OSHA PEL : TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002] See Appendix C (nengapdxc.html)		Measurement Methods: **OSHA** 58 (http://www.osha.gov/dts/sltc/methods/organic/org058/org058.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description: Black or dark-brown amorphous residue.

Properties vary depending upon the specific compound.					

Combustible Solids

Incompatibilities & Reactivities: Strong oxidizers

Exposure Routes: inhalation, skin and/or eye contact

Symptoms: dermatitis, bronchitis, [potential occupational carcinogen]

Target Organs: respiratory system, skin, bladder, kidneys

Cancer Site: [lung, kidney & skin cancer]

Personal Protection/Sanitation (See protection codes (protect.html))	First Aid (See procedures (firstaid.html)) **Eye:** Irrigate immediately

Skin: Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** Daily **Remove:** No recommendation **Change:** Daily	**Skin:** Soap wash immediately **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 1415 (/niosh/ipcsneng/neng1415.html) See MEDICAL TESTS: 0054 (/niosh/docs/2005-110/nmed0054.html)

Page last reviewed: April 4, 2011
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Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

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cdcinfo@cdc.gov

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CHROMIUM
CAS # 7440-47-3

Division of Toxicology and Environmental Medicine ToxFAQs™ September 2008

This fact sheet answers the most frequently asked health questions (FAQs) about chromium. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chromium occurs from ingesting contaminated food or drinking water or breathing contaminated workplace air. Chromium(VI) at high levels can damage the nose and cause cancer. Ingesting high levels of chromium(VI) may result in anemia or damage to the stomach or intestines. Chromium(III) is an essential nutrient. Chromium has been found in at least 1,127 of the 1,669 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is chromium?

Chromium is a naturally occurring element found in rocks, animals, plants, and soil. It can exist in several different forms. Depending on the form it takes, it can be a liquid, solid, or gas. The most common forms are chromium(0), chromium(III), and chromium(VI). No taste or odor is associated with chromium compounds.

The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving.

What happens to chromium when it enters the environment?

- Chromium can be found in air soil, and water after release from the manufacture, use, and disposal of chromium-based products, and during the manufacturing process.
- Chromium does not usually remain in the atmosphere, but is deposited into the soil and water .
- Chromium can easily change from one form to another in water and soil, depending on the conditions present.
- Fish do not accumulate much chromium in their bodies from water.

How might I be exposed to chromium?

- Eating food containing chromium(III).
- Breathing contaminated workplace air or skin contact during use in the workplace.
- Drinking contaminated well water.
- Living near uncontrolled hazardous waste sites containing chromium or industries that use chromium.

How can chromium affect my health?

Chromium(III) is an essential nutrient that helps the body use sugar, protein, and fat.

Breathing high levels of chromium(VI) can cause irritation to the lining of the nose, nose ulcers, runny nose, and breathing problems, such as asthma, cough, shortness of breath, or wheezing. The concentrations of chromium in air that can cause these effects may be different for different types of chromium compounds, with effects occurring at much lower concentrations for chromium(VI) compared to chromium(III).

The main health problems seen in animals following ingestion of chromium(VI) compounds are irritation and ulcers in the stomach and small intestine and anemia. Chromium(III) compounds are much less toxic and do not appear to cause these problems.

Sperm damage and damage to the male reproductive system have also been seen in laboratory animals exposed to chromium(VI).

Skin contact with certain chromium(VI) compounds can cause skin ulcers. Some people are extremely sensitive to chromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted.

How likely is chromium to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Reseach on Cancer (IARC), and the EPA have determined that chromium(VI) compounds are known human carcinogens. In workers, inhalation of chromium(VI) has been shown to cause lung cancer. Chromium(VI) also causes lung cancer in animals. An increase in stomach tumors was observed in humans and animals exposed to chromium(VI) in drinking water.

How can chromium affect children?

It is likely that health effects seen in children exposed to high amounts of chromium will be similar to the effects seen in adults.

We do not know if exposure to chromium will result in birth defects or other developmental effects in people. Some developmental effects have been observed in animals exposed to chromium(VI).

How can families reduce the risks of exposure to chromium?

❑ Children should avoid playing in soils near uncontrolled hazardous waste sites where chromium may have been discarded.

❑ Chromium is a component of tobacco smoke. Avoid smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.

❑ Although chromium(III) is an essential nutrient, you should avoid excessive use of dietary supplements containing chromium.

Is there a medical test to determine whether I've been exposed to chromium?

Since chromium(III) is an essential element and naturally occurs in food, there will always be some level of chromium in your body. Chromium can be measured in hair, urine, and blood.

Higher than normal levels of chromium in blood or urine may indicate that a person has been exposed to chromium. However, increases in blood and urine chromium levels cannot be used to predict the kind of health effects that might develop from that exposure.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to chromium in drinking water at concentrations of 1 mg/L for up to 10 days is not expected to cause any adverse effects in a child.

The FDA has determined that the chromium concentration in bottled drinking water should not exceed 1 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 0.0005 mg/m^3 chromium(VI), 0.5 mg/m^3 chromium(III), and 1.0 mg/m^3 chromium(0) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological Profile for Chromium (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop E-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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DDT, DDE, AND DDD

CAS # 50-29-3, 72-55-9, 72-54-8

Division of Toxicology ToxFAQs™ **September 2002**

This fact sheet answers the most frequently asked health questions (FAQs) about DDT, DDE, and DDD. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to DDT, DDE, and DDD occurs mostly from eating foods containing small amounts of these compounds, particularly meat, fish and poultry. High levels of DDT can affect the nervous system causing excitability, tremors and seizures. In women, DDE can cause a reduction in the duration of lactation and an increased chance of having a premature baby. DDT, DDE, and DDD have been found in at least 441 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are DDT, DDE, and DDD?

DDT (dichlorodiphenyltrichloroethane) is a pesticide once widely used to control insects in agriculture and insects that carry diseases such as malaria. DDT is a white, crystalline solid with no odor or taste. Its use in the U.S. was banned in 1972 because of damage to wildlife, but is still used in some countries.

DDE (dichlorodiphenyldichloroethylene) and DDD (dichlorodiphenyldichloroethane) are chemicals similar to DDT that contaminate commercial DDT preparations. DDE has no commercial use. DDD was also used to kill pests, but its use has also been banned. One form of DDD has been used medically to treat cancer of the adrenal gland.

What happens to DDT, DDE, and DDD when they enter the environment?

- DDT entered the environment when it was used as a pesticide; it still enters the environment due to current use in other countries.
- DDE enters the environment as contaminant or breakdown product of DDT; DDD also enters the environment as a breakdown product of DDT.
- DDT, DDE, and DDD in air are rapidly broken down by sunlight. Half of what's in air breaks down within 2 days.
- They stick strongly to soil; most DDT in soil is broken down slowly to DDE and DDD by microorganisms; half the DDT in soil will break down in 2-15 years, depending on the type of soil.
- Only a small amount will go through the soil into groundwater; they do not dissolve easily in water.
- DDT, and especially DDE, build up in plants and in fatty tissues of fish, birds, and other animals.

How might I be exposed to DDT, DDE, and DDD?

- Eating contaminated foods, such as root and leafy vegetables, fatty meat, fish, and poultry, but levels are very low.
- Eating contaminated imported foods from countries that still allow the use of DDT to control pests.
- Breathing contaminated air or drinking contaminated water near waste sites and landfills that may contain higher levels of these chemicals.
- Infants fed on breast milk from mothers who have been exposed.
- Breathing or swallowing soil particles near waste sites or landfills that contain these chemicals.

How can DDT, DDE, and DDD affect my health?

DDT affects the nervous system. People who accidentally swallowed large amounts of DDT became excitable and had tremors and seizures. These effects went away after the exposure stopped. No effects were seen in people who took small daily doses of DDT by capsule for 18 months.

A study in humans showed that women who had high amounts of a form of DDE in their breast milk were unable to

breast feed their babies for as long as women who had little DDE in the breast milk. Another study in humans showed that women who had high amounts of DDE in breast milk had an increased chance of having premature babies.
In animals, short-term exposure to large amounts of DDT in food affected the nervous system, while long-term exposure to smaller amounts affected the liver. Also in animals, short-term oral exposure to small amounts of DDT or its breakdown products may also have harmful effects on reproduction.

How likely are DDT, DDE, and DDD to cause cancer?

Studies in DDT-exposed workers did not show increases in cancer. Studies in animals given DDT with the food have shown that DDT can cause liver cancer.
The Department of Health and Human Services (DHHS) determined that DDT may reasonable be anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) determined that DDT may possibly cause cancer in humans. The EPA determined that DDT, DDE, and DDD are probable human carcinogens.

How can DDT, DDE, and DDD affect children?

There are no studies on the health effects of children exposed to DDT, DDE, or DDD. We can assume that children exposed to large amounts of DDT will have health effects similar to the effects seen in adults. However, we do not know whether children differ from adults in their susceptibility to these substances.
There is no evidence that DDT, DDE, or DDD cause birth defects in people. A study showed that teenage boys whose mothers had higher DDE amounts in the blood when they were pregnant were taller than those whose mothers had lower DDE levels. However, a different study found the opposite in preteen girls. The reason for the discrepancy between these studies is unknown.
Studies in rats have shown that DDT and DDE can mimic the action of natural hormones and in this way affect the development of the reproductive and nervous systems. Puberty was delayed in male rats given high amounts of DDE as juveniles. This could possibly happen in humans.
A study in mice showed that exposure to DDT during the first weeks of life may cause neurobehavioral problems later in life.

How can families reduce the risk of exposure to DDT,DDE, and DDE?

- ❑ Most families will be exposed to DDT by eating food or drinking liquids contaminated with small amounts of DDT.
- ❑ Cooking will reduce the amount of DDT in fish.
- ❑ Washing fruit and vegetables will remove most DDT from their surface.
- ❑ Follow health advisories that tell you about consumption of fish and wildlife caught in contaminated areas.

Is there a medical test to show whether I've been exposed to DDT, DDE, and DDD?

Laboratory tests can detect DDT, DDE, and DDD in fat, blood, urine, semen, and breast milk. These tests may show low, moderate, or excessive exposure to these compounds, but cannot tell the exact amount you were exposed to, or whether you will experience adverse effects. These tests are not routinely available at the doctor's office because they require special equipment.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) sets a limit of 1 milligram of DDT per cubic meter of air (1 mg/m^3) in the workplace for an 8-hour shift, 40-hour workweek.
The Food and Drug Administration (FDA) has set limits for DDT, DDE, and DDD in foodstuff at or above which the agency will take legal action to remove the products from the market.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for DDT/DDE/DDD (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ETHYLBENZENE
CAS # 100-41-4

This fact sheet answers the most frequently asked health questions (FAQs) about ethylbenzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Ethylbenzene is a colorless liquid found in a number of products including gasoline and paints. Breathing very high levels can cause dizziness and throat and eye irritation. Ethylbenzene has been found in at least 731 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is ethylbenzene?

(Pronounced ĕth′ əl bĕn′ zēn′)

Ethylbenzene is a colorless, flammable liquid that smells like gasoline. It is found in natural products such as coal tar and petroleum and is also found in manufactured products such as inks, insecticides, and paints.

Ethylbenzene is used primarily to make another chemical, styrene. Other uses include as a solvent, in fuels, and to make other chemicals.

What happens to ethylbenzene when it enters the environment?

- Ethylbenzene moves easily into the air from water and soil.
- It takes about 3 days for ethylbenzene to be broken down in air into other chemicals.
- Ethylbenzene may be released to water from industrial discharges or leaking underground storage tanks.
- In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water.
- In soil, it is broken down by soil bacteria.

How might I be exposed to ethylbenzene?

- Breathing air containing ethylbenzene, particularly in areas near factories or highways.
- Drinking contaminated tap water.
- Working in an industry where ethylbenzene is used or made.
- Using products containing it, such as gasoline, carpet glues, varnishes, and paints.

How can ethylbenzene affect my health?

Limited information is available on the effects of ethylbenzene on people's health. The available information shows dizziness, throat and eye irritation, tightening of the chest, and a burning sensation in the eyes of people exposed to high levels of ethylbenzene in air.

Animals studies have shown effects on the nervous system, liver, kidneys, and eyes from breathing ethylbenzene in air.

How likely is ethylbenzene to cause cancer?

The EPA has determined that ethylbenzene is not classifiable as to human carcinogenicity.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

No studies in people have shown that ethylbenzene exposure can result in cancer. Two available animal studies suggest that ethylbenzene may cause tumors.

How can ethylbenzene affect children?

Children may be exposed to ethylbenzene through inhalation of consumer products, including gasoline, paints, inks, pesticides, and carpet glue. We do not know whether children are more sensitive to the effects of ethylbenzene than adults.

It is not known whether ethylbenzene can affect the development of the human fetus. Animal studies have shown that when pregnant animals were exposed to ethylbenzene in air, their babies had an increased number of birth defects.

How can families reduce the risk of exposure to ethylbenzene?

Exposure to ethylbenzene vapors from household products and newly installed carpeting can be minimized by using adequate ventilation.

Household chemicals should be stored out of reach of children to prevent accidental poisoning. Always store household chemicals in their original containers; never store them in containers children would find attractive to eat or drink from, such as old soda bottles. Gasoline should be stored in a gasoline can with a locked cap.

Sometimes older children sniff household chemicals, including ethylbenzene, in an attempt to get high. Talk with your children about the dangers of sniffing chemicals.

Is there a medical test to show whether I've been exposed to ethylbenzene?

Ethylbenzene is found in the blood, urine, breath, and some body tissues of exposed people. The most common way to test for ethylbenzene is in the urine. This test measures substances formed by the breakdown of ethylbenzene. This test needs to be done within a few hours after exposure occurs, because the substances leave the body very quickly.

These tests can show you were exposed to ethylbenzene, but cannot predict the kind of health effects that might occur.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level of 0.7 milligrams of ethylbenzene per liter of drinking water (0.7 mg/L).

The EPA requires that spills or accidental releases into the environment of 1,000 pounds or more of ethylbenzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 100 parts of ethylbenzene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for ethylbenzene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

FUEL OILS

CAS # 8008-20-6, 70892-10-3, 68476-30-2, 68476-34-6, 68476-31-3

This fact sheet answers the most frequently asked health questions (FAQs) about fuel oils. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Fuel oils are liquid mixtures produced from petroleum, and their use mostly involves burning them as fuels. Drinking or breathing fuel oils may cause nausea or nervous system effects. However, exposure under normal use conditions is not likely to be harmful. Fuel oils have been found in at least 26 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are fuel oils?

(Pronounced fyo͞o′əl oilz)

Fuel oils are a variety of yellowish to light brown liquid mixtures that come from crude petroleum. Some chemicals found in fuel oils may evaporate easily, while others may more easily dissolve in water.

Fuel oils are produced by different petroleum refining processes, depending on their intended uses. Fuel oils may be used as fuel for engines, lamps, heaters, furnaces, and stoves, or as solvents.

Some commonly found fuel oils include kerosene, diesel fuel, jet fuel, range oil, and home heating oil. These fuel oils differ from one another by their hydrocarbon compositions, boiling point ranges, chemical additives, and uses.

What happens to fuel oils when they enter the environment?

- Some chemicals found in fuel oils may evaporate into the air from open containers or contaminated soil or water.
- Some chemicals found in fuel oils may dissolve in water after spills to surface waters or leaks from underground storage tanks.
- Some chemicals found in fuel oils may stick to particles in water, which will eventually cause them to settle to the bottom sediment.
- Some of the chemicals found in fuel oils may be broken down slowly in air, water, and soil by sunlight or small organisms.
- Some of the chemicals found in fuel oils may build up significantly in plants and animals.

How might I be exposed to fuel oils?

- Using a home kerosene heater or stove, or using fuel oils at work.
- Breathing air in home or building basements that has been contaminated with fuel oil vapors entering from the soil.
- Drinking or swimming in water that has been contaminated with fuel oils from a spill or a leaking underground storage tank.
- Touching soil contaminated with fuel oils.
- Using fuel oils to wash paint or grease from skin or equipment.

How can fuel oils affect my health?

Little information is available about the health effects that may be caused by fuel oils. People who use kerosene

stoves for cooking do not seem to have any health problems related to their exposure.

Breathing some fuel oils for short periods may cause nausea, eye irritation, increased blood pressure, headache, lightheadedness, loss of appetite, poor coordination, and difficulty concentrating. Breathing diesel fuel vapors for long periods may cause kidney damage and lower your blood's ability to clot.

Drinking small amounts of kerosene may cause vomiting, diarrhea, coughing, stomach swelling and cramps, drowsiness, restlessness, painful breathing, irritability, and unconsciousness. Drinking large amounts of kerosene may cause convulsions, coma, or death. Skin contact with kerosene for short periods may cause itchy, red, sore, or peeling skin.

How likely are fuel oils to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that some fuel oils (heavy) may possibly cause cancer in humans, but for other fuel oils (light) there is not enough information to make a determination. IARC has also determined that occupational exposures to fuel oils during petroleum refining are probably carcinogenic in humans.

Some studies with mice have suggested that repeated contact with fuel oils may cause liver or skin cancer. However, other mouse studies have found this not to be the case. No studies are available in other animals or in people on the carcinogenic effects of fuel oils.

Is there a medical test to show whether I've been exposed to fuel oils?

There is no medical test that shows if you have been exposed to fuel oils. Tests are available to determine if some of the chemicals commonly found in fuel oils are in your blood. However, the presence of these chemicals in blood may not necessarily mean that you have been exposed to fuel oils.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) and the Air Force Office of Safety and Health (AFOSH) have set a permissible exposure level (PEL) of 400 parts of petroleum distillates per million parts of air (400 ppm) for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that average workplace air levels not exceed 350 milligrams of petroleum distillates per cubic meter of air (350 mg/m^3) for a 40-hour workweek.

The Department of Transportation (DOT) lists fuel oils as hazardous materials and, therefore, regulates their transportation.

Glossary

Carcinogenic: Able to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

Hydrocarbon: Any compound made up of hydrogen and carbon.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for fuel oils. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

LEAD

CAS # 7439-92-1

Division of Toxicology and Environmental Medicine ToxFAQs™ August 2007

This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,272 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

What happens to lead when it enters the environment?

- Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- When lead is released to the air, it may travel long distances before settling to the ground.
- Once lead falls onto soil, it usually sticks to soil particles.
- Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

- Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.
- Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.
- Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.
- Using health-care products or folk remedies that contain lead.

How can lead affect my health?

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services

(DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

- ❑ Avoid exposure to sources of lead.
- ❑ Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.
- ❑ If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.
- ❑ Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children
- ❑ If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to determine whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (µg/dL). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 µg/dL to be a level of concern for children.

EPA limits lead in drinking water to 15 µg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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MERCURY
CAS # 7439-97-6

Agency for Toxic Substances and Disease Registry ToxFAQs April 1999

This fact sheet answers the most frequently asked health questions (FAQs) about mercury. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to mercury occurs from breathing contaminated air, ingesting contaminated water and food, and having dental and medical treatments. Mercury, at high levels, may damage the brain, kidneys, and developing fetus. This chemical has been found in at least 714 of 1,467 National Priorities List sites identified by the Environmental Protection Agency.

What is mercury?

(Pronounced mûr'kya-rē)

Mercury is a naturally occurring metal which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make.

Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

What happens to mercury when it enters the environment?

- Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.
- Methylmercury may be formed in water and soil by small organisms called bacteria.
- Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

How might I be exposed to mercury?

- Eating fish or shellfish contaminated with methylmercury.
- Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels.
- Release of mercury from dental work and medical treatments.
- Breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).
- Practicing rituals that include mercury.

How can mercury affect my health?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea,

vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

How likely is mercury to cause cancer?

There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

How can mercury affect children?

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there. It can also can pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Mercury's harmful effects that may be passed from the mother to the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.

How can families reduce the risk of exposure to mercury?

Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase exposure. If a large amount of mercury has been spilled, contact your health department. Teach children not to play with shiny, silver liquids.

Properly dispose of older medicines that contain mercury. Keep all mercury-containing medicines away from children.

Pregnant women and children should keep away from rooms where liquid mercury has been used.

Learn about wildlife and fish advisories in your area from your public health or natural resources department.

Is there a medical test to show whether I've been exposed to mercury?

Tests are available to measure mercury levels in the body. Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury. Mercury in whole blood or in scalp hair is measured to determine exposure to methylmercury. Your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2 parts of mercury per billion parts of drinking water (2 ppb).

The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m^3) and 0.05 mg/m^3 of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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METHYL *TERT*-BUTYL ETHER (MTBE) CAS # 1634-04-4

This fact sheet answers the most frequently asked health questions (FAQs) about methyl *tert*-butyl ether (MTBE). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Methyl *tert*-butyl ether (MTBE) is a flammable liquid which is used as an additive in unleaded gasoline. Drinking or breathing MTBE may cause nausea, nose and throat irritation, and nervous system effects. MTBE has been found in at least 11 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is methyl *tert*-butyl ether?

(Pronounced měth′əl tûr′shē-ĕr′ē byōōt′l ē′thər)

Methyl *tert*-butyl ether (MTBE) is a flammable liquid with a distinctive, disagreeable odor. It is made from blending chemicals such as isobutylene and methanol, and has been used since the 1980s as an additive for unleaded gasolines to achieve more efficient burning.

MTBE is also used to dissolve gallstones. Patients treated in this way have MTBE delivered directly to their gall bladders through special tubes that are surgically inserted.

What happens to MTBE when it enters the environment?

- MTBE quickly evaporates from open containers and surface water, so it is commonly found as a vapor in the air.
- Small amounts of MTBE may dissolve in water and get into underground water.
- It remains in underground water for a long time.
- MTBE may stick to particles in water, which will cause it to eventually settle to the bottom sediment.
- MTBE may be broken down quickly in the air by sunlight.
- MTBE does not build up significantly in plants and animals.

How might I be exposed to MTBE?

- Touching the skin or breathing contaminated air while pumping gasoline.
- Breathing exhaust fumes while driving a car.
- Breathing air near highways or in cities.
- Drinking, swimming, or showering in water that has been contaminated with MTBE.
- Receiving MTBE treatment for gallstones.

How can MTBE affect my health?

Breathing small amounts of MTBE for short periods may cause nose and throat irritation. Some people exposed to MTBE while pumping gasoline, driving their cars, or working

in gas stations have reported having headaches, nausea, dizziness, and mental confusion. However, the actual levels of exposure in these cases are unknown. In addition, these symptoms may have been caused by exposure to other chemicals.

There are no data on the effects in people of drinking MTBE. Studies with rats and mice suggest that drinking MTBE may cause gastrointestinal irritation, liver and kidney damage, and nervous system effects.

How likely is MTBE to cause cancer?

There is no evidence that MTBE causes cancer in humans. One study with rats found that breathing high levels of MTBE for long periods may cause kidney cancer. Another study with mice found that breathing high levels of MTBE for long periods may cause liver cancer.

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified MTBE as to its carcinogenicity.

Is there a medical test to show whether I've been exposed to MTBE?

MTBE and its breakdown product, butyl alcohol, can be detected in your breath, blood, or urine for up to 1 or 2 days after exposure. These tests aren't available at most doctors' offices, but can be done at special laboratories that have the right equipment. There is no other test specific to determining MTBE exposure.

Has the federal government made recommendations to protect human health?

The EPA has issued guidelines recommending that, to protect children, drinking water levels of MTBE not exceed 4 milligrams per liter of water (4 mg/L) for an exposure of 1-10 days, and 3 mg/L for longer-term exposures.

The American Conference of Governmental Industrial Hygienists (ACGIH) has recommended an exposure limit of 40 parts of MTBE per million parts of air (40 ppm) for an 8-hour workday, 40-hour workweek.

Glossary

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or gas.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

References

This ToxFAQs information is taken from the 1996 Toxicological Profile for Methyl *tert*-Butyl Ether produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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NAPHTHALENE
CAS # 91-20-3

1-METHYLNAPHTHALENE
CAS # 90-12-0

2-METHYLNAPHTHALENE
CAS # 91-57-6

Division of Toxicology ToxFAQs™ August 2005

This fact sheet answers the most frequently asked health questions (FAQs) about naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene happens mostly from breathing air contaminated from the burning of wood, tobacco, or fossil fuels, industrial discharges, or moth repellents. Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. Naphthalene has caused cancer in animals. Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene have been found in at least 687, 36, and 412, respectively, of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What are naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

Naphthalene is a white solid that evaporates easily. Fuels such as petroleum and coal contain naphthalene. It is also called white tar, and tar camphor, and has been used in mothballs and moth flakes. Burning tobacco or wood produces naphthalene. It has a strong, but not unpleasant smell. The major commercial use of naphthalene is in the manufacture of polyvinyl chloride (PVC) plastics. Its major consumer use is in moth repellents and toilet deodorant blocks.

1-Methylnaphthalene and 2-methylnaphthalene are naphthalene-related compounds. 1-Methylnaphthalene is a clear liquid and 2-methylnaphthalene is a solid; both can be smelled in air and in water at very low concentrations.

1-Methylnaphthalene and 2-methylnaphthalene are used to make other chemicals such as dyes and resins. 2-Methylnaphthalene is also used to make vitamin K.

What happens to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene when they enter the environment?

- Naphthalene enters the environment from industrial and domestic sources, and from accidental spills.
- Naphthalene can dissolve in water to a limited degree and may be present in drinking water from wells close to hazardous waste sites and landfills.
- Naphthalene can become weakly attached to soil or pass through soil into underground water.
- In air, moisture and sunlight break it down within 1 day. In water, bacteria break it down or it evaporates into the air.
- Naphthalene does not accumulate in the flesh of animals or fish that you might eat.
- 1-Methylnaphthalene and 2-methylnaphthalene are expected to act like naphthalene in air, water, or soil because they have similar chemical and physical properties.

How might I be exposed to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

- Breathing low levels in outdoor air.
- Breathing air contaminated from industrial discharges or smoke from burning wood, tobacco, or fossil fuels.
- Using or making moth repellents, coal tar products, dyes or inks could expose you to these chemicals in the air.
- Drinking water from contaminated wells.
- Touching fabrics that are treated with moth repellents containing naphthalene.
- Exposure to naphthalene, 1-methylnaphthalene and 2-methylnaphthalene from eating foods or drinking beverages is unlikely.

How can naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene affect my health?

Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. This could cause you to have too few red blood cells until your body replaces the destroyed cells. This condition is called hemolytic anemia. Some symptoms of hemolytic anemia are fatigue, lack of appetite, restlessness, and pale skin. Exposure to large amounts of naphthalene may also cause nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin. Animals sometimes develop cloudiness in their eyes after swallowing high amounts of naphthalene. It is not clear whether this also develops in people. Rats and mice that breathed naphthalene vapors daily for a lifetime developed irritation and inflammation of their nose and lungs. It is unclear if naphthalene

causes reproductive effects in animals; most evidence says it does not.
There are no studies of humans exposed to 1-methylnaphthalene or 2-methylnaphthalene.
Mice fed food containing 1-methylnaphthalene and 2-methylnaphthalene for most of their lives had part of their lungs filled with an abnormal material.

How likely are naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene to cause cancer?

There is no direct evidence in humans that naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene cause cancer.
However, cancer from naphthalene exposure has been seen in animal studies. Some female mice that breathed naphthalene vapors daily for a lifetime developed lung tumors. Some male and female rats exposed to naphthalene in a similar manner also developed nose tumors.
Based on the results from animal studies, the Department of Health and Humans Services (DHHS) concluded that naphthalene is reasonably anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) concluded that naphthalene is possibly carcinogenic to humans. The EPA determined that naphthalene is a possible human carcinogen (Group C) and that the data are inadequate to assess the human carcinogenic potential of 2-methylnaphthalene.

How can naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene affect children?

Hospitals have reported many cases of hemolytic anemia in children, including newborns and infants, who either ate naphthalene mothballs or deodorants cakes or who were in close contact with clothing or blankets stored in naphthalene mothballs.
Naphthalene can move from a pregnant woman's blood to the unborn baby's blood. Naphthalene has been detected in some samples of breast milk from the general U.S. population, but not at levels that are expected to be of concern.
There is no information on whether naphthalene has affected development in humans. No developmental abnormalities were observed in the offspring from rats, mice, and rabbits fed naphthalene during pregnancy.
We do not have any information on possible health effects of 1-methylnaphthalene or 2-methylnaphthalene on children.

How can families reduce the risks of exposure to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

❑ Families can reduce the risks of exposure to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene by avoiding smoking tobacco, generating smoke during cooking, or using fireplaces or heating appliances in the their homes.
❑ If families use naphthalene-containing moth repellents, the material should be enclosed in containers that prevent vapors from escaping, and kept out of the reach from children.
❑ Blankets and clothing stored with naphthalene moth repellents should be aired outdoors to remove naphthalene odors and washed before they are used.
❑ Families should inform themselves of the contents of air deodorizers that are used in their homes and refrain from using deodorizers with naphthalene.

Is there a medical test to determine whether I've been exposed to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

Tests are available that measure levels of these chemicals and their breakdown products in samples of urine, feces, blood, maternal milk, or body fat. These tests are not routinely available in a doctor's office because they require special equipment, but samples can be sent to special testing laboratories. These tests cannot determine exactly how much naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene you were exposed to or predict whether harmful effects will occur. If the samples are collected within a day or two of exposure, then the tests can show if you were exposed to a large or small amount of naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene.

Has the federal government made recommendations to protect human health?

The EPA recommends that children not drink water with over 0.5 parts per million (0.5 ppm) naphthalene for more than 10 days or over 0.4 ppm for any longer than 7 years. Adults should not drink water with more than 1 ppm for more than 7 years. For water consumed over a lifetime (70 years), the EPA suggests that it contain no more than 0.1 ppm naphthalene.
The Occupational Safety and Health Administration (OSHA) set a limit of 10 ppm for the level of naphthalene in workplace air during an 8-hour workday, 40-hour workweek. The National Institute for Occupational Safety and Health (NIOSH) considers more than 500 ppm of naphthalene in air to be immediately dangerous to life or health. This is the exposure level of a chemical that is likely to impair a worker's ability to leave a contaminate area and therefore, results in permanent health problems or death.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005 Toxicological Profile for Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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POLYCHLORINATED BIPHENYLS

Division of Toxicology ToxFAQs™ February 2001

This fact sheet answers the most frequently asked health questions (FAQs) about polychlorinated biphenyls. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

What happens to PCBs when they enter the environment?

❑ PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.

❑ PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.

❑ PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.

❑ PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

How might I be exposed to PCBs?

❑ Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.

❑ Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.

❑ Breathing air near hazardous waste sites and drinking contaminated well water.

❑ In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

How can PCBs affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects

of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

How likely are PCBs to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

How can PCBs affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported. In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

How can families reduce the risk of exposure to PCBs?

❑ You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.

❑ Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.

❑ Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.

❑ If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

Is there a medical test to show whether I've been exposed to PCBs?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Agency for Toxic Substances and Disease Registry ToxFAQs September 1996

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl'ē-sī'klĭk ăr'ə-măt'ĭk hī'drə-kar'bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.

- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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TOLUENE
CAS # 108-88-3

Division of Toxicology ToxFAQs™ **February 2001**

This fact sheet answers the most frequently asked health questions (FAQs) about toluene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to toluene occurs from breathing contaminated workplace air, in automobile exhaust, some consumer products paints, paint thinners, fingernail polish, lacquers, and adhesives. Toluene affects the nervous system. Toluene has been found at 959 of the 1,591 National Priority List sites identified by the Environmental Protection Agency

What is toluene?

Toluene is a clear, colorless liquid with a distinctive smell. Toluene occurs naturally in crude oil and in the tolu tree. It is also produced in the process of making gasoline and other fuels from crude oil and making coke from coal.

Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.

What happens to toluene when it enters the environment?

❑ Toluene enters the environment when you use materials that contain it. It can also enter surface water and groundwater from spills of solvents and petroleum products as well as from leasking underground storage tanks at gasoline stations and other facilities.

❑ When toluene-containing products are placed in landfills or waste disposal sites, the toluene can enter the soil or water near the waste site.

❑ Toluene does not usually stay in the environment long.

❑ Toluene does not concentrate or buildup to high levels in animals.

How might I be exposed to toluene?

❑ Breathing contaminated workplace air or automobile exhaust.

❑ Working with gasoline, kerosene, heating oil, paints, and lacquers.

❑ Drinking contaminated well-water.

❑ Living near uncontrolled hazardous waste sites containing toluene products.

How can toluene affect my health?

Toluene may affect the nervous system. Low to moderate levles can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, loss of appetite, and

hearing and color vision loss. These symptoms usually disappear when exposure is stopped.

Inhaling High levels of toluene in a short time can make you feel light-headed, dizzy, or sleepy. It can also cause unconsciousness, and even death.

High levels of toluene may affect your kidneys.

How likely is toluene to cause cancer?

Studies in humans and animals generally indicate that toluene does not cause cancer.

The EPA has determined that the carcinogenicity of toluene can not be classified.

How can toluene affect children?

It is likely that health effects seen in children exposed to toluene will be similar to the effects seen in adults. Some studies in animals suggest that babies may be more sensitive than adults.

Breathing very high levels of toluene during pregnancy can result in children with birth defects and retard mental abilities, and growth. We do not know if toluene harms the unborn child if the mother is exposed to low levels of toluene during pregnancy.

How can families reduce the risk of exposure to toluene?

❑ Use toluene-containing products in well-ventilated areas.

❑ When not in use, toluene-containing products should be tightly covered to prevent evaporation into the air.

Is there a medical test to show whether I've been exposed to toluene?

There are tests to measure the level of toluene or its breakdown products in exhaled air, urine, and blood. To determine if you have been exposed to toluene, your urine or blood must be checked within 12 hours of exposure. Several other chemicals are also changed into the same breakdown products as toluene, so some of these tests are not specific for toluene.

Has the federal government made recommendations to protect human health?

EPA has set a limit of 1 milligram per liter of drinking water (1 mg/L).

Discharges, releases, or spills of more than 1,000 pounds of toluene must be reported to the National Response Center.

The Occupational Safety and Health Administration has set a limit of 200 parts toluene per million of workplace air (200 ppm).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Toluene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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XYLENE
CAS # 1330-20-7

This fact sheet answers the most frequently asked health questions (FAQs) about xylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to xylene occurs in the workplace and when you use paint, gasoline, paint thinners and other products that contain it. People who breathe high levels may have dizziness, confusion, and a change in their sense of balance. This substance has been found in at least 658 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is xylene?

(Pronounced zi'lēn)

Xylene is a colorless, sweet-smelling liquid that catches on fire easily. It occurs naturally in petroleum and coal tar and is formed during forest fires. You can smell xylene in air at 0.08–3.7 parts of xylene per million parts of air (ppm) and begin to taste it in water at 0.53–1.8 ppm.

Chemical industries produce xylene from petroleum. It's one of the top 30 chemicals produced in the United States in terms of volume.

Xylene is used as a solvent and in the printing, rubber, and leather industries. It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes. It is found in small amounts in airplane fuel and gasoline.

What happens to xylene when it enters the environment?

- Xylene has been found in waste sites and landfills when discarded as used solvent, or in varnish, paint, or paint thinners.
- It evaporates quickly from the soil and surface water into the air.
- In the air, it is broken down by sunlight into other less harmful chemicals.
- It is broken down by microorganisms in soil and water.
- Only a small amount of it builds up in fish, shellfish, plants, and animals living in xylene-contaminated water.

How might I be exposed to xylene?

- Breathing xylene in workplace air or in automobile exhaust.
- Breathing contaminated air.
- Touching gasoline, paint, paint removers, varnish, shellac, and rust preventatives that contain it.
- Breathing cigarette smoke that has small amounts of xylene in it.
- Drinking contaminated water or breathing air near waste sites and landfills that contain xylene.
- The amount of xylene in food is likely to be low.

How can xylene affect my health?

Xylene affects the brain. High levels from exposure for short periods (14 days or less) or long periods (more than 1 year) can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Exposure of

people to high levels of xylene for short periods can also cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; problems with the lungs; delayed reaction time; memory difficulties; stomach discomfort; and possibly changes in the liver and kidneys. It can cause unconsciousness and even death at very high levels.

Studies of unborn animals indicate that high concentrations of xylene may cause increased numbers of deaths, and delayed growth and development. In many instances, these same concentrations also cause damage to the mothers. We do not know if xylene harms the unborn child if the mother is exposed to low levels of xylene during pregnancy.

How likely is xylene to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that xylene is not classifiable as to its carcinogenicity in humans.

Human and animal studies have not shown xylene to be carcinogenic, but these studies are not conclusive and do not provide enough information to conclude that xylene does not cause cancer.

Is there a medical test to show whether I've been exposed to xylene?

Laboratory tests can detect xylene or its breakdown products in exhaled air, blood, or urine. There is a high degree of agreement between the levels of exposure to xylene and the levels of xylene breakdown products in the urine. However, a urine sample must be provided very soon after exposure ends because xylene quickly leaves the body. These tests are not routinely available at your doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 10 ppm of xylene in drinking water.

The EPA requires that spills or accidental releases of xylenes into the environment of 1,000 pounds or more must be reported.

The Occupational Safety and Health Administration (OSHA) has set a maximum level of 100 ppm xylene in workplace air for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) also recommend exposure limits of 100 ppm in workplace air.

NIOSH has recommended that 900 ppm of xylene be considered immediately dangerous to life or health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Evaporate: To change from a liquid into a vapor or a gas.

Carcinogenic: Having the ability to cause cancer.

CAS: Chemical Abstracts Service.

ppm: Parts per million.

Solvent: A liquid that can dissolve other substances.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for xylenes (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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