Environmental Protection Agency
Office of Enforcement
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FIELD INVESTIGATION FOR IMMINENT HAZARD ASSESSMENT
ABM-WADE DISPOSAL SITE
CHESTER, PENNSYLVANIA
[February 7-8 and March 13-14, 1979].

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National Enforcement Investigation Center - Denver
and
Region III - Philadelphia

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I. INTRODUCTION

In the mid-1970's, Mr. Melvin Wade, owner of an approximately 3-acre site along the Delaware River in Chester, Pennsylvania, entered into a contract with Mr. Sparky Barnhouse, owner of the ABM Disposal Service Co., to receive drums containing chemical wastes. The contract was subsequently renewed with the new owner of ABM, Mr. Frank Tyson. The drums, which were estimated by Mr. Wade to number 270 to 300 per week, were either immediately drained onto the ground or into pits, or stored on-site and then drained. The empty drums were subsequently sold by Mr. Wade for reclaim. On the site, which lies immediately below the Commodore Barry Bridge, Mr. Wade also operated the Eastern Rubber and Reclaiming Inc. plant which reclaimed rubber tires.

In 1977, while investigating the disposal practices of another firm, employees of the Pennsylvania Department of Environmental Resources (DER) discovered the ABM-Wade site. Subsequently, in June 1977, the DER ordered the site closed and cleaned up. Mr. Wade responded by filing for bankruptcy. Consequently no cleanup or drum removal was undertaken, although the arrival of additional drums ceased.

In February 1978, a fire broke out at the ABM-Wade site, consuming and collapsing parts of the buildings and igniting chemicals in stored drums. Approximately 45 local firemen were treated for the effects of toxic fumes and other injuries. In addition, the Commodore Barry Bridge overhead was closed for 10 hours. Several weeks later, a second fire broke out and had to be extinguished.

When the ABM-Wade situation was brought to the attention of USEPA Region III by the DER, there was considerable concern since the abandoned site posed several potential hazards, including:

1. Additional fires with generation of toxic fumes.
2. Runoff of toxic chemicals to the Delaware River.
3. Uncontrolled entry of people to the open-access site, an especially inviting area for neighborhood children.
4. Volatilization of chemicals during warm weather with potential effects to neighborhood populace and workers at the Philadelphia Electric facility adjacent to the site.
5. Potential threats of explosion and fire in the event of additional on-site fires due to close proximity of Philadelphia Electric Company's 81 m (265 ft.) diameter liquified natural gas (LNG) tank.

To assess whether hazards posed were imminent, justifying action under Section 7003 of the Resource Conservation and Recovery Act (RCRA), Region III requested that the National Enforcement Investigations Center (NEIC) investigate the site. This investigation was conducted February 7 to 8 and March 13 to 14, 1979. NEIC objectives were to document possible environmental contamination and evaluate consequent threats to the public health.

II. SUMMARY AND CONCLUSIONS

SUMMARY OF INVESTIGATION

NEIC personnel collected soil and liquid samples at the ABM-Wade site from 22 locations, and air samples from 4 locations. Soil and liquid samples were analyzed for metals and for organic compounds with emphasis on priority pollutants*, toxic substances, and compounds with readily available standards. Air samples were analyzed for organics only. By searching established computer data bases, the organic compounds and metals found in the samples were evaluated for their toxicity and health effects on both humans and animals.

Compounds identified during the NEIC investigation were representative of samples collected. They were not, however, necessarily representative of additional contaminants stored in deteriorating drums on the site or soil contamination in locations not sampled. Personnel safety considerations dictated that no drums be opened and sampled. Post-closure activities on the the site (fire, possible movement of materials and soil) precluded other than qualitative selections of former drum drainage locations. Environmental conditions during the air sampling (strong winds and cool temperatures) favored dispersion of air-borne pollutants and suppressed volatilization of stored chemicals.

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* Priority Pollutants are derived from the June 7, 1976 Natural Resources Defense Council (NRDC) vs. Russell Train (USEPA) Settlement Agreement.

CONCLUSIONS

Past fires at the ABM-Wade disposal site in Chester, Pennsylvania have demonstrated that chemicals stored on-site are combustible and create toxic fumes. The risks of calamitous explosions and fires are increased by the presence of the large LNG storage tank immediately adjacent to the site. The NEIC investigation of the disposal site documented environmental contamination by toxic and carcinogenic organic compounds and metals. These contaminants have the potential for transport off the site via the ambient air through volatilization and the water through surface runoff and groundwater movement. They also pose potential health hazards to anyone entering the site and becoming contaminated.

Ambient Air And Soil/Liquid Sampling

A total of 32 organic compounds were identified, 15 in ambient air samples collected on-site and 17 in the soil/liquid samples of the site. Of the 15 found in the ambient air, 6 are priority pollutants which were found in concentrations ranging from low level detection of <4 $\mu g/m^3$ to 500 $\mu g/m^3$. Of the 17 compounds found in the soil/liquid samples, 8 are priority pollutants and were found in concentrations ranging from 260 to 3000 mg/kg.

In addition to the 17 compounds referenced above, an additional 15 were identified but not quantified that were indicative of waste petroleum products. Many more compounds were present in the ABM-Wade samples but could not be confirmed either because of lack of pure compound standards or time constraints.

In addition to the organic compounds, 5 priority pollutant metals were also identified in the liquid samples. Zinc ranged from 0.5 to 69 mg/l, lead from not detectable to 330 mg/l, copper from 0.3 to 210

mg/l, chromium from not detectable to 16 mg/l and nickel from not detectable to 19 mg/l.

Toxicity And Health Effects

To evaluate toxicity and health effects from the 32 organics plus 5 metals, established computer data bases were searched and summary data were compiled. Of the 15 compounds detected in the air samples, 12 have demonstrated human health effects, including eye, blood, central nervous system, systemic (affecting the liver or kidneys), and psychotropic (affecting the mind) effects (acetone; benzene; methylethylketone; p-diokane; ethylene dichloride; trichloroethylene; hexane; methylene chloride; methylmethacrylate; pentane; 4-methyl-2-pentanone; and toluene). It has been reported in the literature that benzene is a human carcinogen. Seven of the 15 compounds also produce an irritant effect on the skin, eye or mucous membrane (methylethylketone; p-dioxane; trichloroethylene; hexane; methylmethacrylate; 4-methyl-2-penanone; and toluene).

Nine of the 15 compounds detected in the air have produced animal health effects (benzene; methylethylketone; p-dioxane; ethylene dichloride; trichloroethylene; methylmethacrylate; 1, 1, 2-trichloropropane; 4-methyl-2-pentanone; and toluene). Benzene, methylethylketone, and methylmethacrylate are teratogenic to rats or mice. Benzene has also been reported as mutagenic to mice. Eight of the 15 compounds also produce an irritant effect on the skin, eye or mucous membranes of the test animals (benzene; p-dioxane; ethylene dichloride; trichloroethylene; methylmethacrylate; 4-methyl-2-penanone; 1, 1, 2-trichloropropane; and toluene).

Of the 17 compounds and 5 metals detected in soil/liquid samples, 8 have demonstrated human health effects, including systemic, central nervous system, eye, gastrointestinal and pulmonary effects

(1,4-dichlorobenzene; 1,3,5-trimethylbenzene; 1-chloro-3-nitrobenzene; copper; lead; bis (2-ethylhexyl) phthalate; dibutylphthalate and zinc). Eight of the 22 have produced toxic effects in animals, including neoplastic (the production of tumors not clearly defined as carcinogenic) and teratogenic effects in laboratory animals (1,2-dichlorobenzene; chromium; diphenylamine; naphthalene; nickel; phenanthrene; bis (2-ethylhexyl) phthalate and dibutyl phthalate). Five of the 22 produced an irritant effect on the skin, eye or mucous membranes of humans or laboratory animals (1,2-dichlorobenzene; 1,4-dichlorobenzene; naphthalene; bis (2-ethylhexyl) phthalate and zinc). Chromium, detected in the soil/liquid samples, is listed as a suspected animal carcinogen. Nickel is reported as a positive animal carcinogen.

III. STUDY METHODOLOGY

The NEIC investigation consisted of five phases, including site mapping, sample station selection, station definition, sampling and analysis. Site mapping included defining fixed points on the site and directional orientation, using tape measure, rangefinder and compass. From this effort, a map of the site was prepared [Figure 1]. Twenty-two soil/liquid sampling points were then selected based on qualitative judgements as to probable points of contamination from spilled drums or past dumping practices. Each site was marked with a wooden lath, assigned a unique sampling station number and photographed. Each sampling station was then defined by its distance from two fixed points on the site [Table 1, Figure 1]. Samples were then collected in glass containers at each station. In addition, ambient air samples were collected at 4 sites (Stations 13, 17, 20, and 23). Sampling methodology included mechanically drawing ambient air through a 6 mm outside diameter, 190 mm long Tenax* column with a Bendix* personnel sampler for 10 minutes at each site. Station 23 represents an upwind station immediately off the site, whereas Station 13 was downwind on the site.** Stations 17 and 20 were both within the buildings which house drums. Blank samples were also collected.

All samples were packed in locked ice chests and transported to the NEIC laboratory in Denver, Colorado. Soil/liquid samples were analyzed for metals and organic compounds, and ambient air samples were analyzed for organics only. Whenever applicable, EPA-approved

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* Trade name.

** Surface winds as measured by the National Weather Service at 3 p.m. on March 14, 1979 at the Philadelphia International Airport were from the southwest at 12 knots.

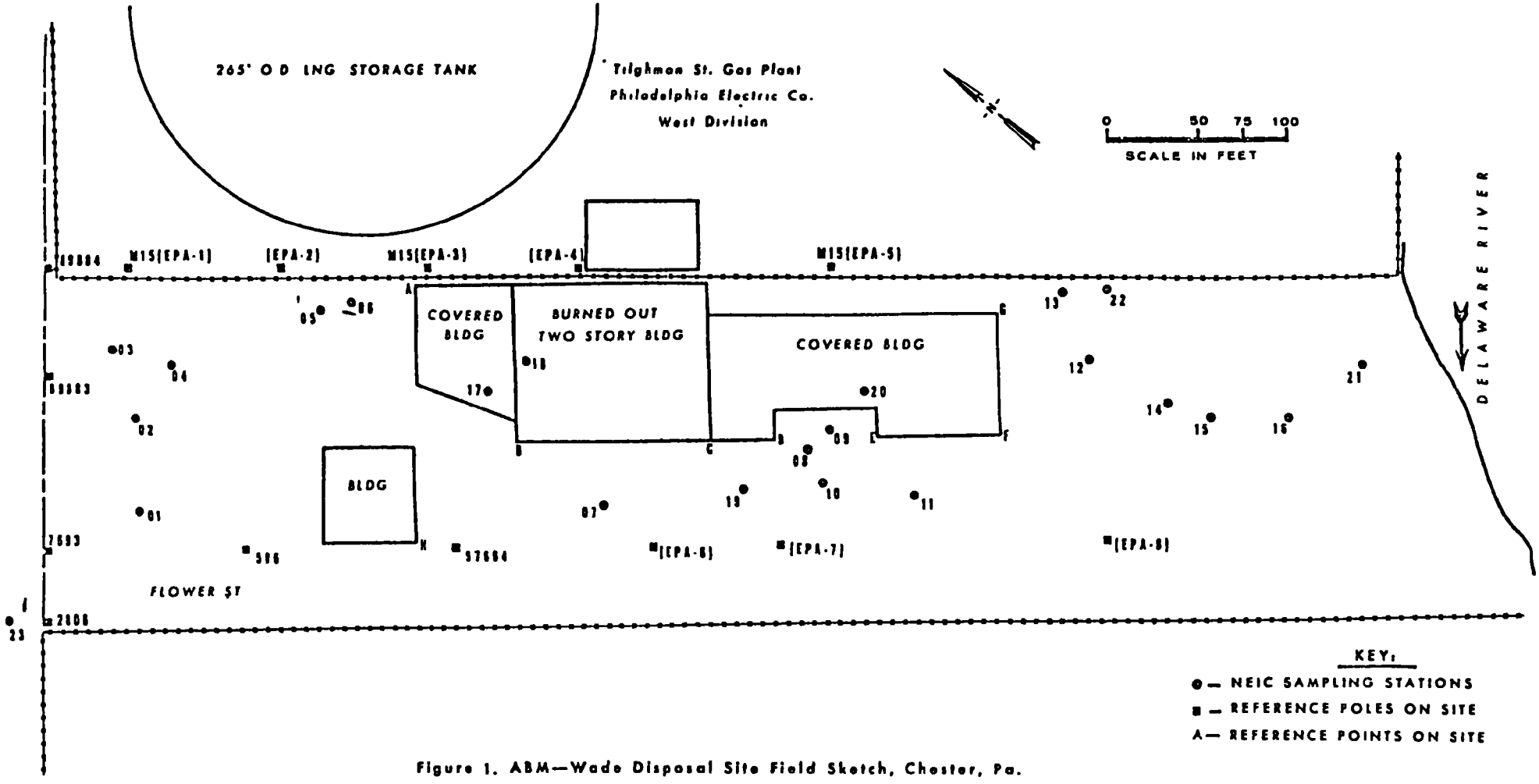

Figure 1. ABM—Wade Disposal Site Field Sketch, Chester, Pa.
March 13—14, 1979

Table 1
SAMPLING STATION DESCRIPTIONS
ABM-WADE DISPOSAL SITE
Chester, Pennsylvania
March 13-14, 1979

Station No.	Description[a]
01	Soil sample approximately 20cm (8 in) down from surface. Location 17m (55 ft) from reference pole 7693 and 28m (92 ft) from reference pole 89883.
02	Spilled contents of drum collected from ground surface. Location 16m (54 ft) from reference pole 89883 and 27m (90 ft) from reference pole 7693.
03	Pooled liquid near over-turned drums. Location 12m (39 ft) from reference pole 89883 and 18m (59 ft) from reference pole 89884.
04	Surface soil sample immediately below drain valve on tanker. Location 27m (88 ft) from reference pole 89884 and 21m (69 ft) from reference pole 89883.
05	Surface soil sample near tanker and over-turned drums. Location 9.8m (32 ft) from reference pole EPA-2 and 17m (56 ft) from reference corner A.
06	Pooled liquid behind tanker near drain valve. Location 12m (38 ft) from reference corner A and 13m (44 ft) from reference pole EPA-2.
07	Sludge-like material next to collapsed drum. Location 19m (62 ft) from reference corner B and 22m (72 ft) from reference corner C.
08	Sludge-like material near collapsed drums. Location 5.8m (19 ft) from reference corner D and 12m (41 ft) from reference corner E.

Table 1 (Continued)
SAMPLING STATION DESCRIPTIONS
ABM-WADE DISPOSAL SITE
Chester, Pennsylvania
March 13-14, 1979

Station No.	Description[a]
09	Pooled liquid near collapsed drums. Location 9.4m (31 ft) from reference corner D and 8.2m (27 ft) from reference corner E.
10	Soil sample approximately 23cm (9 in) down from surface. Location 11m (37 ft) from reference corner D and 12m (41 ft) from reference corner E.
11	Soil sample approximately 13cm (5 in) down from surface. Location 12m (38 ft) from reference corner E and 11m (36 ft) from reference corner F.
12	Soil-liquid combination in pooled area near collapsed drums. Location 20m (64 ft) from reference corner F and 17m (56 ft) from reference corner G.
13	Pooled liquid near tanker. Location 11m (36 ft) from reference corner G and 29m (95 ft) from reference corner F.
14	Pooled liquid near collapsed drums, tires and debris. Location 32m (106 ft) from reference corner G and 28m (93 ft) from reference corner F.
15	Pooled liquid near collapsed drums and tires. Location 35m (116 ft) from reference corner F and 28m (91 ft) from reference pole EPA-8.
16	Pooled liquid near collapsed drums and tires. Location 48m (159 ft) from reference corner F and 37m (122 ft) from reference pole EPA-8.
17	Scrapings and liquid on floor in building near stored drums.

Table 1 (Continued)
SAMPLING STATION DESCRIPTIONS
ABM-WADE DISPOSAL SITE
Chester, Pennsylvania
March 13-14, 1979

Station No.	Description[a]
18	Spilled contents from collapsed drum in burned out area of building. Location 37m (122 ft) from reference corner H and 35m (116 ft) from reference corner C.
19	Liquid from sump.[b] Location 10m (34 ft) from reference corner C and 10m (34 ft) from reference corner D.
20	Floor scrapings near stored drums in building.
21	Viscous solid material on ground near collapsed drums. Location 37m (121 ft) from end of fence line on southwest corner of site and 52m (172 ft) from reference pole EPA-8.
22	Pooled liquid near tanker truck and drums. Location 19m (61 ft) from reference corner G and 49m (160 ft) from reference pole EPA-8.

a See Figure 1 for location of stations on site.
b At Region III request, Chester, Pennsylvania Fire Department pumped in water to see if sump drained to Delaware River. Region III added Rhodamine dye to trace flow.

procedures, as promulgated pursuant to Section 304(h) of the Clean Water Act, were used in the analysis of samples. New methods or modifications to existing methods were documented. Throughout the course of the study (sampling through analysis and reporting) sample and document control for evidentiary purposes were maintained.

IV. STUDY RESULTS

SOIL/LIQUID SAMPLING

Organics

Soil/liquid samples collected from the 22 stations selected [Figure 1, Table 1] and analyzed by gas chromatography/mass spectrometry (GC/MS) indicated the presence of a large number of organic compounds [Table 2]. A total of 17* compounds were identified and confirmed, including the following priority pollutants:

1,4-dichlorobenzene	napthalene
1,2-dichlorobenzene	fluoranthene
1,2,4-trichlorobenzene	phenanthrene
dibutylphthalate	di(2-ethylhexyl)phthalate

For samples where GC screening produced no peaks of significant intensity above the level of the solvent blank, no GC/MS analyses were performed (Stations 03, 09, 13, 14, 16, and 22). In addition, no results were reported for samples containing compounds which either (1) did not meet peak-finding criteria of the automatic data processing routine, (2) could not be matched to the 25,000-compound EPA-NIH** spectral library, or (3) could not be determined for lack of in-house standards. These included samples from Stations 01, 02, 06, 12, 15, 18, and 21.

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* 20 compounds are listed in Table 2. However, the specific isomers present of tetrachlorobenzene, methoxyphenol and dimethylnapthalene could not be determined.

** EPA-National Institute of Health.

Table 2

ORGANICS CHARACTERIZATION DATA-ABM-WADE DISPOSAL SITE,
CHESTER, PENNSYLVANIA-MARCH 14, 1979

Chemical Name	Station / Time	04 (0905)	05 (0910)	07 (0930)	08 (0945)	10 (0955)	11 (1000)	17B (1100)	19A (0940)	20 (1040)
		(All Values mg/kg)								
1,4-dichlorobenzene[f]		380	640							
1,2-dichlorobenzene[f]		490	990							
1,2,4-trichlorobenzene[f]		620								
tetrachlorobenzene isomer		270[d]								
dibutylphthalate[f]		300							3000	
1-methylnaphthalene						100[a]				
2-methylnaphthalene						200			310	
methoxyphenol isomer				[b]	500[e]					
naphthalene[f]						550				
diphenylamine[f,g]				250						
dimethylnaphthalene isomer						130			390[c]	
									500	
									500	
1-chloro-3-nitrobenzene		270								
fluoranthene[f]						260				
phenanthrene[f]						380				
3-ethyltoluene						930				
1,3,5-trimethylbenzene						1070				
1,2,4-trimethylbenzene						1280	40		220	
1,2,3-trimethylbenzene						680				
1,2,3,5-tetramethylbenzene						460				
di(2-ethylhexyl)phthalate[f]			1000			1010	1830	320		680

a No pure standard available of this compound - calculated based upon 2-methylnaphthalene response
b Cannot quantitate - Tails badly and is deteriorating in sample
c Three isomers in this sample all quantitated based upon the response of 1,2-dimethylnaphthalene
d Quantitation based upon the response of 1,2,4-tetrachlorobenzene
e Quantitation based upon the response of 4-methoxyphenol. Value is approximate due to poor response on non-polar column.
f Priority pollutants
g N-nitrosodiphenylamine will break down in the heated injector of a gas chromatograph to yield diphenylamine. It is not known whether n-nitrosodiphenylamine or diphenylamine was originally present.

As noted in Table 2, the priority pollutant compounds were primarily found at Stations 04 and 10, ranging from 300 to 620 mg/kg at Station 04 and 260 to 1010 mg/kg at Station 10. Station 04 was located immediately below the drain valve on one of the abandoned tankers; Station 10 was soil-collected approximately 9 inches below the surface at a location thought by Region III personnel to be one of the former drum draining points. It should be noted that selection of sampling stations was largely qualitative; other locations could contain more or less compounds. Compounds found are representative of past contaminants brought onto the site. A significant caveat, though, is that for personnel safety reasons none of the deteriorating drums on the site were opened and sampled. Consequently, quantities of additional compounds as well as more of the identified ones may well be present and capable of further contamination of the site and surrounding area.

In addition to the 17 compounds referenced above, 15 others were identified (Stations 04, 05, and 19A) that were indicative of waste petroleum products. These included:

decane	nonadecane
dodecane	eicosane
tridecane	heneicosane
tetradecane	tricosane
pentadecane	tetracosane
hexadecane	pristane
heptadecane	phytane
octadecane	

Many more compounds were present in the ABM-Wade samples but could not be confirmed either because of lack of pure compound standards or time constraints. Analytical priorities were placed on confirmation and quantification of priority pollutants, toxic compounds, and compounds for which standards were readily available.

Metals

All liquid samples collected on March 14, 1979, were analyzed for metals content by inductively coupled plasma-atomic emission spectrometry [Table 3]. Of the priority pollutant metals, zinc ranged from 0.5 to 69 mg/l, lead from not detectable to 330 mg/l, copper from 0.3 to 210 mg/l, chromium from not detectable to 16 mg/l and nickel from not detectable to 19 mg/l. Zinc, lead and chromium were particularly high in samples from Station 09 (24, 160, and 12 mg/l, respectively) and Station 17 (69, 330, and 16 mg/l, respectively). Copper was found in concentrations of at least 10 mg/l in samples from Stations 06, 14, 15, 16 and 17. Particularly noteworthy was the sample from Station 17 with a concentration of 210 mg/l. The highest level of nickel was 19 mg/l found at Station 06.

In addition to the analyses referenced above, selected solids samples were scanned for elemental composition by X-Ray fluorescence [Table 4]. As with the liquid samples, the priority pollutant metals zinc, lead, copper, chromium, and nickel were present. Zinc was present in all 6 of the samples, lead in 4 of 6, copper in all 6, chromium in 5 of 6, and nickel in 1 of 6.

AMBIENT AIR SAMPLING

Ambient air samples collected at the upwind side of the disposal site (Station 23) contained trace levels of organic compounds [Table 5, Figure 1]. Downwind samples (Station 13) also contained trace organics with the exception of 100 $\mu g/m^3$ of methylethylketone. It should be noted, however, that meteorological conditions at the time of sampling did not favor detection of organic contamination from the site. Average wind velocities for the two hours prior to sampling ranged from 13 to 16 knots, gusting to 20 knots.* Periodic rain showers also

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* Meteorological conditions measured by National Weather Service at Philadelphia International Airport approximately 10 miles away from site.

Table 3

METALS CHARACTERIZATION DATA
ABM-WADE DISPOSAL SITE
CHESTER, PENNSYLVANIA
March 14, 1979

Station Time	03 (0900)	06 (0915)	09 (0950)	13 (1030)	14 (1045)	15 (1054)	16 (1057)	17 (1100)	19 (0940)	22 (1035)	D.L.[a]
Metal	Concentrations in mg/l										
Zn	0.5	2.6	24	0.7	2.4	1.9	2.2	69	1.9	0.7	0.001
Pb	1.6	ND[b]	160	ND	3.2	2.7	1.9	330	0.4	ND	0.2
Mn	0.5	0.1	1.6	0.2	0.2	0.04	0.06	2.2	1.4	0.3	0.04
Fe	1.1	11	76	0.8	1.9	2.2	2.3	200	27	1.1	0.6
Mg	7.7	3.2	28	3.1	9.2	2.9	5.0	18	9.7	5.8	0.6
Al	1.2	78	27	ND	ND	1.3	ND	11	14	ND	1.2
Ca	35	28	120	20	31	27	18	42	38	29	2.4
Cu	0.3	10	1.1	2.3	16	28	39	210	1.1	3.4	0.06
Cr	0.3	1.0	12	ND	0.3	0.4	0.6	16	1.7	ND	0.2
B	ND	16	5.4	1.9	ND	ND	ND	5.2	ND	ND	4.0
Na	97	6800	160	88	1200	1200	1100	1200	42	110	10
Ni	ND	19	1.2	ND	ND	ND	ND	0.9	1.2	ND	0.6

a Detection limits based on two times the highest level found in a blank sample or the concentration equivalent to 3 times the standard deviation of the background noise, whichever was greater.

b ND = not detectable.

Table 4

QUALITATIVE X-RAY FLUORESCENCE ANALYSIS
ABM-WADE DISPOSAL SITE,
CHESTER, PENNSYLVANIA-MARCH 14, 1979

Sample Station	Ca	Ti	Cr	Mn	Fe	Ni	Cu	Zn	Pb	Aliquot for Analysis
01	X[a]	X		X	X		X	X		0.420g
04	X	X	X		X		X	X		0.128g
05	X	X	X		X	X	X	X	X	0.141g
10	X	X	X		X		X	X	X	0.510g
11	X	X	X		X		X	X	X	0.340g
20	X	X	X		X		X	X	X	0.748g

[a] X indicates element was observed
X-Ray Tube Conditions - 20KV 1.0ma
Aquisition Time - 100 seconds
All samples blank subtracted and smoothed
All samples analyzed at atmospheric pressure
All samples analyzed with a microsample positioner with a 1 mm I.D. minicollimator

Table 5

ORGANIC COMPOUNDS MEASURED IN AIR SAMPLES
ABM-WADE DISPOSAL SITE, CHESTER PENNSYLVANIA-MARCH 14, 1979

Station Number	13 1454	17[a] 1359	20[b] 1439	23 1510	Blank 1 1340	Blank 2 1340	Det[c] Limit
Chemical Name	Concentrations in $\mu g/m^3$						
acetone	BDL[d]	200	BDL(ND)	BDL	10	1	20
methylethylketone	100	ND[e]	BDL(ND)	ND	ND	ND	4
1,2-dichloroethane[g]	ND	300	ND(ND)	ND	ND	ND	4
1,4-dioxane	ND	20	ND(ND)	ND	ND	ND	4
trichloroethylene[g]	5	BDL	BDL(BDL)	ND	ND	ND	4
methylmethacrylate	ND	200	800(800)	ND	ND	ND	4
pentane	ND	ND	BDL(BDL)	80	30	20	60
benzene[g]	BDL	30	7(BDL)	BDL	1	ND	4
hexane	ND	7	10(BDL)	ND	2	ND	4
toluene[g]	BDL	500	10(30)	BDL	3	ND	6
dichloromethane[f,g]	ND	ND	DET(DET)	ND	DET	ND	-
trichlorofluoromethane[f,g]	ND	ND	ND(DET)	ND	DET	ND	-
methylcyclopentane[f]	ND	ND	DET(ND)	ND	ND	ND	-
4-methyl-2-pentanone[f]	ND	DET	DET(ND)	ND	ND	ND	-
chloropropene isomer[f]	ND	DET	ND(ND)	ND	ND	ND	-
1,1,2-trichloropropane[f]	ND	DET	ND(ND)	ND	ND	ND	-

a Duplicate sample (17-3/14-1410) results are not available, analysis failed.
b Duplicate sample (20-3/14-1426) results are shown in parenthesis.
c Detection limits based on 2 times the highest level found in a blank sample or 4 $\mu g/m^3$ whichever was greater.
d BDL. - Chemical was identified by its mass spectra but was below the quantitative detection limits.
e ND. - Chemical was not detected by its mass spectrum.
f These compounds identified from reference mass spectra but could not be verified.
DET means chemical detected in these samples.
All others verified by mass spectra collected under same analytical conditions.
g Priority Pollutants as defined by the June 7, 1976 Natural Resources Defense Council vs Russell Train (USEPA) Settlement Agreement.

occurred. During the sampling period, wind velocities averaged 9 to 12 knots promoting dispersion of pollutants. The temperatures during sampling was 13°C (55°F) which would not favor volatilization.

Ambient air sampling within the covered buildings which still house drums (Stations 17 and 20) detected the presence of organic contaminants. Compounds found in detectable and measureable concentrations included acetone, 1,4-dioxane, methylmethacrylate and hexane, and the priority pollutants 1,2-dichloroethane, benzene and toluene. Summer conditions, with significantly elevated temperatures, would enhance the possibilities of volatilization of organics.

V. TOXICITY AND HEALTH EFFECTS OF POLLUTANTS IDENTIFIED DURING STUDY

Thirty-two organic compounds were identified in the samples collected from the ABM Wade Disposal Site: 15 in the air samples and 17 in the soil and/or liquid samples. In addition to these organics, 5 priority pollutant metals were identified in the soil/liquid samples (Cr, Cu, Ni, Pb, Zn). Toxicity and health effects data for the air and soil/liquid compounds are presented in Tables 6 and 7.

To obtain toxicity and health effects data, the 32 organics plus 5 metals were searched in the Registry of Toxic Effects of Chemical Substances (RTECS), an annual compilation prepared by the National Institute for Occupational Safety and Health.

RTECS contains toxicity data for approximately 33,929 substances, but does not presently include all chemicals for which toxic effects have been found. Chemical substances in RTECS have been selected primarily for the toxic effect produced by single doses, some lethal and some non-lethal. Substances whose principal toxic effect is from exposure over a long period of time are not presently included. Toxic information on each chemical substance is determined by examining and evaluating the published medical, biological, engineering, chemical and trade information, and data for each substance selected.

The 32 organics plus 5 metals were also searched in the Toxline data base, a computerized bibliographic retrieval system for toxicology, containing over 650,000 records taken from material published in primary journals. It is part of the MEDLINE file from the National Library of Medicine and is composed of ten subfiles:

1. Chemical-Biological Activities, 1965-
   (taken from Chemical Abstracts, Biochemistry Sections)

2. Toxicity Bibliography 1968-
   (a subset of Index Medicus)

3. Abstracts on Health Effects of Environment Pollutants, 1971-
   (published by the American Society of Hospital Pharmacists)

4. International Pharmaceutical Abstracts 1970-
   (published by the American Society of Hospital Pharmacists)

5. Pesticides Abstracts 1967-
   (compiled by EPA)

6. Environmental Mutagen Information Center 1969-
   (Dept. of Energy, Oak Ridge National Lab)

7. Environmental Teratology Information Center 1950-
   (Dept. of Energy, Oak Ridge National Lab)

8. Toxic Materials Information Center
   (Dept. of Energy, Oak Ridge National Lab)

9. Teratology file 1971-1974
   (a collection of citations on teratology compiled by the National Library of Medicine)

10. The Hayes File on Pesticides
    (a collection of more than 10,000 citations on the health aspects of pesticides compiled by Dr. W.J. Hayes, Jr., EPA)

The RTECS search yielded information on 34 of the 37 compounds and metals. The TOXLINE search yielded 1,946 citations to human health effects from the 34 compounds and metals, providing support to the toxic data from RTECS. Nineteen* of these 34 are listed as priority pollutants.

Additional data bases searched to locate or support toxic information on all 37 compounds and metals were: (1) Toxicology Data Bank

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* As noted in footnote 1 of Table 2, Diphenylamine may have originally been in the form of N-Nitrosodiphenylamine which is a priority pollutant. This would mean 20 rather than 19 priority pollutants.

(TDB), from the National Library of Medicine, which currently contains information on 1,100 substances; (2) Oil and Hazardous Materials Technical Assistance Data System (OHMTADS), an EPA file, containing toxic data for about 1,000 compounds; (3) Excerpta Medica, a medical file with a section on toxicology and environmental pollution; and (4) Chemical Abstracts.

Of the 15 compounds detected in the air samples, [Table 6] twelve have demonstrated human health effects, including eye, blood, central nervous system, systemic (affecting the liver or kidneys), and psychotropic (affecting the mind) effects (acetone; benzene; methylethylketone; p-dioxane; ethylene dichloride; trichloroethylene; hexane; methylene chloride; methylmethacrylate; pentane; 4-methyl-2-pentanone; and toluene). It has been reported in the literature that benzene is a human carcinogen. Seven of the 15 compounds also produce an irritant effect on the skin, eye or mucous membrane (methylethylketone; p-dioxane; trichloroethylene; hexane; methylmethacrylate; 4-methyl-2-pentanone; and toluene).

Nine of the 15 compounds detected in the air samples have produced animal health effects (benzene; methylethylketone; p-dioxane; ethylene dichloride; trichloroethylene; methylmethacrylate; 1, 1, 2-trichloropropane; 4-methyl-2-penanone; and toluene. Benzene, methylethylketone, and methylmethacrylate are teratogenic to rats or mice. Benzene has also been reported as mutagenic to mice. Eight of the 15 compounds also produce an irritant effect on the skin, eye or mucous membranes of the test animals (benzene; p-dioxane; ethylene dichloride; trichloroethylene; methylmethacrylate; 4-methyl-2-pentanone; 1, 1, 2-trichloropropane; and toluene).

Of the 22 compounds and metals detected in soil/liquid samples, [Table 7] eight have demonstrated human health effects, including systemic, central nervous system, eye, gastrointestinal and pulmonary

effects (1,4-dichlorobenzene; 1,3,5-trimethylbenzene; 1-chloro-3-nitrobenzene; copper; lead; bis (2-ethylhexyl) phthalate; dibutyl phthalate and zinc). Eight of the 22 detected in the soil/liquid samples have produced toxic effects in animals, including neoplastic (the production of tumors not clearly defined as carcinogenic) and teratogenic effects in lab animals (1,2-dichlorobenzene; chromium; diphenylamine; naphthalene; nickel; phenanthrene; bis (2-ethylhexyl) phthalate and dibutyl phthalate). Five of the 22 produced an irritant effect on the skin, eye or mucous membranes of humans or lab animals (1,2-dichlorobenzene; 1,4-dichlorobenzene; naphthalene; bis(2-ethylhexyl) phthalate and zinc). Chromium, detected in the soil/liquid samples, is listed as a suspected animal carcinogen. Nickel is reported as a positive animal carcinogen.

No toxicity data was located on 3-ethyltoluene or 1,2,3,5-tetramethylbenzene in any of the files searched.

TABLE 6

TOXICITY OF COMPOUNDS IN AIR SAMPLES COLLECTED AT ABM WADE DISPOSAL SITE CHESTER, PENNSYLVANIA

Compound Name	Molecular Formula	Chemical Abstracts Service No.	Aquatic Toxicity[a]	Other Toxicity Data[b] Route of Entry	Species	Type of Dose	Dose	Duration	Effects[e]	Exposure Limits[c]
Acetone	C_3H_6O	67-64-1	TLm 96:Over 1000 ppm	Oral-human		LDLo:	50 mg/kg			OSHA std (air): TWA 1000 ppm
				Inhalation-human		TCLo:	500 ppm		Eye	
				Inhalation-man		TCLo:	12,000 ppm	4H	Central Nervous System	
				Oral-rat		LD50:	9,750 mg/kg			
				Inhalation-rat		LCLo:	64,000 ppm	4H		
				Inhalation-mouse		LCLo:	110,000 mg/m^3	62M		
				Intraperitoneal-mouse		LD50:	1,297 mg/kg			
				Oral-dog		LDLo:	24 g/kg			
				Intraperitoneal-dog		LDLo:	8 g/kg			
				Subcutaneous-dog		LDLo:	5 g/kg			
				Oral-rabbit		LD50:	5,300 mg/kg			
				Skin-rabbit		LD50:	20 gm/kg			
				Subcutaneous-guinea pig		LDLo:	5,000 mg/kg			
Benzene	C_6H_6	71-43-2[d]	TLm 96: 100-10 ppm	Oral-human		LDLo:	50 mg/kg			OSHA std (air): TWA 10 ppm; Cl 25 Pk 50/10M/8H
				Inhalation-human		LDLo:	20,000 ppm	5M		
				Inhalation-human		TCLo:	210 ppm		Blood	
				Inhalation-man		TCLo:	2,100 mg/m^3	4YI	Carcinogenic	
				Oral-rat		LD50:	3,800 mg/kg			
				Inhalation-rat		LC50.	10,000 ppm	7H		
				Intraperitoneal-rat		LDLo:	1,150 mg/kg			
				Oral-mouse		LD50:	4,700 mg/kg			
				Inhalation-mouse		LC50:	9,980 ppm			
				Skin-mouse		TDLo:	1,200 gm/kg	49WI	Neoplastic	
				Intraperitoneal-mouse		LD50:	468 mg/kg			
				Subcutaneous-mouse		TDLo:	2,700 mg/kg	13D (Preg.)	Teratogenic	
				Oral-dog		LDLo:	2,000 mg/kg			
				Inhalation-dog		LCLo:	146,000 mg/m^3			
				Inhalation-cat		LCLo:	170,000 mg/m^3			
				Intraperitoneal-guinea pig		LDLo:	527 mg/kg			
				Subcutaneous-frog		LDLo:	1,400 mg/kg			
				Inhalation-mammal		LCLo:	20,000 ppm	5M		
				Skin-rabbit			15 mg	24H open	Mild Irritation	
				Eye-rabbit			88 mg		Moderate Irritation	
				Oral-human		TDLo:	130 mg/kg		Central Nervous System	
				Oral-mouse		TDLo:	1 mg/kg		Mutagenic	
				Intravenous-rabbit		LDLo:	88 mg/kg			

Table 6 (continued)

TOXICITY OF COMPOUNDS IN
AIR SAMPLES COLLECTED AT
ABH WADE DISPOSAL SITE
CHESTER, PENNSYLVANIA

Compound Name	Molecular Formula	Chemical Abstracts Service No.	Aquatic Toxicity[a]	Other Toxicity Data[b]					Exposure Limits[c]
				Route of Entry	Species	Type of Dose	Dose	Duration	Effects[e]	
2-butanone (methyl ethyl ketone)	C_4H_8O	78-93-3	TLm 96:over 1,000 ppm	Oral-human		LDLo:	500 mg/kg			TLV(air):200 ppm
				Inhalation-human		TCLo:	100ppm	5M	Irritant	OSHA std (air): TWA 200 ppm
				Oral-rat		LD50:	3,400 mg/kg			
				Inhalation-rat		LCLo:	2,000 ppm	4H		
				Inhalation-rat		TCLo:	1,000 ppm	6-15D (Preg.)	Teratogenic	
				Intraperitoneal-mouse		LD50:	616 mg/kg			
				Skin-rabbit		LD50:	13 gm/kg			
Cyclopentane, Methyl-	C_6H_{12}	96-37-7	TLm 96: over 1,000 ppm	Inhalation-mouse		LCLo:	95,000 mg/m^3			
p-Dioxane (1,4-Dioxane)	$C_4H_8O_2$	123-91-1	TLm 96: 1,000-100 ppm	Eye-human			300 ppm	15M	Irritation	OSHA std (air): 100 ppm (skin)
				Oral-human		LDLo:	500 mg/kg			NIOSH recm std (air) C1 1ppm/30m
				Inhalation-human		TCLo:	470 ppm			
				Inhalation-human		TCLo:	5,500 ppm	1M	Eye	
				Inhalation-human		LCLO:	470 ppm	3D		
				Oral-rat		LD50:	4,200 mg/kg			
				Oral-rat		TDLo:	416 gm/kg	57W-C	Carcinogenic	
				Inhalation-rat		LCLo:	1,250 ppm	9H-I		
				Intraperitoneal-rat		LD50:	5,600 mg/kg			
				Oral-mouse		LD50:	5,700 mg/kg			
				Oral-mouse		TDLo:	630 gm/kg	90W-C	Carcinogenic	
				Inhalation-mouse		LCLo:	1,250 ppm	3H-I		
				Skin-mouse		TDLo:	1,440 gm/kg	60W-I	Neoplastic	
				Intraperitoneal-mouse		LD50:	790 mg/kg			
				Oral-cat		LD50:	2,000 mg/kg			
				Oral-rabbit		LD50:	2,000 mg/kg			
				Skin-rabbit		LD50:	7,500 mg/kg			
				Intravenous-rabbit		LDLo:	1,500 mg/kg			
				Skin-rabbit			515 mg open		Irritation	
				Eye-rabbit			21 mg		Irritation	
				Oral-guinea pig		LD50:	3,150 mg/kg			
				Oral-rat		TDLo:	370 gm/kg	1Y-C	Carcinogenic	

Table 6 (continued)

TOXICITY OF COMPOUNDS IN
AIR SAMPLES COLLECTED AT
ABM WADE DISPOSAL SITE
CHESTER, PENNSYLVANIA

Compound Name	Molecular Formula	Chemical Abstracts Service No.	Aquatic Toxicity[a]	Other Toxicity Data[b]					Exposure Limits[c]
				Route of Entry	Species	Type of Dose	Duration	Effects[e]	
Ethane, 1,2-Dichloro- (Ethylene Dichloride)	$C_2H_4Cl_2$	107-06-2[d]	TLm 96: 1,000-100 ppm	Inhalation	human	TCLo: 4,000 ppm	H	Central Nervous System	OSHA std (air): TWA 50 ppm; C1 100; Pk 200/5M/3H
				Oral	human	TDLo: 428 mg/kg			
				Oral	man	LDLo: 810 mg/kg			
				Oral	human	LDLo: 500 mg/kg			
				Oral	rat	LD50: 680 mg/kg			
				Inhalation	rat	LCLo: 1,000 ppm	4H		
				Intraperitoneal	rat	LDLo: 600 mg/kg			
				Subcutaneous	rat	LDLo: 500 mg/kg			
				Oral	mouse	LDLo: 600 mg/kg			NIOSH recm std (air)
				Inhalation	mouse	LCLo: 5,000 mg/m^3	2H		TWA 5 ppm; C1 15
				Intraperitoneal	mouse	LDLo: 250 mg/kg			
				Subcutaneous	mouse	LDLo: 380 mg/kg			
				Oral	dog	LDLo: 2,000 mg/kg			
				Intravenous	dog	LDLo: 175 mg/kg			
				Oral	rabbit	LD50: 860 mg/kg			
				Inhalation	rabbit	LCLo: 3,000 ppm	7H		
				Subcutaneous	rabbit	LDLo: 1,200 mg/kg			
				Inhalation	pig	LCLo: 3,000 ppm	7H		
				Inhalation	guinea pig	LCLo: 1,500 ppm	7H		
				Intraperitoneal	guinea pig	LDLo: 600 mg/kg			
				Skin	rabbit	625 mg open		Mild Irritation	
				Eye	rabbit	63 mg		Severe Irritation	
Ethylene, Trichloro- (Trichloroethene)	C_2HCl_3	79-01-6[d]	TLm 96: 1,000-100 ppm	Oral	human	LDLo: 150 mg/kg			OSHA std (air): TWA 100 ppm; C1 200; Pk 300/5M/20
				Inhalation	human	TCLo: 6,900 mg/m^3	10M	Central Nervous System	
				Inhalation	human	TCLo: 160 ppm	83M	Central Nervous System	
				Inhalation	man	TCLo: 110 ppm	8H	Irritant	NIOSH recm std (air) TWA 100 ppm; C1 150/10M
				Oral	rat	LD50: 4,920 mg/kg			
				Inhalation	rat	LCLo: 8,000 ppm	4H		
				Oral	mouse	TDLo: 135 gm/kg	27WI	Carcinogenic	
				Inhalation	mouse	LC50: 3,000 ppm	2H		
				Intravenous	mouse	LD50: 34 mg/kg			
				Oral	dog	LDLo: 5,860 mg/kg			
				Intraperitoneal	dog	LD50: 1,900 mg/kg			
				Intravenous	dog	LDLo: 150 mg/kg			

Table 6 (continued)

TOXICITY OF COMPOUNDS IN AIR SAMPLES COLLECTED AT ABM WADE DISPOSAL SITE CHESTER, PENNSYLVANIA

Compound Name	Molecular Formula	Chemical Abstracts Service No.	Aquatic Toxicity[a]	Other Toxicity Data[b]						Exposure Limits[c]
				Route of Entry	Species	Type of Dose	Dose	Duration	Effects[e]	
Ethylene, Trichloro-continued				Subcutaneous-rabbit		LDLo:	1,800 mg/kg			
				Oral-cat		LDLo:	5,864 mg/kg			
				Inhalation-cat		LCLo:	32,500 mg/m^3	2H		
				Inhalation-guinea pig		LCLo:	37,200 ppm	40M		
				Eye-human			5 ppm		Irritation	
				Skin-rabbit			500 mg	24H	Severe Irritation	
				Eye-rabbit			20 mg	24H	Severe Irritation	
				Oral-human		LDLo:	7 gm/kg			
				Inhalation-human		TDLo:	812 mg/kg		Systemic	
				Inhalation-man		LCLo:	2,900 ppm			
				Intraperitoneal-mouse		LD50:	3,000 mg/kg			
				Subcutaneous-dog		LDLo:	150 mg/kg			
				Oral-rabbit		LDLo:	7,330 mg/kg			
				Subcutaneous-rabbit		LDLo:	1,800 mg/kg			
Hexane	C_6H_{14}	110-54-3	TLm 96: over 1,000 ppm	Eye-human			5 ppm		Irritation	
				Inhalation-human		TCLo:	5,000 ppm	10M	Central Nervous System	OSHA std (air): TWA 500 ppm
				Intraperitoneal-rat		LDLo:	9,100 mg/kg			
				Inhalation-mouse		LCLo:	120 gm/m^3			NIOSH recm std (air). TWA 350 mg/m^3; Cl 1800 mg/m^3/15M
Methane, Dichloro- (Methylene Chloride)	CH_2Cl_2	75-09-2[d]	TLm 96: 1,000-100 ppm	Inhalation-human		TCLo:	500 ppm	1YI	Central Nervous System	OSHA std (air): TWA 500 ppm; Cl 1,000, Pk 2,000/5M/2
				Oral-human		LDLo:	500 mg/kg			
				Inhalation-human		TCLo:	500 ppm	8H	Blood	NIOSH recm std (air). TWA 75 ppm, Pk 500/15M
				Oral-rat		LD50:	945 mg/kg			
				Inhalation-mouse		LC50:	14,400 ppm	7H		
				Intraperitoneal-mouse		LD50:	1,500 mg/kg			
				Subcutaneous-mouse		LD50:	6,460 mg/kg			
				Oral-dog		LDLo:	3,000 mg/kg			
				Inhalation-dog		LCLo:	20,000 ppm	7H		
				Intraperitoneal-dog		LDLo:	950 mg/kg			
				Subcutaneous-dog		LDLo:	2,700 mg/kg			
				Intravenous-dog		LDLo:	200 mg/kg			
				Oral-rabbit		LDLo:	1,900 mg/kg			
				Subcutaneous-rabbit		LDLo:	2,700 mg/kg			
				Inhalation-guinea pig		LCLo:	5,000 ppm	2H		
				Inhalation-rat		LC50.	88,000 mg/m^3	30M		
				Inhalation-cat		LCLo:	43,400 mg/m^3	4.5H		

Table 6 (continued)

TOXICITY OF COMPOUNDS IN AIR SAMPLES COLLECTED AT ABM WADE DISPOSAL SITE CHESTER, PENNSYLVANIA

Compound Name	Molecular Formula	Chemical Abstracts Service No.	Aquatic Toxicity[a]	Other Toxicity Data[b] Route of Entry	Species	Type of Dose	Dose	Duration	Effects[e]	Exposure Limits[c]
Methane, Fluorotrichloro-	CCl_3F	75-64-4[d]		Inhalation	rat	LCLo:	10 pph	20M		OSHA std (air): TWA 1000 ppm
				Intraperitoneal	mouse	LD50:	1,743 mg/kg			
Methyl Methacrylate	$C_5H_8O_2$	80-62-6	TLm 96: 1,000-100 ppm	Inhalation	human	TCLo:	125 ppm		Irritant Central Nervous System	OSHA std (air): 100 ppm
				Inhalation	human	TCLo:	150 mg/m^3			
				Oral	human	LDLo:	5,000 mg/kg			
				Oral	rat	LDLo:	8,000 mg/kg			
				Inhalation	rat	LC50:	3,750 ppm			
				Intraperitoneal	rat	LD50:	1,328 mg/kg			
				Intraperitoneal	rat	TDLo:	800 mg/kg	5-15D (Preg.)	Teratogenic	
				Subcutaneous	rat	LD50:	7,500 mg/kg			
				Inhalation	mouse	LCLo:	13 gm/m^3			
				Intraperitoneal	mouse	LD50:	1,000 mg/kg			
				Subcutaneous	mouse	LD50:	6,300 mg/kg			
				Oral	dog	LDLo:	5,000 mg/kg			
				Subcutaneous	dog	LD50:	4,500 mg/kg			
				Oral	rabbit	LDLo:	6,550 mg/kg			
				Inhalation	rabbit	LCLo:	17,500 mg/m^3	4H		
				Skin	rabbit		10 gm/kg	open	Irritation	
				Eye	rabbit		150 mg		Irritation	
				Oral	guinea pig	LD50:	6,300 mg/kg			
				Inhalation	guinea pig	LCLo:	19,000 mg/m^3	5H		
				Intraperitoneal	guinea pig	LD50:	6,300 mg/kg			
Pentane	C_5H_{12}	109-66-0	TLm 96: 100-10 ppm	Inhalation	human	LCLo:	13,000 ppm			OSHA std (air): 1000 ppm; NIOSH recm std (air): TWA 350 mg/m^3; Cl 1800 mg/m^3/15M
				Inhalation	human	TCLo:	90,000 ppm	5M	Central Nervous System	
2-Pentanone, 4-methyl-	$C_6H_{12}O$	108-10-1	TLm 96: over 1,000 ppm	Eye	human		200 ppm	15M	Irritation	OSHA std (air): TWA 100 ppm
				Inhalation	human	TCLo:	200 ppm		Irritant	
				Oral	human	LDLo:	500 mg/kg			NIOSH recm std (air) TWA 200 mg/m^3
				Oral	rat	LD50:	2,080 mg/kg			

Table 6 (continued)

TOXICITY OF COMPOUNDS IN
AIR SAMPLES COLLECTED AT
ABM WADE DISPOSAL SITE
CHESTER, PENNSYLVANIA

Compound Name	Molecular Formula	Chemical Abstracts Service No.	Aquatic Toxicity[a]	Other Toxicity Data[b]						Exposure Limits[c]
				Route of Entry	Species	Type of Dose	Dose	Duration	Effects[e]	
2-Pentanone, 4-methyl-continued				Inhalation	rat	LCLo:	4,000 ppm	15M		
				Oral	mouse	LDLo	2,850 mg/kg			
				Intraperitoneal	mouse	LD50:	268 mg/kg			
				Eye	rabbit		40 mg		Severe Irritation	
Propane, 1,1,2 - Trichloro-	$C_3H_5Cl_3$	598-77-6		Oral	rat	LD50	1,230 mg/kg			
				Inhalation	rat	LC50.	2,000 ppm	4H		
				Skin	rabbit		10 mg	24H	Mild Irritation	
				Eye	rabbit		20 mg		Severe Irritation	
Toluene	C_7H_8	108-88-3[d]	TLm 96: 100-10 ppm	Eye	Human		300 ppm		Irritation	OSHA std (air): TWA 200 ppm
				Oral	human	LDLo:	50 mg/kg			C1 300; pk 500/10M
				Inhalation	human	TCLo:	200 ppm		Central Nervous System	
				Inhalation	man	TCLo:	100 ppm		Psychotropic	NIOSH recm std (air TWA 100 ppm;
				Oral	rat	LD50:	5,000 mg/kg			C1 200 ppm/10M
				Inhalation	rat	LCLo:	4,000 ppm	4H		
				Intraperitoneal	rat	LDLo:	800 mg/kg			
				Inhalation	mouse	LC50:	5,320 ppm	8H		
				Skin	rabbit	LD50:	14 gm/kg			
				Skin	rabbit		435 mg		Mild Irritation	
				Eye	rabbit		870 µg		Mild Irritation	
				Subcutaneous	frog	LDLo:	920 mg/kg			

Table 6 (continued)

TOXICITY OF COMPOUNDS IN
AIR SAMPLES COLLECTED AT
ABM WADE DISPOSAL SITE
CHESTER, PENNSYLVANIA
Abbreviation
(per Registry of Toxic Effects of Chemical)
Substances - NIOSH - 1977 Edition

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[a] Aquatic Toxicity — TLm 96. 96-hour static or continuous flow standard protocol, in parts per million (ppm)

Other Toxicity Data
- LD50 - lethal dose 50% kill
- LCLo - lowest published lethal concentration
- LC50 - lethal concentration 50% kill
- LDLo - lowest published lethal dose
- TDLo - lowest published toxic dose
- TCLo - lowest published toxic concentration
- TD - toxic dose
- M - minute, H-hour, D-day, W-week; Y-year
- C - continuous
- I - intermittent

[c] Exposure Limits.
- NR - not reported
- NIOSH - National Institute for Occupational Safety and Health
- OSHA - Occupational Safety and Health Act of 1970
- TWA - time-weighted average concentration
- TLV - threshold limit value
- Cl - ceiling
- Pk - peak concentration

[d] This chemical has been selected for priority attention as point source water effluent discharge toxic pollutant (NRDC vs Train consent decree)

[e] Blood - Blood effects, effect on all blood elements, electrolytes, pH, protein, oxygen carrying or releasing capacity.
Carcinogenic - Carcinogenic effects, producting cancer, a cellular tumor the nature of which is fatal, or is associated with the formation of secondary tumors (metastasis).
Central Nervous System - Includes effects such as headaches, tremor, drowsiness, convulsions, hypnosis, anesthesia
Eye - Irritation, diplopia, cataracts, eye ground, blindness by affecting the eye or the optic nerve
Gastrointestinal - diarrhea, constipation, ulceration.
Irritant - Any irritant effect on the skin, eye or mucous membrane.
Mutagenic - Transmissible changes produced in the offspring
Neoplastic - The production of tumors not clearly defined as carcinogenic.
Psychotropic - Exerting an effect upon the mind
Pulmonary - Effects on respiration and respiratory pathology.
Systemic - Effects on the metabolic and excretory function of the liver or kidneys
Teratogenic - Nontransmissible changes produced in the offspring.

TABLE 7

TOXICITY OF COMPOUNDS IN
SOIL/LIQUID SAMPLES COLLECTED AT ABM WADE DISPOSAL SITE
CHESTER, PENNSYLVANIA

Compound Name	Molecular Formula	Chemical Abstracts Service No.	Aquatic Toxicity[a]	Other Toxicity Data[b]				
				Route of Entry - Species	Type of Dose:	Dose	Duration	Effects	Exposure Limits[c]
Benzene, 1,2-dichloro-	$C_6H_4Cl_2$	95-50-1[d]		Oral-human	LDLo:	500 mg/kg			OSHA std (air, Cl 50 ppm
				Oral-rat	LD50.	500 mg/kg			
				Inhalation-rat	LCLo	821 ppm	7H		
				Intraperitoneal-rat	LD50.	840 mg/kg			
				Intravenous-mouse	LDLo	400 mg/kg			
				Oral-rabbit	LD50.	500 mg/kg			
				Intravenous-rabbit	LDLo.	250 mg/kg			
				Oral-guinea pig	LDLo:	2,000 mg/kg			
				Inhalation-guinea pig	LCLo:	800 ppm	24H		
				Eye-rabbit		100 mg	30 sec	Mild Irritation	
Benzene, 1,4-dichloro-	$C_6H_4Cl_2$	106-46-7[d]		Oral-human	LDLo:	500 mg/kg			OSHA std (air TWA 75 ppm
				Oral-human	TDLo.	300 mg/kg		Systemic Irritation	
				Eye-human		80 ppm			
				Oral-rat	LD50	500 mg/kg			
				Intraperitoneal-rat	LD50:	2,562 mg/kg			
				Oral-mouse	LD50	2,950 mg/kg			
				Subcutaneous-mouse	LD50	5,145 mg/kg			
				Oral-guinea pig	LDLo	2,800 mg/kg			
Benzene, 1,2,4-trichloro-	$C_6H_3Cl_3$	120-82-1[d]	TLm 96: 10-1 ppm	Oral-rat	LD50:	756 mg/kg			TLV (air): 5 ppm
				Oral-mouse	LD50·	766 mg/kg			
				Intraperitoneal-mouse	LDLo.	500 mg/kg			
Benzene, 1,2,3-trimethyl-	C_9H_{12}	526-73-8		Oral-rat	LDLo:	5,000 mg/kg			TLV (air) 25 ppm
Benzene, 1,2,4-trimethyl-	C_9H_{12}	95-63-6		Oral-rat	LDLo:	5,000 mg/kg			TLV (air): 25 ppm
				Intraperitoneal-rat	LDLo:	2,000 mg/kg			
				Intraperitoneal-guinea pig	LDLo·	1,788 mg/kg			
Benzene, 1,3,5-trimethyl-	C_9H_{12}	108-67-8		Inhalation-human	TCLo:	10 ppm		Central Nervous System	TLV (air): 25 ppm
				Inhalation-rat	LCLo:	2,240 ppm	24H		
				Intraperitoneal-guinea-pig	LDLo:	1,303 mg/kg			
1-chloro-3-nitrobenzene	$C_6H_4ClNO_2$	121-73-3		Inhalation-human	TCLo·	12µg/m³		Eye	
				Oral-mouse	LD50.	390 mg/kg			

Table 7 (continued)

TOXICITY OF COMPOUNDS IN
SOIL/LIQUID SAMPLES COLLECTED AT ABM WADE DISPOSAL SITE
CHESTER, PENNSYLVANIA

Compound Name	Molecular Formula	Chemical Abstracts Service No.	Aquatic Toxicity[a]	Other Toxicity Data[b]					Exposure Limits[c]
				Route of Entry - Species	Type of Dose:	Dose	Duration	Effects	
Chromium	Cr	7440-47-3[d]		Intravenous-rat	TDLo:	2mg/kg	6W-I	Neoplastic	TLV (air): 0.5 mg/m^3 OSHA std (air): TWA 1 mg/m^3
				Implant-rat	TDLo:	1mg/kg	6W-I	Neoplastic	
Copper	Cu	7440-50-8[d]		Oral-human	TDLo:	120 µg/kg		Gastro-intestinal Tract	TLV (air): 0.2 mg/m^3 (fume)
Diphenylamine	$C_{12}H_{11}N$	122-39-4		Oral-human	LDLo:	500 mg/kg			
				Oral-rat	LDLo:	3,000 mg/kg			
				Oral-rat	TDLo:	7,500 mg/kg	(17-22D Preg.)	Teratogenic	
				Oral-guinea pig	LD50:	300 mg/kg			
Fluoranthene	$C_{16}H_{10}$	206-44-0[d]		Oral-rat	LD50:	2,000 mg/kg			
				Intravenous-mouse	LD50:	100 mg/kg			
				Skin-rabbit	LD50:	3,180 mg/kg			
Lead	Pb	7439-92-1[d]		Oral-woman	TDLo:	450 mg/kg	6Y	Central Nervous System	TLV (air): 0.15 mg/m^3 OSHA std (air): 200 µg/m^3 NIOSH recm std (air). TWA 0.10 mg/m^3
				Intraperitoneal-rat	LDLo:	1,000 mg/kg			
Naphthalene	$C_{10}H_8$	91-20-3[d]	TLm 96: 10-1 ppm	Oral-child	LDLo:	100 mg/kg			OSHA std (air): TWA 10 ppm
				Oral-human	LDLo:	50 mg/kg			
				Oral-rat	LD50:	1,780 mg/kg			
				Subcutaneous-rat	TDLo	3,500 mg/kg	98D-I	Neoplastic	
				Intraperitoneal-mouse	LD50:	150 mg/kg			
				Subcutaneous-mouse	LD50:	969 mg/kg			
				Intravenous-mouse	LD50:	100 mg/kg			
				Skin-rabbit		495 mg open		Mild Irritation	
				Eye-rabbit		100 mg		Mild Irritation	

Table 7 (continued)

TOXICITY OF COMPOUNDS IN
SOIL/LIQUID SAMPLES COLLECTED AT ABM WADE DISPOSAL SITE
CHESTER, PENNSYLVANIA

Compound Name	Molecular Formula	Chemical Abstracts Service No.	Aquatic Toxicity[a]	Other Toxicity Data[b]					
				Route of Entry - Species	Type of Dose:	Dose	Duration	Effects	Exposure Limits[c]
Naphthalene, 1-methyl-	$C_{11}H_{10}$	90-12-0		Oral-rat	LDLo:	5,000 mg/kg			
Naphthalene, 2-methyl-	$C_{11}H_{10}$	91-57-6		Oral-rat	LDLo:	5,000 mg/kg			
Nickel	Ni	7440-02-0[d]		Inhalation-rat	TCLo:	15 mg/m^3		Carcinogenic	OSHA std (air):
				Subcutaneous-rat	TDLo:	15 mg/kg	6W-I	Neoplastic	TWA 1 mg/m^3
				Intramuscular-rat	TDLo:	1,000 mg/kg	17W-I	Carcinogenic	(skin)
				Intrapleural-rat	TDLo:	1,250 mg/kg	22W-I	Neoplastic	
				Parenteral-rat	TDLo:	40 mg/kg	56W-I	Carcinogenic	NIOSH recm
				Intratracheal-rat	LDLo:	12 mg/kg			std (air):
				Implant-rat	TDLo:	250 mg/kg		Carcinogenic	TWA 15µ/m^3
				Intravenous-mouse	LDLo:	50 mg/kg			
				Intramuscular-mouse	TDLo:	100 mg/kg		Carcinogenic	
				Intravenous-dog	LDLo:	10 mg/kg			
				Implant-rabbit	TDLo:	165 mg/kg	2Y-I	Neoplastic	
				Oral-guinea pig	LDLo:	5 mg/kg			
				Inhalation-guinea pig	TCLo:	15 mg/m^3	91W-I	Carcinogenic	
				Intramuscular-hamster	TDLo:	208 mg/kg	22W	Carcinogenic	
				Intramuscular-rat	TDLo:	58 mg/kg		Neoplastic	
				Intramuscular-rat	TDLo:	100 mg/kg	18W-I	Carcinogenic	
Phenanthrene	$C_{14}H_{10}$	85-01-8[d]		Oral-mouse	LD50:	700 mg/kg			
				Skin-mouse	TDLo:	71 mg/kg		Neoplastic	
				Intravenous-mouse	LD50:	56 mg/kg			
Phthalic Acid, Bis (2-ethylhexyl) Ester	$C_{24}H_{38}O_4$	117-81-7[d]		Oral-man	TDLO:	143 mg/kg		Gastro-intestinal Tract	OSHA std (air): TWA 5 mg/m^3
				Oral-rat	LD50:	31 gm/kg			
				Intraperitoneal-rat	LD50:	30,700 mg/kg			
				Intraperitoneal-rat	TDLo:	30 gm/kg	(6-15D Preg)	Teratogenic	
				Intravenous-rat	LDLo:	300 mg/kg			
				Oral-mouse	LD50:	30 gm/kg			
				Oral-mouse	TDLo:	7,500 mg/kg	(8D Preg.)	Teratogenic	
				Intraperitoneal-mouse	LD50:	14 gm/kg			
				Oral-rabbit	LD50.	34 gm/kg			
				Skin-rabbit	LD50:	25 gm/kg			
				Eye-rabbit		500 mg		Irritation	
				Skin-guinea Pig	LD50:	10 gm/kg			