



Record of Decision
Remedial Alternative Selection
for:

Rose Township - Demode Road Site
Oakland County, Michigan

PURPOSE

This decision document represents the selected remedial action for the Rose Township site. It was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, The National Contingency Plan (40 CFR Part 300) of 1985.

The State of Michigan has concurred on the selected remedy, as stated in the attached Letter of Concurrence.

BASIS

The selection of remedy is based upon the Rose Township Site Administrative Record. The attached index identifies the items which comprise this record.

DESCRIPTION OF SELECTED REMEDY

The remedy selected is a final remedial action. It consists of the excavation of as much as 50,000 cubic yards of contaminated soil, onsite thermal destruction of the organic contaminants in this soil, and the disposal of the resultant ash as appropriate. Depending on the results of EP toxicity testing, the ash may either be backfilled onsite (if passing), treated to remove leachable lead and backfilled onsite (if not-passing), or placed in an off-site Resource Conservation and Recovery Act (RCRA) permitted, double-lined landfill facility (if not-passing).

The remedy also consists of the extraction of contaminated ground water, treatment by chemical coagulation, air stripping, and activated carbon adsorption, and discharge of the treated water in an appropriate manner. If the treated water does not exceed Ambient Water Quality Criteria (AWQC) for organic and inorganic chemicals, it will be discharged into the adjacent marsh.

DECLARATIONS

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective. As mandated by CERCLA as amended by SARA, The remedy satisfies the preference for treatment that reduces toxicity, mobility, or volume



of waste as a principal element. Finally, I have determined that this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

In the event that, during the remedial design investigations on the Rose site waste, it is discovered that the cost of thermal destruction exceeds the cost estimate in the Feasibility Study by 50% or that thermal destruction will not be necessary to permanently treat the entire estimated volume of wastes, I will reconsider the Record of Decision to determine if the selected alternative still represents the cost-effective remedy and take appropriate action at that time. The State of Michigan will be consulted in the event that I reconsider my decision.

9-30-87
Date

Frank M. Covington
for Valdas V. Adamkus
Regional Administrator
U.S. EPA, Region V

ADMINISTRATIVE RECORD INDEX: ROSE TOWNSHIP DUMP

<u>Title/Subject</u>	<u>Author</u>	<u>Date</u>	<u>No. of Pages</u>
A. 1979 Removal Records	MDNR	1979/1980	approx 2 feet
B. MDNR Investigation Report	Wm Murphy	1979	21
C. Phase I Hydrogeologic Investigation Data	MDNR	10/81	35
D. Site Visit Report and File Chronology	CH ₂ M Hill	12/21/82	7
E. Groundwater Contamination Study (Phase II Hydrogeologic Study)	MDNR	1/28/83	82
F. Preliminary Assessment Report	U.S. EPA	1/20/83	4
G. Site Inspection Report	CH ₂ M Hill	9/3/82	14
H. Hazardous Ranking Scoring Package	U.S. EPA	7/19/82	79
I. U.S. EPA Notice Letters	U.S. EPA	10/26/82	14
J. 1983 Removal Documents	MDNR	1/83	approx 6 inches
K. Remedial Action Master Plan	Ch ₂ M Hill	4/4/83	140
L. Response to Information Request	Chrysler Corp.	7/21/83	28
M. Rose Township Safety Plan	MDNR	3/22/84	105
N. Work plan for Remedial Investigation/Feasibility Study	E.C. Jordan	4/84	85
O. Work Plan Addendum	E.C. Jordan	4/27/84	2
P. Work Plan Addendum	MDNR	5/4/84	1
Q. Sampling Study Plan	MDNR	7/3/84	6
R. Task 13 Work Plan Site Investigation	E.C. Jordan	3/85	27

<u>Title/Subject</u>	<u>Author</u>	<u>Date</u>	<u>No. of Pages</u>
S. Work Plan Amendment	MDNR	4/29/86	10
T. Safety Plan Amendment	MDNR	6/19/86	2
U. Supplemental Work Plan for Remedial Investigation/Feasibility Study	E.C. Jordan	8/86	77
V. Supplemental Work Plan for Revised Risk Assessment	E.C. Jordan	1/15/87	5
W. Trip Report	U.S. EPA	3/9/84	1
AA. Quality Assurance Project Plan	E.C. Jordan	5/84	124
BB. Community Relations Plan	E.C. Jordan	7/18/84	43
CC. RI/FS Progress Report	E.C. Jordan	9/84	122
DD. Preinvestigative Evaluation	E.C. Jordan	9/84	7
EE. QA/QC'd raw data and Chain of Custody Forms	E.C. Jordan	1984/1987	approx. 10 file drawers
FF. Action Memorandum	U.S. EPA	11/13/85	4
GG. Information Request to Herman Anchill	U.S. EPA	5/8/86	3
HH. Response to Information Request	H. Anchill	5/21/86	2
II. OSC Report Outline for November, 1985 Removal Action	Roy F. Weston	11/86	45
JJ. 1985 Removal Documents	U.S. EPA	11/85-8/86	approx. 2 feet
KK. Letters Concerning November, 1985 Removal Action	Ralph Dollhopf	11/20/85	14
LL. Manufacturers Information on Thermal Destruction	Shirco Infrared Systems	Undated	23

<u>Title/Subject</u>	<u>Author</u>	<u>Date</u>	<u>No. of Pages</u>
MM. Site Program Description of Technology	Shirco Infrared	7/15/86	4
NN. U.S. EPA Meeting Notes	Kevin Adler	3/19/87	2
OO. Letter to Steve Luzkow	Shirco Infrared Systems, Inc.	4/7/87	14
PP. Final Remedial Investigation/Feasibility Study	MDNR	6/87	234
QQ. Public Notice of Completion of the Remedial Investigation/Feasibility Study Report	MDNR	6/87	1
RR. Progress Report	MDNR	6/22/87	2
SS. Feasibility Study Fact Sheet	MDNR	6/22/87	5
TT. Site Program Fact Sheet	MDNR	6/22/87	4
UU. U.S. EPA Correspondence Concerning Completion of RI/FS	U.S. EPA	6/25/87	11
VV. Transcript of Public Meeting	MDNR	7/1/87	14
WW. Demonstration Plan for Rose Township Site	Shirco Infrared Systems	7/87	91
AAA. Guidance on Remedial Investigations Under CERCLA	U.S. EPA	6/85	170
BBB. Guidance on Feasibility Studies Under CERCLA	U.S. EPA	6/85	178
CCC. Superfund Public Health Evaluation Manual	U.S. EPA	10/86	228
DDD. Interim Guidance on Superfund Selection of Remedy	U.S. EPA	12/24/86	11

<u>Title/Subject</u>	<u>Author</u>	<u>Date</u>	<u>No. of Pages</u>
EEE. Letter to James Florio	Lee Thomas	5/21/87	5
FFF. Additional Interim Guidance for FY '87 Records of Decision	U.S. EPA	7/24/87	6
GGG. Meeting Notes for July 17, 1987 PRP Meeting	U.S. EPA	7/17/87	17
HHH. Meeting Notes from August 3, 1987 PRP Meeting	U.S. EPA	8/3/87	4
III. Public Comments on RI/FS	PRP Group	8/11/87	327
JJJ. Meeting Notes for September 3, 1987 PRP Meeting	U.S. EPA	9/3/87	5
KKK. Meeting Notes for September 3, 1987 PRP Meeting	PRP Group	9/3/87	9
LLL. MDNR Interoffice Memorandum	Brad Vanman	9/10/87	4
MMM. Meeting Notes for September 15, 1987 PRP Meeting	U.S. EPA	9/15/87	7
NNN. Meeting Notes for September 15, 1987 PRP Meeting	PRP Group	9/15/87	5
OOO. MDNR Interoffice Memorandum	Robert Hayes	9/16/87	5
PPP. MDNR Interoffice Memorandum	Robert Hayes	9/16/87	10
QQQ. Record of Decision and Responsiveness Summary	U.S. EPA	9/30/87	175

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

ROSE TOWNSHIP DUMP

I. Site Location and Description

The Rose Township Dump site is located on Demode Road in rural Rose Township, Oakland County, Michigan (Figure 1). Located approximately one mile west of the town of Rose Center, the 110 acre site comprises an upland area which is almost completely surrounded by wetlands. The southern periphery of the site is heavily wooded with hardwoods. The middle portion, a rolling meadowland, is bordered by a marsh to the west and the northeast and Demode Road to the north. There is an abundance of wildlife onsite, as evidenced by an actual siting of deer during a site inspection in September 1986.

The population of Rose Township was estimated to be 4,560 in July of 1984. Adjacent to the site, a sparse population is located next to several small lakes. Although entrance to the Rose site is restricted, onsite activities which increase risk of exposure to contamination presently include hunting, snowmobiling, and riding all-terrain vehicles (ATVS). In addition, inspection walks occur along the natural gas pipeline easement which is present in the most heavily contaminated area. The two most heavily contaminated areas onsite were fenced as part of an emergency removal action in 1985. However, a large hole in one of the fences offers mute testimony to continued site access.

An examination of aerial photographs reveal that a portion of the Rose site land was farmed through the late 1950's. In the 1960's, farming was abandoned and illegal waste disposal began. The operators placed an estimated 5,000 drums of waste consisting of solvents, paints, and PCBs upon and into 12 acres in the southwest part of the site. Another portion of the site was contaminated by lead battery sludges. There are two ground water contaminant plumes onsite. In the north is a plume consisting mainly of vinyl chloride, and in the southwest part of the site is a plume consisting of vinyl chloride, xylene, toluene, benzene, and several other chemicals of concern. The northern plume threatens to contaminate nearby domestic wells. One well is located only 1,600 feet away from the site.

II. Site History

A. Previous Investigations

The following is a chronology of events related to the Rose site:

- ° From 1966 to 1968 an unknown number of drums of wastes which included solvents, paint sludges, and PCBs were buried in a 12 acre portion of the site. Bulk wastes (including the above) were also discharged to the surface or into shallow lagoons or pits in the area.

- The Oakland County Health Department (OCHD) was notified of illegal dumping at the site in 1968. A subsequent court action ordered a site cleanup by the waste hauler. In 1969, an adjacent landowner sued the waste hauler and the Rose site landowner, demanding that the site be cleaned up. No apparent cleanup occurred at either time.
- Rose Township also brought suit against the waste hauler and property owner in 1971 to force the dumping to cease and to initiate a cleanup. Dumping finally ceased and some unspecified cleanup action was reportedly undertaken.
- The Michigan Department of Natural Resources (MDNR) was notified of the existence of the site by the OCHD in April 1979. The MDNR surveyed the area and identified approximately 1,500 drums. Although some drums were partially buried, most had been left on the surface. A majority of the drums were either leaking or were bulging due to expansion of contents.
- A search warrant, obtained in June of 1979, allowed the drums to be sampled to identify their contents. PCBs, phthalates, organic solvents, oil and grease, phenols, and heavy metals (especially lead and chromium) were found to be present.
- Coincident with the drum sampling in June of 1979, the MDNR tested domestic wells in the area. Apparent low level contamination consisting of trichloroethylene (TCE) and perchloroethylene (PCE) in the wells made it necessary to supply bottled water to residents. However, in mid-1980, a second round of sampling indicated no contamination existed and the bottled water program was discontinued.
- Based on the 1979 drum sampling results, a Toxic Substance Emergency was declared by the Michigan Toxic Substance Control Commission. Funds were appropriated for an immediate removal action and for a study to determine the nature and extent of contamination onsite. By July of 1980, when the removal action was completed, over 5,000 drums had been removed from the site.
- Spring, 1980 saw the beginning of a hydrogeologic study onsite. The MDNR installed nine monitoring wells and sampled soils. Completed in 1981, this initial investigation indicated that organic chemical contamination extended below the shallowest aquifer and that additional soil samples and monitoring wells would be needed to further define the horizontal and vertical distribution of chemicals.
- MDNR directed the next phase of investigation in 1982. Intending to define geology, to determine the vertical extent of contamination, and to determine and profile the existence of deeper aquifers, the State's contractor installed an additional 13 monitoring wells and performed numerous soil-test borings. The additional data

still failed to provide conclusive information regarding ground water flow direction and distribution of contamination.

- ° The Rose site was placed on the National Priorities List in 1982.
- ° Federal funds were available in June of 1983 to perform a Remedial Investigation (RI) and Feasibility Study (FS). E.C. Jordan Co. (Jordan) was contracted to assess (1) physiographic site conditions, (2) chemical contaminant distribution, and (3) resultant health and/or environmental risks associated with the contamination. The data from previous investigations and from this phase provided the information necessary to perform the FS.

B. Current Site Status

The Remedial Investigation/Feasibility Study (RI/FS) of the Rose Site was begun in February 1984. In late 1984, the following activities occurred onsite:

- ° installation of 19 monitoring wells at 11 locations;
- ° ground water sampling of the 19 new monitoring wells, the 22 existing monitoring wells, and 11 domestic wells;
- ° composite surface soil sampling on a grid in the southwestern portion of the site, and collection of 50 soil grab samples from locations throughout the site;
- ° soil borings and associated sampling of subsurface soils;
- ° magnetometer and resistivity surveys; and
- ° air quality analysis.

In 1985 a test-pitting program was undertaken to determine the nature and quantity of buried metallic objects associated with eight magnetic anomalies found beneath the drum storage area onsite. Additionally, three soil borings were collected and one monitoring well was installed to investigate the newly discovered northern vinyl chloride ground water plume. A second sampling grid was constructed in this area and composite surface soil samples were taken. Soil samples were taken from the test pits and the 10 northern area wells were sampled as well.

In the Summer of 1986, seven additional monitoring wells ("DNR" series-see Figure 4) were installed to further define the ground water plume boundaries onsite. Sampling of all 49 wells occurred in the Fall.

C. Site Characterization

The result of the previously mentioned investigations indicates that the Rose site ground water, surface soils, subsurface soils, and the adjacent wetlands are contaminated with toxic chemicals. The following sections will address each area of concern:

1. Ground water

a. Introduction: Hydrogeology, Hydrology

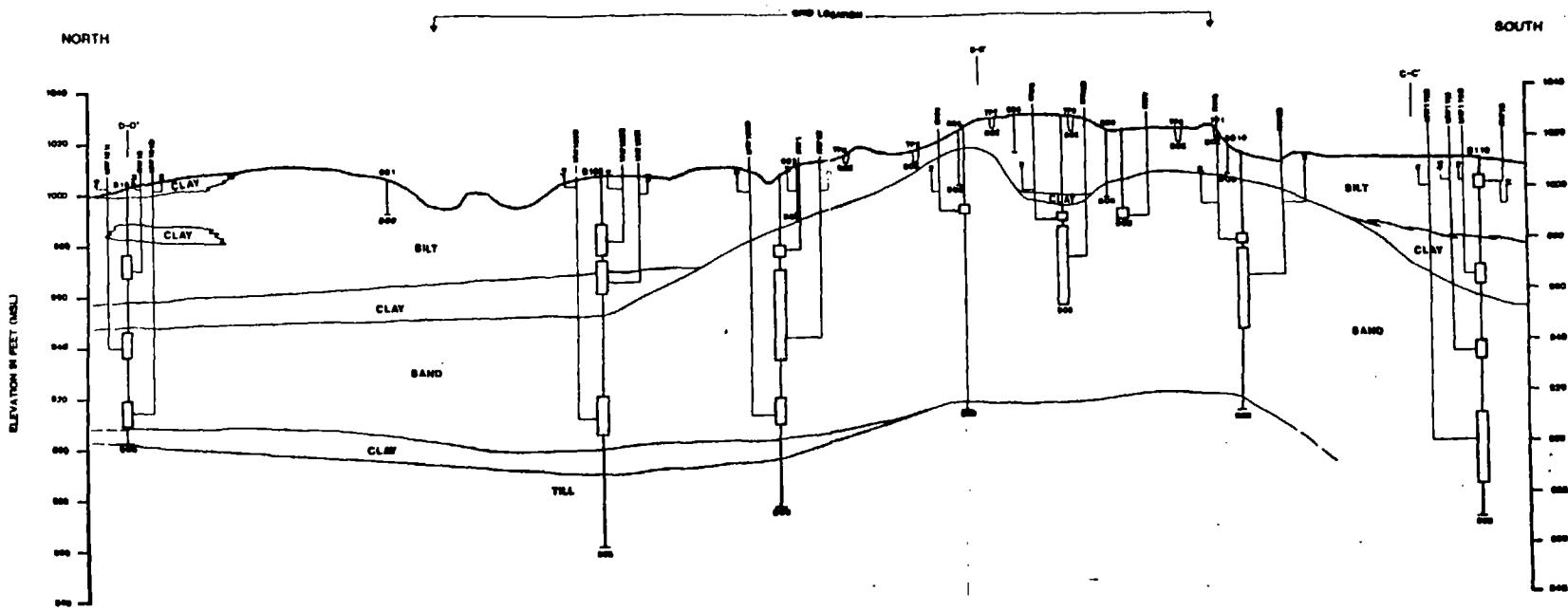
The Oakland County area is underlain by bedrock at depths of 200-300 feet. Composed mostly of shales and sandstone, the bedrock is overlain by complex stratified glacial deposits (Figure 2). The site itself is located on a morainal ridge, which is surrounded by glacial outwash deposits. As seen in Figure 2, a 40-120 foot thick sand unit exists beneath the site. This is the most permeable of the site soils. The hydraulic conductivity is on the order of 10^{-3} cm/sec. The underlying till has an estimated hydraulic conductivity of 10^{-7} cm/sec and is expected to serve as the lower hydraulic boundary. In the lower wetlands areas and upon the adjacent slopes, the sand aquifer is overlain by lacustrine clay (Figure 2), which results in localized confined conditions in the sand aquifer.

The residents in the site vicinity utilize glacial drift aquifers for domestic water supplies. Numerous domestic wells are located in these aquifers, as shown in Figure 3. Sampled domestic wells are labeled "DW". Providing moderate to high yields of water, the local wells range from 24 to 330 feet deep and average 100 feet in depth. Approximately six miles north of the Rose site is the community of Holly, the closest municipal water supply. Holly also utilizes a glacial drift aquifer source.

The regional ground water flow gradient in the vicinity of the site is to the north and northwest. Superimposed upon the regional flow is the local recharge system and shallow ground water flow. Following the contour of the land surface, a mounding effect occurs on the ground water levels during recharge conditions¹ (Figure 4). This mounding effect flattens out during limited recharge conditions² (Figure 5). Overall, flow locally is to the north. During recharge conditions, however, flow occurs in a radial manner, from the top of the mound, outward. Estimated flow rates range from five feet/year in the southwest plume area to 8-21 feet/year in the northern plume area. However, the rate may be ten times higher in the confined aquifer area and where local permeability is much greater.

¹generally late fall and early spring

²generally late spring through early fall, and mid winter



PROFILE A-A'

LEGEND

- BORING AND MONITORING WELL LOCATION
- OBSERVED WATER LEVEL (FEET, MSL) ON NOVEMBER 16, 1964
- WELL SCREEN AND SAND SAMPLE
- BOTTOM OF BORING
- SHALLOW BORING LOCATION
- BOTTOM OF BORING
- MATCHPOINT WITH GEOLOGIC PROFILE C-C'
- TEST PIT
- BOTTOM OF EXCAVATION

NOTES

1. SEE FIGURE A-1 FOR LOCATION AND ORIENTATION OF PROFILES.
2. PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SURFACE DATA. ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN.
3. EXPLORATIONS OFFSET FROM PROFILE A-A'

SW 18, NW 18, SW 18, NW 18	60 FEET WEST	SW 1	80 FEET EAST
NW 18, SW 18, NW 18	100 FEET EAST	SW 2	80 FEET EAST
SW 18, NW 18	70 FEET WEST	SW 3	80 FEET EAST
SW 18	20 FEET WEST	SW 4	40 FEET EAST
SW 18, NW 18	100 FEET EAST	SW 5	10 FEET EAST
SW 18	40 FEET WEST	SW 6	10 FEET EAST
SW 18, NW 18, SW 18	70 FEET WEST		
SW 18	50 FEET EAST		
SW 18, NW 18	50 FEET WEST		
SW 18	100 FEET EAST		
SW 1	20 FEET WEST		
SW 2	60 FEET EAST		

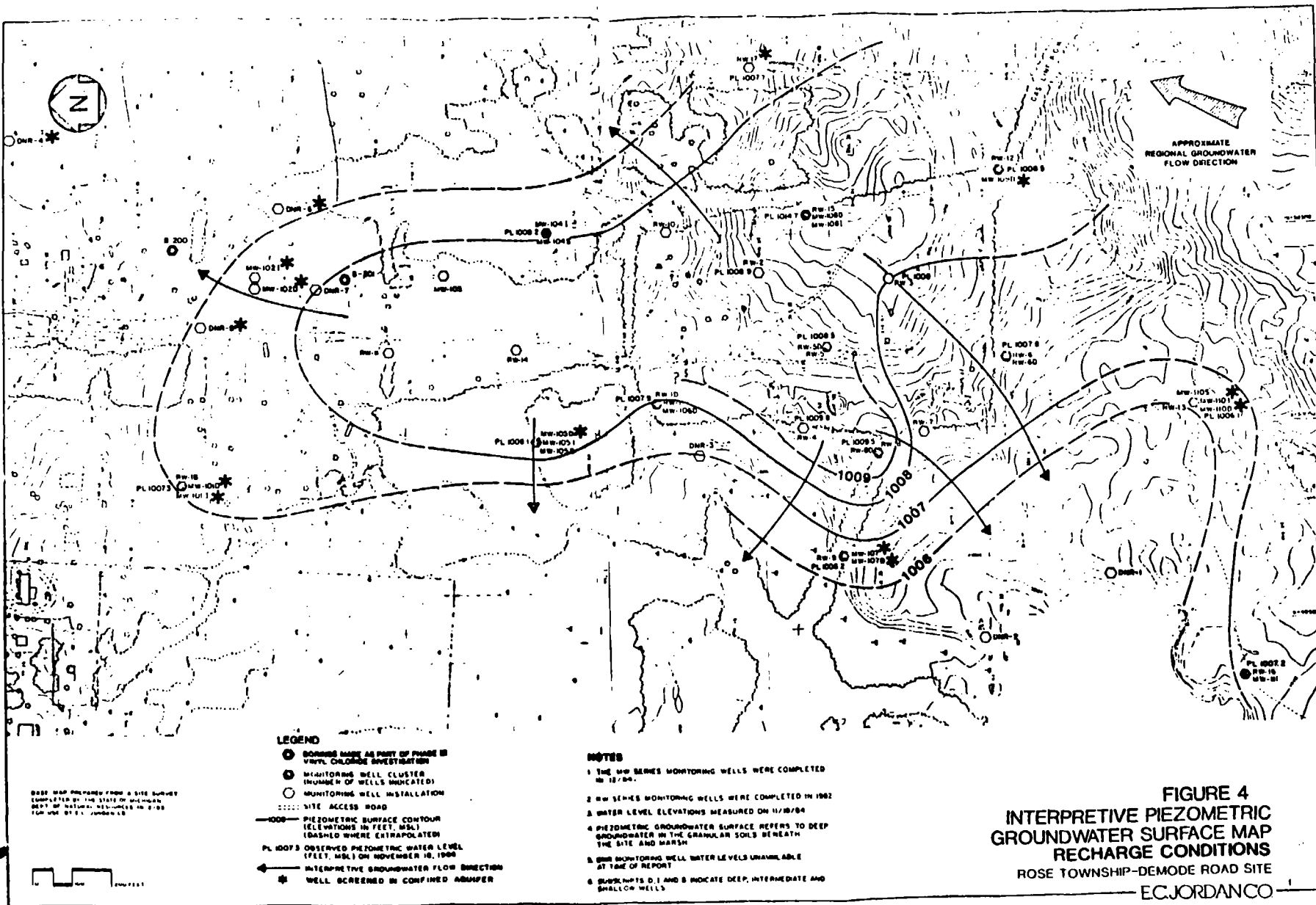
SYMBOL DESCRIPTIONS

- SAND** FINE TO COARSE GRANULAR GUTTENBERG DEPOSIT, STRATIFIED, WITH OCCASIONAL SILT OR GRAVEL LENSES
- SILT** HEAVILY STRIPPED AND BIRCHBARK, FINE LAMINATIONS OF SANDY SILT AND SILTY SAND WITH SOME SAND IMPRESSIONS
- CLAY** SHALE BROWN TO OLIVE GRAY LACUSTRINE DEPOSITS CONSISTENT OF CLAY AND SILTY CLAY
- TRIL** SAND HORIZONTALS AND HORIZONTAL BEDS OF COMPACT CLAYS AND SILTS WITH COBBLES SAND AND GRAVEL

FIGURE 2
INTERPRETIVE GEOLOGIC PROFILE
 ROSE TOWNSHIP-DEMODE ROAD SITE
 EC.JORDAN CO

**FIGURE 3: DOMESTIC WELL LOCATIONS
HAS BEEN REDACTED – ONE PAGE**

CONTAINS POTENTIAL PERSONALLY- IDENTIFYING INFORMATION



BASE MAP PREPARED FROM A SITE SURVEY
COMPLETED BY THE STATE OF MICHIGAN
DEPT. OF NATURAL RESOURCES IN 1989
FOR USE BY P.L. JORDANCO

LEGEND

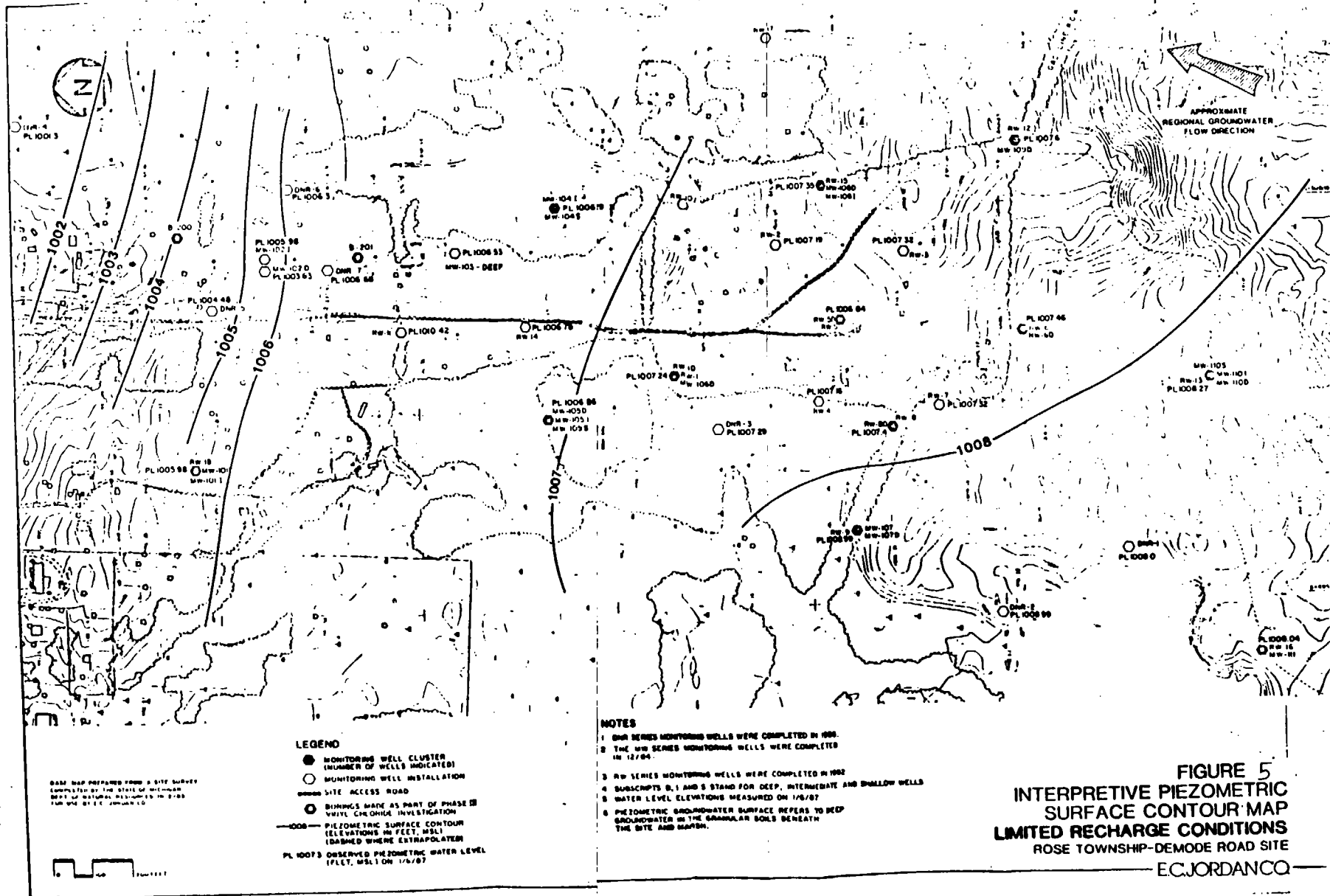
- BORINGS MADE AS PART OF PHASE III VINYL CHLORIDE INVESTIGATION
- MONITORING WELL CLUSTER (NUMBER OF WELLS INDICATED)
- MONITORING WELL INSTALLATION
- SITE ACCESS ROAD
- 1006— PIEZOMETRIC SURFACE CONTOUR (ELEVATIONS IN FEET, MSL) (DASHED WHERE EXTRAPOLATED)
- PL 1007.3 OBSERVED PIEZOMETRIC WATER LEVEL (FEET, MSL) ON NOVEMBER 10, 1989
- ← INTERPRETIVE GROUNDWATER FLOW DIRECTION
- ★ WELL SCREENED IN CONFINED AQUIFER

NOTES

- 1 THE MW SERIES MONITORING WELLS WERE COMPLETED IN 1979.
- 2 RW SERIES MONITORING WELLS WERE COMPLETED IN 1982
- 3 WATER LEVEL ELEVATIONS MEASURED ON 11/10/84
- 4 PIEZOMETRIC GROUNDWATER SURFACE REFERS TO DEEP GROUNDWATER IN THE GRANULAR SOILS BENEATH THE SITE AND MARSH
- 5 DMR MONITORING WELL WATER LEVELS UNAVAILABLE AT TIME OF REPORT
- 6 SUBSCRIPTS D, I AND S INDICATE DEEP, INTERMEDIATE AND SHALLOW WELLS

FIGURE 4
INTERPRETIVE PIEZOMETRIC
GROUNDWATER SURFACE MAP
RECHARGE CONDITIONS
ROSE TOWNSHIP-DEMODO ROAD SITE

EC.JORDANCO



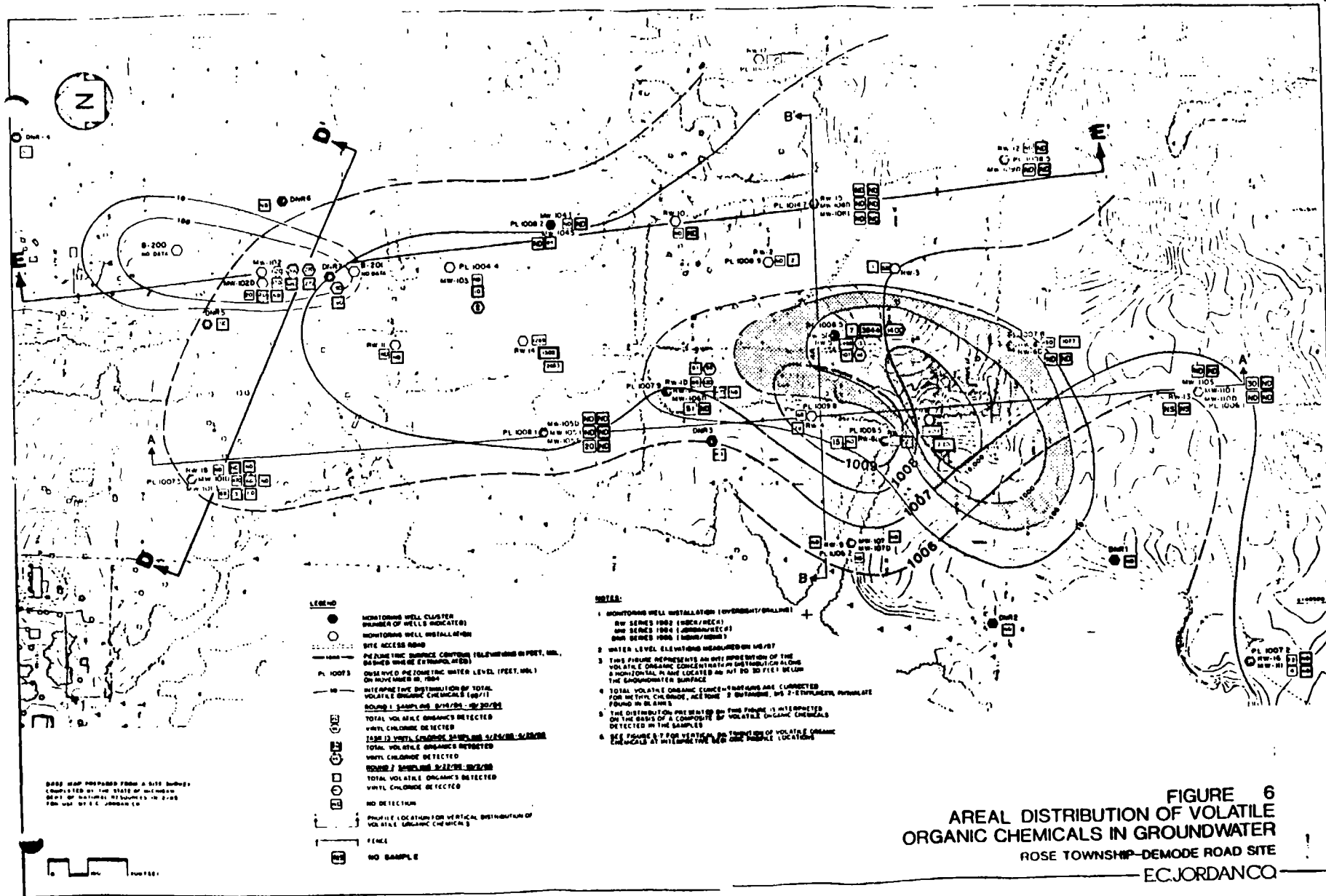
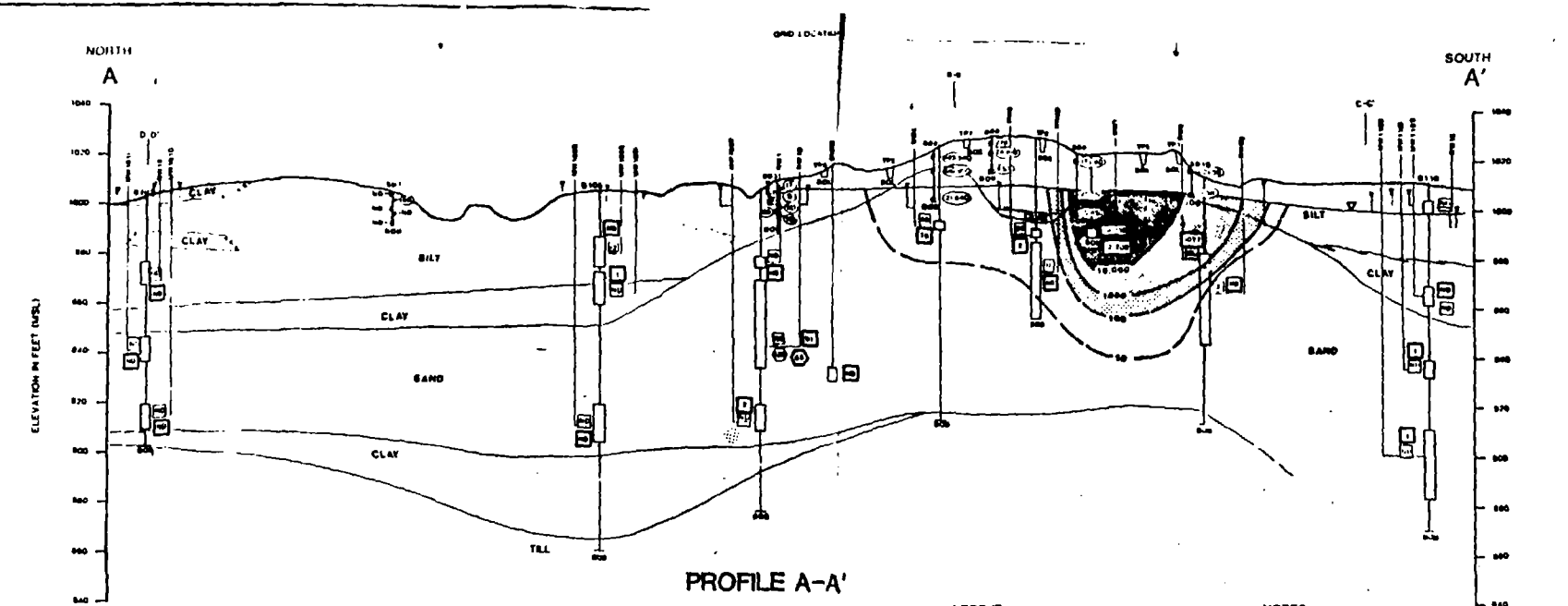


FIGURE 6
AREAL DISTRIBUTION OF VOLATILE ORGANIC CHEMICALS IN GROUNDWATER
 ROSE TOWNSHIP-DEMODO ROAD SITE
 EC.JORDANCO

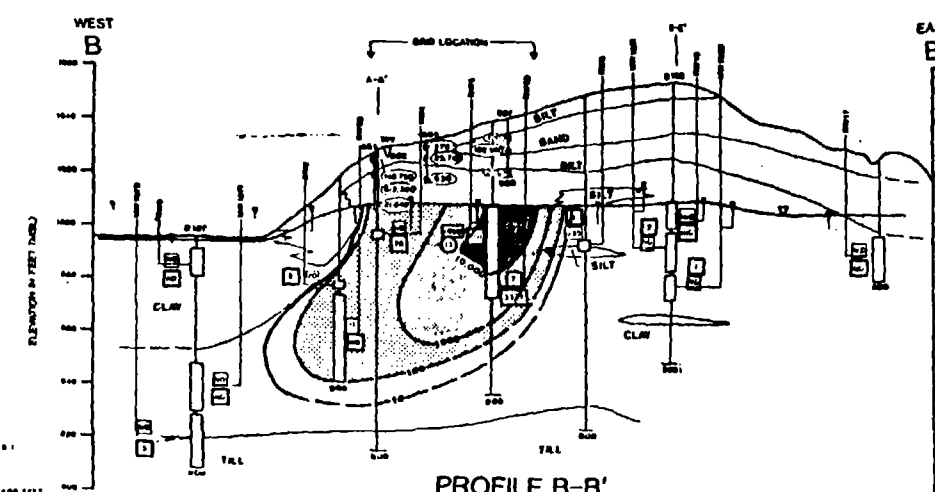
- LEGEND**
- MONITORING WELL CLUSTER (NUMBER OF WELLS INDICATED)
 - MONITORING WELL INSTALLATION
 - SITE ACCESS ROAD
 - PIEZOMETRIC SURFACE CONTOUR (ELEVATION IN FEET, MSL, AS SHOWN UNLESS OTHERWISE NOTED)
 - PL 1007.3
DATE AND PIEZOMETRIC WATER LEVEL (FEET, MSL) ON NOVEMBER 18, 1984
 - INTERPOLATED DISTRIBUTION OF TOTAL VOLATILE ORGANIC CHEMICALS (µg/L)
ROUND 1 SAMPLING 06/01/94 - 06/30/94
 - TOTAL VOLATILE ORGANICS DETECTED
 - VINYL CHLORIDE DETECTED
 - TAM 22** VINYL CHLORIDE SAMPLES 5/12/94 - 5/17/94
 - TOTAL VOLATILE ORGANICS DETECTED
 - VINYL CHLORIDE DETECTED
 - ROUND 2** SAMPLING 06/01/94 - 06/30/94
 - TOTAL VOLATILE ORGANICS DETECTED
 - VINYL CHLORIDE DETECTED
 - NO DETECTION
 - PROFILE LOCATION FOR VERTICAL DISTRIBUTION OF VOLATILE ORGANIC CHEMICALS
 - FENCE
 - NO SAMPLE

- NOTES:**
- 1 MONITORING WELL INSTALLATION (UPPERCASE/LOWERCASE)
RW SERIES 1982 (INCH/FEET)
MW SERIES 1984 (LIMBS/FEET)
MW SERIES 1988 (INCH/FEET)
 - 2 WATER LEVEL ELEVATIONS MEASURED ON MW/ST
 - 3 THIS FIGURE REPRESENTS AN INTERPRETATION OF THE VOLATILE ORGANIC CONCENTRATIONS IN THE DISTRIBUTION ALONG A HORIZONTAL PLANE LOCATED 30 FEET BELOW THE GROUNDWATER SURFACE
 - 4 TOTAL VOLATILE ORGANIC CONCENTRATIONS ARE CORRECTED FOR METHYL CHLORIDE, ACETONE, AND 2-ETHANETHIOL, BUTANOLATE FOUND IN ALL SWS
 - 5 THE DISTRIBUTION PRESENTED ON THIS FIGURE IS INTERPRETED ON THE BASIS OF A COMPOSITE OF VOLATILE ORGANIC CHEMICALS DETECTED IN THE SAMPLES
 - 6 SEE FIGURE 5.7 FOR VERTICAL PROFILES OF VOLATILE ORGANIC CHEMICALS AT VARIOUS TIE-BACK SURFACE LOCATIONS

DATA MAP PREPARED FROM A SITE SURVEY
 COMPLETED BY THE STATE OF MINNESOTA
 DEPT. OF NATURAL RESOURCES IN 1984
 FOR USE BY THE JOHNSON CO.



PROFILE A-A'



PROFILE B-B'

LEGEND

- 1 WELL AND MONITORING WELL LOCATION (OBSERVED SURFACE LEVEL (FSLT, MSL) ON NOVEMBER 14, 1984)
- 2 WELL BOREHOLE AND SAND BACKFILL
- 3 BOTTOM OF BOREHOLE
- 4 SHALLOW BOREHOLE LOCATION
- 5 BOTTOM OF BOREHOLE
- 6 MATCHPOINT WITH GEOLOGIC PROFILE C-C'
- 7 INTERPRETED GROUNDWATER SURFACE
- 8 HYDROLOGIC DISTRIBUTION OF TOTAL VOLATILE ORGANIC CHEMICALS (CIRCLES)-DAPED (WELL) IS INTERPOLATED
- 9 ROUND 1 SAMPLES 8/14/84 - 10/25/84
 - TOTAL VOLATILE ORGANICS DETECTED
 - VINYL CHLORIDE DETECTED
- 10 ROUND 2 SAMPLES 8/22/84 - 10/2/84
 - TOTAL VOLATILE ORGANICS DETECTED
 - VINYL CHLORIDE DETECTED
 - NOT DETECTED
- 11 TOTAL VOLATILE ORGANICS DETECTED IN SUBSURFACE SOILS (WELL)
- 12 TEST PIT
- 13 BOTTOM OF EXCAVATION

NOTES

- 1 SEE FIGURE 5-4 FOR LOCATION AND ORIENTATION OF PROFILES
 - 2 PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SAND-SHAW ALL DATA. ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN
 - 3 THE FIGURE REPRESENTS THE VERTICAL DISTRIBUTION OF VOLATILE ORGANICS BY GROUNDWATER ALONG THE ALIGNMENT OF THE PROFILE. TOTAL VOLATILE ORGANICS DETECTED IN SOIL AT BOREHOLE LOCATIONS ARE ALSO SHOWN.
 - 4 TOTAL VOLATILE ORGANIC CONCENTRATIONS IN GROUNDWATER ARE CORRECTED FOR METHYLENE CHLORIDE, ACETONE, 2-BUTANONE, PHTHALATES THAT WERE DETECTED IN THE SAMPLE BLANKS.
 - 5 THE DISTRIBUTION PBL IS PLotted ON THIS FIGURE IS INTERPRETED ON THE BASIS OF A COMPOSITE OF LABORATORY ANALYTICAL RESULTS OBTAINED FROM SAMPLES COLLECTED FROM 8/14/83-10/25/84 AND FROM 8/22/84 - 10/2/84 (SEE COMB. EVENT)
 - 6 FOR OFFSET OF EXPLORATIONS FROM PROFILE SEE FIGURE 7-1
 - 7 SECOND SAMPLING ROUND CONDUCTED 7/14/85 - 10/2/85
- GEOLOGIC DESCRIPTIONS
- SAND FINE TO COARSE GRANULAR OUTWASH DEPOSIT, STRATIFIED, WITH OCCASIONAL SILT OR GRAVEL LENSES
 - SILT HEAVILY STRATIFIED AND DISCORDANT, WITH LAMINATIONS OF SAND AND SILTY SAND WITH SOME SAND PITTING
 - CLAY SAND SHOWN TO CLAY; GRAY LACUSTRINE DEPOSITS CONSISTING OF CLAY AND SILTY CLAY
 - TAL BLANK UNBORDERED AND NONHOMOGENEOUS DEPOSITS OF COMPACT CLAYS AND SILTS WITH COBBLES, SAND AND GRAVEL

FIGURE 7
VERTICAL DISTRIBUTION OF
TOTAL VOLATILE ORGANIC CHEMICALS IN SOILS
AND GROUNDWATER AT PROFILES A-A' AND B-B'
ROSE TOWNSHIP-DEMODOE ROAD SITE
E.C. JORDAN CO.

VERTICAL EXAGGERATION 5:1
HORIZONTAL SCALE
100 FEET

NOTES

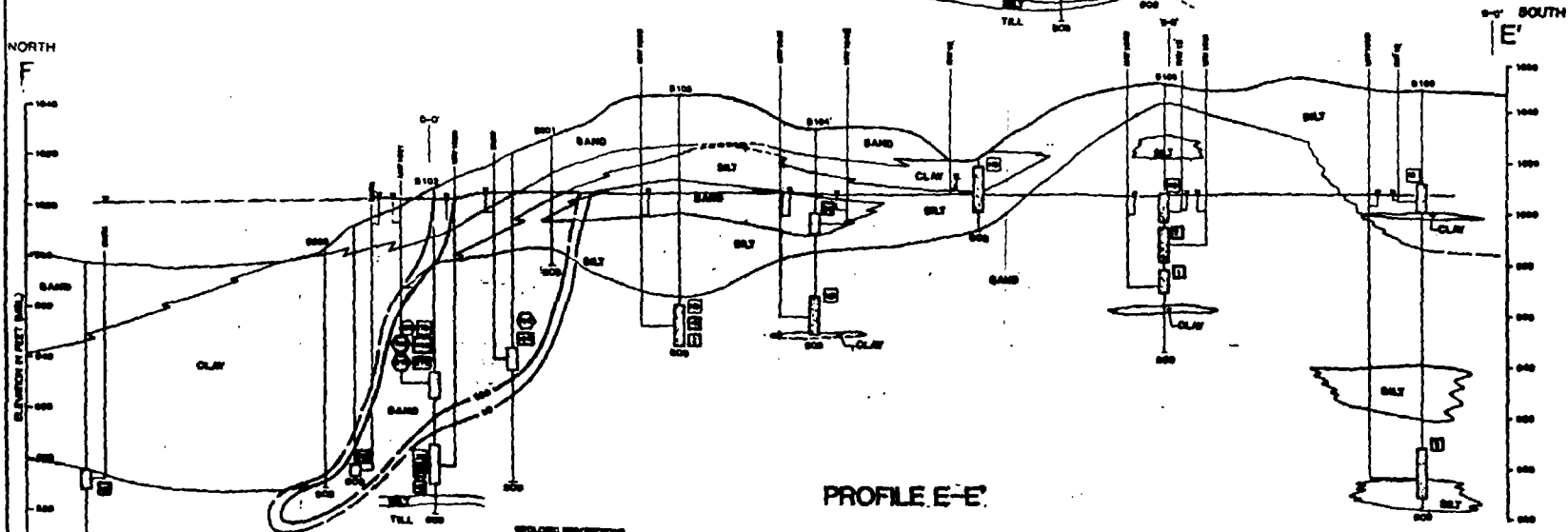
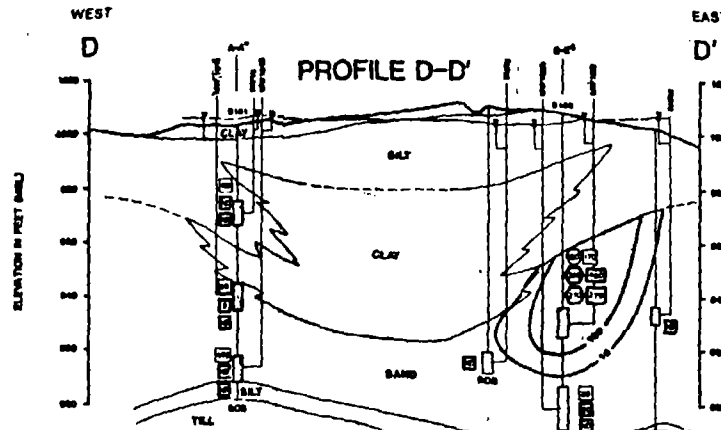
- SEE FIGURES 6-1 FOR LOCATION AND ORIENTATION OF PROFILES
- PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SURFACE DATA. ACTUAL CONDITIONS BETWEEN EXPLORATIONS MAY VARY FROM THOSE SHOWN.
- EXPLORATIONS OFFSET FROM PROFILE D-D'

EW10	60 FEET NORTH
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- EXPLORATIONS OFFSET FROM PROFILE E-E'

EW100	70 FEET WEST
EW104S, EW104N	30 FEET EAST
EW110	30 FEET WEST
EW112, EW102	30 FEET EAST
EW200	75 FEET EAST
EW201	30 FEET WEST
EW204	450 FEET EAST
EW205	105 FEET WEST
EW207	45 FEET WEST
- THE PROFILE REPRESENTS THE VERTICAL DISTRIBUTION OF VOLATILE ORGANICS IN GROUNDWATER ALONG THE ALIGNMENT OF THE PROFILE. TOTAL VOLATILE ORGANICS DETECTED IN SOIL AT BORING LOCATIONS ARE ALSO SHOWN.
- TOTAL VOLATILE ORGANIC CONCENTRATIONS IN GROUNDWATER ARE CORRECTED FOR METHYLENE CHLORIDE, ACETONE, 1,1-DICHLOROETHYLENE, AND PHTHALATES THAT WERE DETECTED IN THE SAMPLE BLANKS.
- THE DISTRIBUTION PRESENTED ON THIS FIGURE IS INTERPRETED ON THE BASIS OF A COMPOSITE OF LABORATORY ANALYTICAL RESULTS OBTAINED FROM SAMPLES COLLECTED FROM 8/11/88 - 10/30/88 (EVENT 1) AND FROM 8/23/88 - 10/2/88 (SECOND EVENT).
- FOR OFFSET OF EXPLORATIONS FROM PROFILE SEE FIGURES 7 AND 8.
- SECOND SAMPLING ROUND CONDUCTED 7/16/88 - 10/3/88.

LEGEND

- BORING AND MONITORING WELL LOCATION
- OBSERVED WATER LEVEL (FEET, MSL) ON JANUARY 6, 1987
- WELL SCREEN AND SAND BACKFILL
- BOTTOM OF BORING
- SHALLOW BORING LOCATION
- BOTTOM OF BORING
- MATCHPOINT WITH GEOLOGIC PROFILE C-C'
- INTERPRETED GROUNDWATER SURFACE
- INTERPRETED ESTIMATION OF TOTAL VOLATILE ORGANIC CONCENTRATION (DASHED WHERE EXTRAPOLATED)
- ROUND 1 SAMPLING 8/11/88 - 10/30/88
- TOTAL VOLATILE ORGANICS DETECTED
- WVTL CHLORIDE DETECTED
- ROUND 2 SAMPLING 8/23/88 - 10/2/88
- TOTAL VOLATILE ORGANICS DETECTED
- WVTL CHLORIDE DETECTED
- NO DETECTION

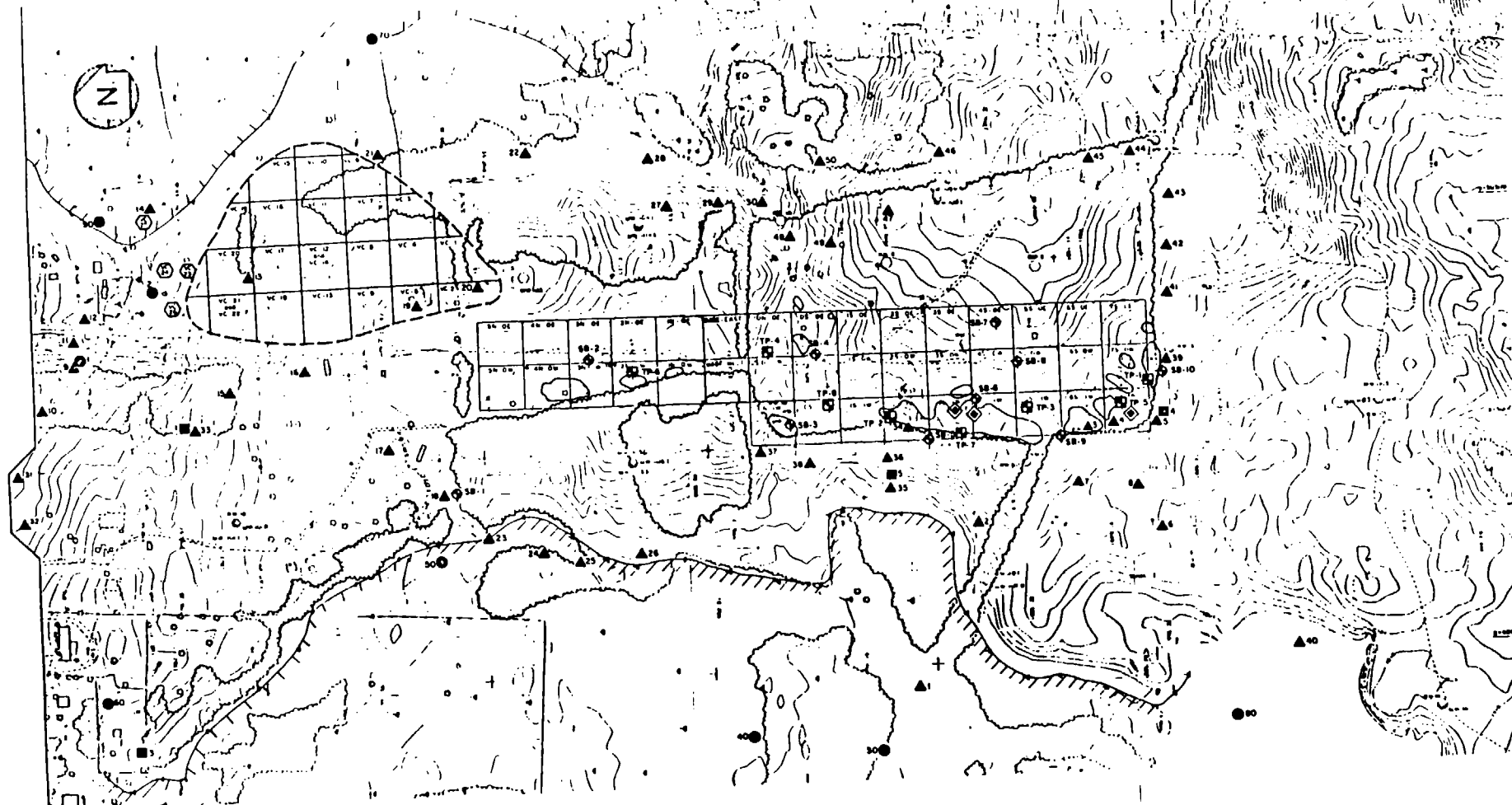


- GEOLOGIC DESCRIPTION**
- SAND FINE TO COARSE GRANULAR OUTWASH DEPOSIT, FINE-SIZED, WITH OCCASIONAL SILT OR GRAVEL LENSES
 - SILT HIGHLY STRATIFIED AND BEDDED, THE LAMINATIONS OF SILTY SILT AND SILTY SAND WITH SOME SAND ACCRETIONS
 - CLAY SANDY SILT TO CLAY, SPARSE LAMINATE BEDDING, COMBINATION OF CLAY AND SILTY CLAY
 - TILL SANDS RECORDED AND REPRESENTED BY SPARSE CONTACT CLAYS AND SILTS WITH COARSE SAND AND GRAVEL

VERTICAL SCALE 1:1
HORIZONTAL SCALE 1:200

FIGURE 8
VERTICAL DISTRIBUTION OF
TOTAL VOLATILE ORGANIC CHEMICALS IN SOILS
AND GROUNDWATER AT PROFILES D-D' AND E-E'
ROSE TOWNSHIP-DEMODO ROAD SITE

EC.JORDAN CO.



LEGEND

PHASE 2 SITE INVESTIGATION

- ▲ SURFACE SOIL & SEDIMENT SAMPLE LOCATION
- SEEP SAMPLE LOCATION
- SURFACE WATER SAMPLE LOCATION
- ⚡ SHALLOW BORING LOCATION
- ⊕ DRUM EXCAVATION LOCATION
- ⊞ COMPOSITE SOIL SAMPLING GRID
- ⊙ SAMPLED SHOULDER MOUND
- MARSH BOUNDARY

TAB 18 SITE INVESTIGATION

- ⊞ INVESTIGATION AREA
- ⊞ COMPOSITE SOIL SAMPLING GRID
- ⊞ SURFACE SOIL GRAB SAMPLE
- ⊞ TEST PIT LOCATION

SOIL MAP PREPARED FROM A SITE SURVEY
 COMPLETED BY THE STATE OF MICHIGAN
 DEPT. OF NATURAL RESOURCES IN 1988
 FOR USE BY E.C. JORDAN CO.

1:50,000
 1" = 1000'

FIGURE 9
SURFICIAL SAMPLE LOCATIONS
 ROSE TOWNSHIP-DEMODE ROAD SITE
 EC.JORDANCO

b. Contamination

A total of 49 monitoring wells has been installed onsite (Figure 4). Data from 126 ground water samples (including blanks) taken during two sampling episodes are shown in Tables 1 through 4. Manganese, lead, iron, and zinc were consistently detected in the samples (Tables 1 and 2). Barium was found in later samples (Table 2). Aluminum was also detected, but generally did not exceed the blank values. Copper, mercury, and arsenic were occasionally found in the samples.

Lead exceeded its Maximum Contaminant Level³ (MCL) at three well locations in the first round of sampling (RW-7, MW-102I, and MW-108D) and at one well (RW-7) during the second round (Tables 1 and 2). Arsenic exceeded its MCL in one well in the second round of sampling (MW-106D).

The levels of zinc, iron, and manganese exceed only the secondary (aesthetic) standards for drinking water. The zinc and iron may be derived from the galvanized well casing while the manganese may be naturally occurring. Barium and copper levels do not exceed their MCLs. Mercury levels approximate those of blank values, and thus pose no threat.

No metal exceeded its MCL in domestic well samples.

Two ground water plumes containing organic chemicals exist at the Rose site. The northern plume consists mainly of vinyl chloride. The southwestern plume contains toluene, xylene, vinyl chloride, chlorobenzene, benzene, naphthalene, 1,1,1-trichloroethylene, and 1,1-dichloroethane, as well as other hydrocarbons. The relative distribution of volatile organic chemicals in the ground water is shown in Figure 6.

Two northern plume wells, MW-102I and DNR-7, are contaminated with vinyl chloride, as shown in Tables 3 and 4. Southwest plume well data are also shown in Tables 3 and 4. Figures 7 and 8 show the plumes in cross-section. No organic chemicals were detected in domestic well samples.

2. Soils

Soil sampling at the site consisted of five separate activities (Figure 9):

³A Maximum Contaminant Level is a promulgated drinking water standard under the Safe Drinking Water Act. MCLs are based upon consideration of the adverse health effects of contaminants and are set as close to Maximum Contaminant Level Goals (MCLGs) as technically feasible. MCLGs are levels at which the contaminants pose absolutely no risk.

- ° A system of 100 ft by 100 ft grids was located in the southwestern site area and a total of 39 composite samples were collected. (These grids were located in areas of former waste handling activities.)
- ° A total of eight composite and 42 grab samples of surface soils and sediments was collected in selected site areas and in the east and west marshes nearby.
- ° A total of 77 subsurface soil samples was analyzed from 10 shallow borings (hollow-stem auger) in the southwestern area of the site. Borings were placed on the basis of the location of former waste handling activities and ongoing RI activities.
- ° Forty-one samples from seven test pits were analyzed for organic and metals contamination. Locations were selected on the basis of geophysical investigations performed in 1984.
- ° A total of 20 composite surface samples was collected from a 100 ft by 100 ft grid located in the area of MW-102I (northern plume).

Results of national, site specific background, and site specific contaminated soil samples are summarized in Table 5. Metal parameters found to exceed background levels on a consistent basis are lead and zinc. Metals found to occasionally exceed background levels are arsenic, antimony, barium, cobalt, chromium, selenium, silver, and tin. The distribution of lead correlates with that of other metals, therefore, lead alone has been used in the discussion of metals contamination. Figure 10 depicts the distribution of lead in surface soils as determined by the sampling efforts.

High metal values were detected primarily in the southwestern portion of the site in the area where waste dumping or staging operations are known to have occurred. Two widely separated grid sections have lead concentrations greater than 1000 mg/kg. Two grab samples and ten grid sections have lead concentrations greater than 100 mg/kg (Figure 10).

Subsurface soil analyses for metals have indicated that (metal) contamination derived from surface dumping of wastes has not undergone significant transport to the subsurface. Within the upper one to four feet of soil, lead concentrations dropped below 50 mg/kg. Very few anomalous levels of metals were detected in the surface grid sampling area in the vicinity of MW-102.

The surface soil distribution of PCBs, shown in Figure 11, is similar to that of metals (compare to Figure 10). PCB concentrations greater than 10 mg/kg were found in nine southwestern sampling grids. Three of the nine grids have PCBs in excess of 50 mg/kg. Three test pits (#1,3,5) showed PCBs in excess of 50 mg/kg, while levels of PCBs in shallow borings were low. With the exception of one sample, no PCBs were detected from the surface soil grid around MW-102. Test pit data are shown in Table 6.

TABLE 5
ELEMENT COMPOSITION OF SOILS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
ROSE TOWNSHIP-DEMONE ROAD SITE, MICHIGAN

ELEMENT	BACKGROUND CONCENTRATIONS OF METALS IN U.S. SOILS ¹ , (mg/kg)		BACKGROUND LEVELS IN SOILS AT THE ROSE TOWNSHIP SITE (mg/kg) ⁴		MAXIMUM CONCENTRATION OF METALS IN SURFACE AND SUBSURFACE SAMPLES AT ROSE TOWNSHIP SITE (mg/kg)		
	RANGE	MEDIAN	RANGE	MEAN	SURFACE ⁵	SUBSURFACE ⁶	
Aluminum	Al	70-100,000	66,000	0-7455	4246.2	9765	18,000
Antimony	Sb	0.2-10 ³	1	---	0	6.5	62
Arsenic	As	1-50 ²	5	1.0-13.5	3.5	148	8.6
Barium	Ba	15-5,000 ²	554	18-87	42	3010	82
Beryllium	Be	0.01-40	6	0-1.0	0.44	1.0	ND
Cadmium	Cd	0.01-7	0.06	0-0.1	0.13	8.3	8.2
Chromium	Cr	1-15,000 ²	53	4-11.5	7.7	510	107
Cobalt	Co	<3-70	10	0-6.5	3.5	148	7.8
Copper	Cu	<1-300	25	4-27.5	12.3	22,045	109
Iron	Fe	100-100,000	25,000	2854-13,265	6603	31,900	56,300
Lead	Pb	2-200 ²	10	4-15	9.5	3200	1300
Manganese	Mn	<1-7,000	560	21.5-1179	313.6	1532	656
Mercury	Hg	0.01-4.6	0.112	0-0.1	0.02	0.19	.45
Nickel	Ni	<5-70	20	2.8-13	6.8	31	106
Selenium	Se	0.1-2 ²	0.3	0-0.1	0.1	1.9	6.5
Silver	Ag	0.01-5 ²	0.05	0-0.7	0.1	22	8.2
Thallium	Tl	0.1-0.8 ³	0.2	---	0	0.9	ND
Tin	Sn	2-200 ²	10	0-6.0	1.0	62	35
Vanadium	V	<7-500	76	0-16.5	7.2	32	41
Zinc	Zn	<25-2,000	54	12.5-35	23.8	2323	7630

Notes

¹Source for all data except those marked: Ure, A.M. and M.L. Berrow. 1982. The Element Constituents of Soils in Environmental Chemistry. H.J.M. Bowen, ed. 2:94-204.

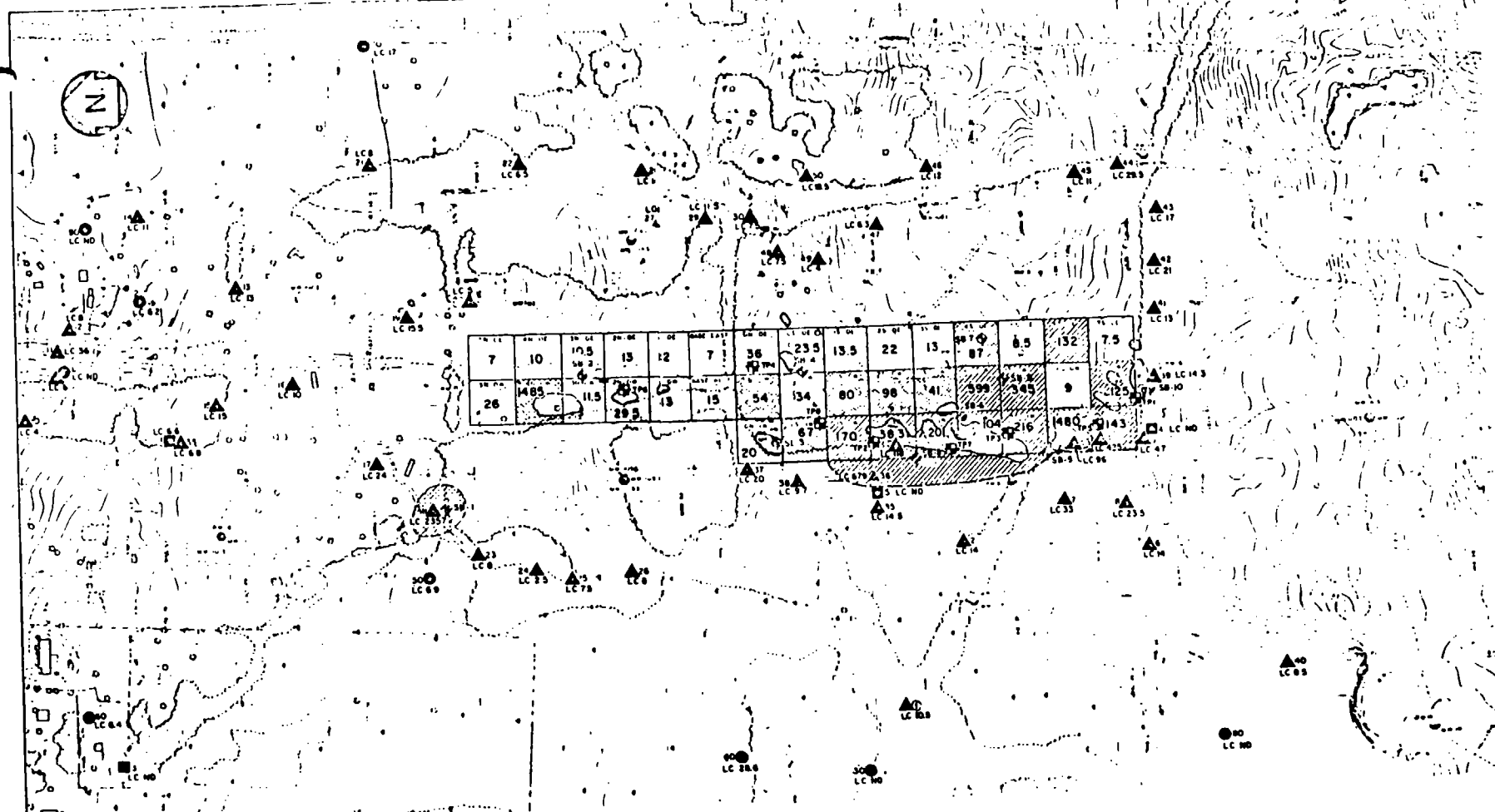
²Lindsay, Willard L. 1979. Chemical Equilibria in Soils, Wiley Interscience. New York. pp. 7-8.

³Bowen, H.J.M. 1982. Environmental Chemistry. The Royal Soc. of Chemistry. London. pp. 203-204.

⁴Based on statistical analysis of the following surface soil grab sample population: SRDA-10, 13, 14, 15, 16, 20, 21, 22, 27, 28, 33, 40, 46.

⁵Samples collected from depths <10 feet.

⁶Samples collected from depths >10 feet.



7	10	10.5	15	12	7	36	23.5	13.5	22	13	87	8.5	132	7.5
26	148.5	11.5	29.5	13	15	54	134	80	98	41	399	345	9	125
						20	67	170	38.3	201	10	216	180	143

LEGEND

- ▲ SURFACE SOIL & SEDIMENT SAMPLE LOCATION
- DEEP SAMPLE LOCATION
- SURFACE WATER SAMPLE LOCATION
- ⚡ SHALLOW BORING LOCATION
- ⊖ SHIM EXCAVATION LOCATION
- Ⓜ TEST PIT LOCATION

LEAD CONCENTRATION

- > 1000 mg/kg
- 100 - 999 mg/kg
- 30 - 99 mg/kg
- < 30 mg/kg
- - - VISIBLE EXTENT OF PAINT BLINDS CONTAMINATION
- LEAD CONCENTRATION FOR COMPOSITE SOIL GRAB SAMPLES COLLECTED AT FOUR LOCATIONS WITHIN THE GRID BLOCK AREA (mg/kg)
- LEAD CONCENTRATION FOR SOIL GRAB SAMPLES COLLECTED AT A SURFACE SOIL OR SEDIMENT LOCATION OUTSIDE THE GRID AREA (mg/kg)

NOTES

1. LEAD CONCENTRATIONS IN SOIL ARE EXPRESSED IN MG/KG DRY WEIGHT
2. SOIL SAMPLES WERE COLLECTED BETWEEN JUNE AND NOVEMBER 1984
3. LEAD CONCENTRATIONS SHOWN FOR SOIL SAMPLES WERE COLLECTED 4 TO 8 INCHES BELOW GROUND SURFACE
4. LEAD CONCENTRATION IN SURFACE WATER AND DEEP SAMPLES ARE IN MG/L
5. ND - NO DETECTION

DATE AND PREPARATION OF THIS SURVEY
 COMPLETED BY THE TARRANT CONSULTANTS
 10/1/84

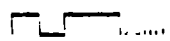


FIGURE 10
LEAD CONCENTRATIONS
IN SURFACE SOIL
ROSE TOWNSHIP-DEMODOE ROAD SITE
 E.C. JORDAN CO.

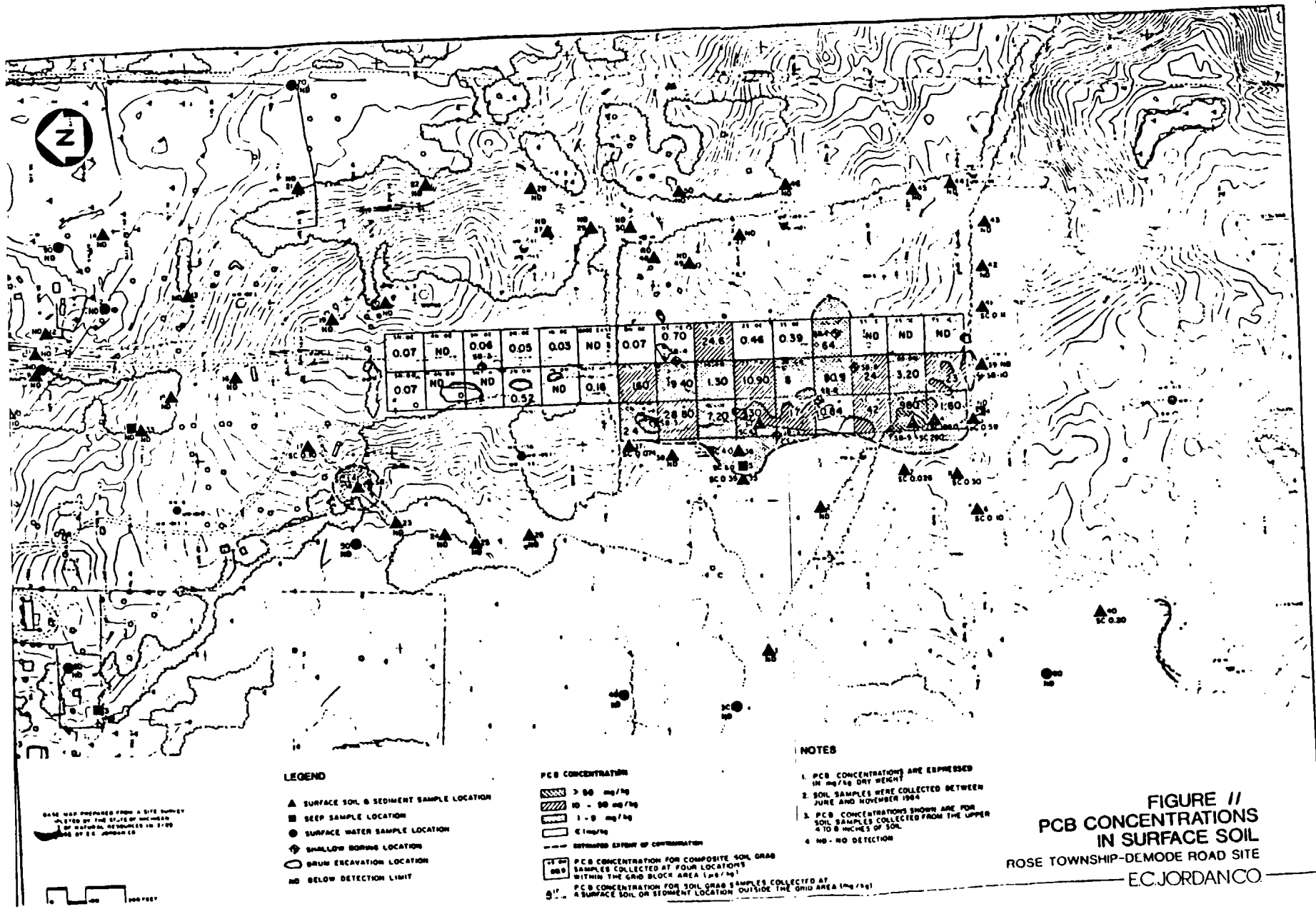


FIGURE //
PCB CONCENTRATIONS
IN SURFACE SOIL
 ROSE TOWNSHIP-DEMODE ROAD SITE
 E.C. JORDAN CO.

Many surface soil samples showed no detectable levels of volatile organic compounds (VOCs). Methylene chloride was present in most samples, but it is suspected that it may be a laboratory contaminant. Phthalates were present at levels less than 10 mg/kg, with the exception of three samples. Isolated low levels (<10 mg/kg) of pentachlorophenol, benzoic acid, and 4-methyl phenol were also found.

VOCs and semivolatile organic compounds (SVOCs) were detected in shallow soil borings and in test pit samples, especially in areas of PCB and lead contamination. The most common contaminants (and maximum levels obtained) in soils are toluene (4700 mg/kg), ethylbenzene (430 mg/kg), chlorobenzene (570 mg/kg), xylene (1400 mg/kg), naphthalene (31 mg/kg), pentachlorophenol (32 mg/kg), acetone (76 mg/kg), and phthalates (total) (91 mg/kg). In general, concentrations decreased with depth. However, high levels (>1000 ug/kg) of total organics were found as deep as 26 feet. A three-dimensional block diagram depicting VOC concentrations in the southwestern gridded area of the site is presented in Figure 12. Concentrations of SVOCs, although similar in distribution to the VOCs, are generally one order of magnitude less (no figure shown, see Table 7 for soils analyses).

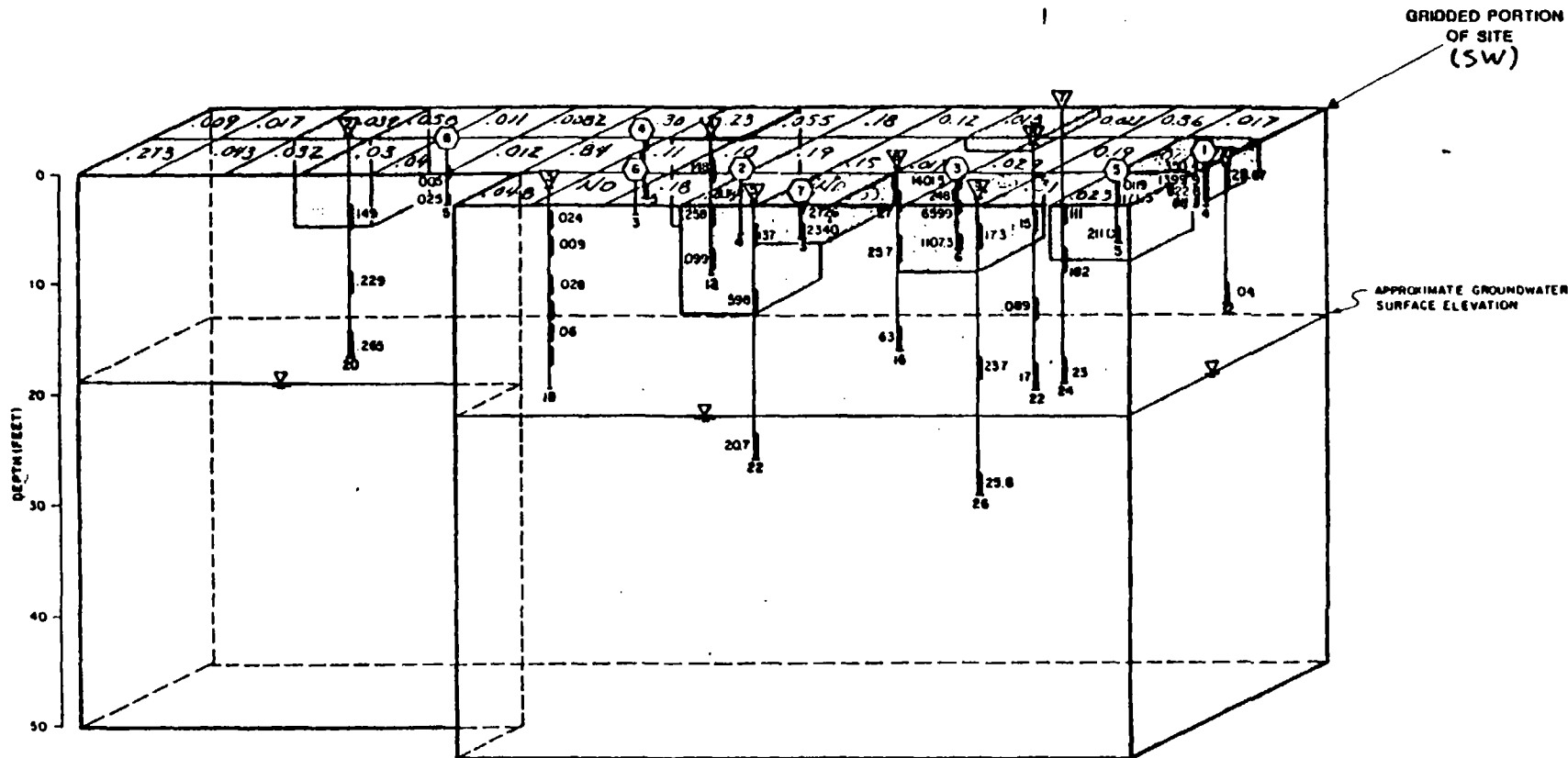
3. Wetlands

Two contiguous wetland areas that have been affected by contamination from site dumping are present at the Rose site (Figure 1). The west marsh, lying about 150 feet from the main dumping area, is approximately 140 acres in area. The east marsh, about 600 feet from the main dumping area, is about 100 acres in area. The marshes are part of extensive wetlands which drain to Buckhorn Lake.

To evaluate the impact and migration of site-derived chemicals on the adjacent marshes, a total of nine surface water samples were collected from both the east and west marsh in addition to a small stagnant pond about 1/2 mile west of the site. Sediment and seep samples were collected from drainage pathways and discharge zones located along the flanks of the site. Results of chemical analyses are plotted in Figures 10 and 11 (which show lead and PCB values). The surface water analyses indicate that lead is found uniformly throughout the wetlands in concentrations of five to six ug/l. Although these samples slightly exceed the chronic Ambient Water Quality Criteria⁴ (AWQC) of 3.2 ug/l, there is no apparent correlation between site drainages and elevated lead levels. One sample from the west marsh had a value of 28.6 ug/l while one sample from the east marsh showed 17 ug/l. These sample points were not located in primary site surface water drainages and therefore cannot be directly attributed to site sources.

The five seep samples were collected from discharges along the northern and western slopes of the site. Two samples, both of which were from seeps discharging into the west marsh, contained trace amounts of organic chemicals. PCBs were detected in SE-5 (Figure 11) at a concentration of 2.6 ug/l. SE-3 contained bis(2-ethylhexyl) phthalate at 100

⁴Ambient Water Quality Criteria, established under the Clean Water Act, are developed for protection of aquatic life.



LEGEND

- SHALLOW BORING NUMBER
- SAMPLE INTERVAL AND CONCENTRATION (mg/kg)
- TOTAL DEPTH OF BORING (FT)
- TEST PIT NUMBER
- BOTTOM OF TEST PIT

NOTE: FIGURE DEPICTS CONCENTRATION IN SOILS AND ASSUMES DISTRIBUTION IS UNIFORM THROUGHOUT GRID COMPONENT. ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN

CONCENTRATION OF VOLATILE ORGANIC CHEMICALS IN SURFACE SOILS (mg/kg)
 CONCENTRATIONS IN EXCESS OF 1000 mg/kg
 CONCENTRATIONS IN EXCESS OF 100 mg/kg



FIGURE 12
VOLATILE ORGANICS IN SOILS

ug/l. No elevated levels of inorganic chemicals were detected in the seep samples. The AWQCs for PCBs and bis(2-ethylehexyl) phthalate are 0.014 ug/l and 3 ug/l, respectively.

Eight sediment samples were collected from the west and east marsh areas and an additional ten samples were collected from drainage pathways related to site source areas. Sediments in the upper portions of the western drainage pathways contained low level concentrations of phthalates (<2.5 mg/l) and trace amounts of PCBs (<0.35 mg/kg). One marsh sediment sample (SE-40, Figure 11) contained PCBs at 0.2 mg/kg. No other organic chemicals were detected in the sediment samples.

III(a). Risks to Receptors

The Endangerment Assessment performed on the Rose site divided the affected media into separate categories to address the risk to human health and the environment in an orderly fashion. The following site areas were addressed:

- A. Northern Ground Water Plume
- B. Southwestern Ground Water Plume
- C. Northern Soil Sampling Area
- D. Southwest Soil Sampling Area
- E. Offsite Marshes

Since the number of chemicals (especially organics) onsite was so large as to make a risk assessment unwieldy, a screening process was performed to narrow the list to the most important chemicals of concern. The *Superfund Public Health Evaluation Manual* (1986) was used in this process. Chemicals selected were evaluated on the relative importance of inherent toxicity, measured concentrations onsite, physical and chemical parameters related to environmental mobility, and the persistence of each chemical. Table 8 lists the pared down list of chemicals of concern for the Rose site.

Potential risks from contaminated sediments and ground waters from the Rose site are based upon the assumption that the site would be used in the future for residential development. Two scenarios for risk assessment were used. These are the "worst-case" and "most-probable" situations. Worst-case assumes contact with the highest concentration of a given chemical found onsite. Most-probable assumes contact with an average concentration of a given chemical onsite. An average concentration level is calculated for a given chemical by totaling up the reported concentrations in the samples taken from a given area and dividing by the total number of samples taken in that area.

Incremental cancer risks for carcinogens and summary hazard risks for non-carcinogens were calculated for the chemicals of concern. Excess lifetime cancer risk is defined as the incremental increase in the probability of getting cancer compared to the probability if no exposure occurred. For example, a 10^{-6} excess lifetime cancer risk represents the exposure that could increase the incidence of cancer by one case per million people exposed. The practicable target level for cleanup of carcinogens is an excess lifetime cancer incremental increase of 10^{-4} to 10^{-7} . Region V policy is to attempt to clean up to a 10^{-6} incremental cancer risk level where technically feasible.

TABLE 8

CHEMICALS OF CONCERN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
ROSE TOWNSHIP - DEMODE ROAD SITE, MICHIGAN

VOLATILE ORGANIC COMPOUNDS (VOCs)

Aromatics

Benzene
Chlorobenzene
Toluene

Ketones

2-Butanone
Isophorone

Chlorinated Aliphatics

Methylene chloride
1,1,1-Trichloroethane
Trichloroethylene
Vinyl Chloride

SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs)

Phthalate Esters

Bis(2-ethylhexyl)phthalate

Phenols and Acid Extractables

Pentachlorophenol

PAHs

Fluoranthene
Naphthalene

PCBs AND PESTICIDES

PCBs

INORGANICS

Arsenic
Lead

1.87.107T
0007.0.0

Non-carcinogenic risk values are determined by dividing estimated body dose levels for a given chemical by the relevant Acceptable Chronic Daily Intake criterion for the chemical. The resulting ratios are summed to determine the hazard index, or, the total health hazard expected from exposure to more than a single chemical of concern. Generally, if the risk ratio is less than one, an insignificant risk is presented by the chemical in question. However, more specific data need to be considered before dismissing any given hazard indices as insignificant.

In general, the routes of exposure identified for the various site media are as follows:

Ground Water. Exposure to chemical contaminants in ground water may occur through dermal absorption, through ingestion as drinking water, and through inhalation of VOCs while showering or bathing. Dermal absorption and inhalation of chemicals have not been assessed in the scientific literature adequately enough to estimate body dose levels for these methods of exposure. However, when compared to the total body dose of potential ingestion of ground water, the contribution is estimated to be small for dermal absorption and inhalation. Accordingly, only "worst-case" and "most-probable" scenarios for ingestion of contaminated ground water were developed to assess exposure risks.

Soils. Exposure to contaminated soils onsite may lead to body dose levels derived from dermal absorption through skin contact with the soils, and by ingestion of the contaminated soils. However, ingestion was discounted in relation to soil contact hazards, since ingestion of soil usually occurs during early childhood. It was assumed that very young children (less than three years old) would not have access to contaminated soil areas due to adult supervision. Data are lacking regarding soil ingestion among adults (although cobalt has been suggested as another chemical of concern due to ingestion hazards at the low concentrations which are found onsite).

Marsh soils and surface waters. Similar exposure hazards exist in the marshes, since access is unrestricted and low levels of contaminants were found in marsh soils. Only exposure due to dermal absorption of soil contaminants was estimated, since insufficient information was available to quantitatively assess the surface water exposure risks. No biological samples were examined for contaminant concentrations. Thus, risks from the consumption of wildlife could not be calculated.

Air. There are two routes of possible exposure through the air: (1) inhalation of fugitive dust, and (2) inhalation of volatile contaminants. Presently, due to the presence of existing vegetation and lack of excavation activity onsite, fugitive dust is predicted to be nearly absent and thus exposure is minimal. The nearest homes downgradient of the prevailing winds are one mile away and surface volatilization of chemicals is expected to be low. Thus, inhalation exposure is expected to be minimal also. Future site response activities may enhance both of these exposure routes and monitoring will need to be implemented accordingly. These potential effects are evaluated in the developed remedial alternatives discussion later in this document.

- A. Northern Ground Water Plume. Six chemicals of concern were detected in the ground water plume located in the northern area of the site. Although there is no exposure to the water at this time, these chemicals presently pose potential risks. Thus, hypothetical exposure⁵ was assumed and a risk assessment was performed using the parameters shown in Table 9. Under realistic lifetime worst-case conditions, lead would pose a significant non-carcinogenic risk. Incremental cancer risks exceed 10^{-4} for both most-probable and realistic worstcase conditions. At this time, virtually all the summary incremental cancer risks for ingestion of this ground water is due to vinyl chloride. Table 10 summarizes the calculated risk values for the northern plume chemicals of concern.

Future potential risk was estimated for the northern plume by modelling underground conditions and predicting what chemical concentrations would be present at the time when the plume reached Demode Road (i.e., offsite, in an estimated 2 to 250 years). Table 11 presents the parameters used to estimate the future potential risks. Although most chemicals have been diluted to negligible levels, vinyl chloride would still be present in significant quantity to exceed the 10^{-4} to 10^{-7} risk range for both the most-probable and realistic worst-case conditions, at a level about one order of magnitude lower than under present conditions. Thus, ingestion of this ground water could continue to pose a health hazard in the future. For additional discussion of the ground water in the northern plume, see the MDNR comments in the attached Responsiveness Summary.

- B. Southwestern Ground Water Plume.

Fourteen chemicals of concern have been detected in the southwestern ground water plume. As with the northern plume there is no current exposure to this water. Thus, hypothetical exposure⁵ was assumed to estimate the risk in ingesting this water. Again, Table 9 presents the parameters used in performing the risk assessment. Under present conditions, total non-carcinogenic summary hazard risk ranges from 2.58 to 103 which indicates that further analyses of the effects of each non-carcinogenic compound is warranted. Chlorobenzene poses the greatest single noncarcinogenic risk under both most-probable and worst-case conditions. The summary incremental cancer risks for all carcinogens is extremely high, ranging from 1×10^{-2} to 7×10^{-1} . The highest risks are posed by PCBs, vinyl chloride, and arsenic under the conditions used.

Under modelled future conditions (when this plume reaches Demode Road, i.e., offsite, in an estimated 80 to 270 years), the noncarcinogenic risk levels are less than 1.0. Incremental cancer risks still exceed the target range (10^{-4} to 10^{-7}) for vinyl chloride under most probable conditions, and for vinyl chloride and arsenic under worst-case conditions (Table 12).

⁵Hypothetical exposure assumes that a drinking water well would be installed in the present day center of either plume.

Table 9
 Lifetime Ground Water Ingestion Exposure
 (Present Conditions)
 Rose Township Site

Chemical	Most-Probable Case Concentration (ug/l)		Worst-Case Exposure Concentration (ug/l)	
	Southwest Plume	North Plume	Southwest Plume	North Plume
Benzene	4J	-	170	-
Chlorobenzene	94J	0.8J	3500	10J
Isophorone	2	-	44	-
Methylene Chloride	9J	0.2	500	3
Toluene	667	1.4J	52000	10J
1,1,1 trichloro- ethane	527J	-	2000	-
Trichloroethylene	52J	-	1200	-
Vinyl Chloride	22	83J	1400	380
Bis(2-ethylhexyl) phthalate	11	8J	470	65
Naphthalene	5	-	210	-
Pentachlorophenol	0.04	-	3	-
PCBs	62	-	4800	-
Arsenic	2	-	124	-
Lead	7	7	150	44

Other Parameters

Years of Exposure:	Lifetime	Lifetime
Average Weight over Exposure Period:	70 kg	70 kg
Amount of Water Consumed:	2 l/day	2 l/day

J = Approximate
 - = Not detected

Table 10
 Summary of Risk Characterization
 (Present Conditions)
 Rose Township Site

Noncarcinogenic Effects

Medium	Exposure Route	Exposed Population	Significant Chemicals	Risk Ratio		Summary Hazard Index	
				Most Probable	Worst Case	Most Probable	Worst Case
Southwestern Soils	Direct Contact	Child	Lead (95%)	—	21.2	0.25	22.2
		Adult	Lead (95%)	—	14.1	0.04	14.8
Northern Soils	Direct Contact	Child	Lead (100%)	—	39.7	0.1	39.8
		Adult	Lead (95%)	—	21.2	0.03	26.5
Southwestern Ground Water Plume	Ingestion	Child	Chlorobenzene	1.58	58.8	2.58	103.4
			Toluene	—	26		
		Adult	1,1,1-trichloroethane	—	10		
			Naphthalene	—	1.1		
			Lead	—	7.1		
Northern Ground Water Plume	Ingestion	Child	Lead (88%)	—	2.1	0.39	2.39
		Adult	Lead (88%)	—	2.1	0.39	2.39

— = Less than 0.1

Other Chemicals, Exposure Routes show no significant risk.

Numbers in parentheses represent percentage of total noncarcinogenic risk contributed by specific chemicals.

Table 10
 Summary of Risk Characterization
 (Present Conditions)
 Rose Township Site

Carcinogenic Effects

Medium	Exposure Route	Exposed Population	Significant Chemicals	Summary Hazard Index	
				Most Probable	Worst Case
Southwestern Soils	Direct Contact	Child	PCBs (77%) Arsenic (23%)	3×10^{-7}	4×10^{-4}
		Adult	PCBs (77%) Arsenic (23%)	2×10^{-8}	3×10^{-4}
Northern Soils	Direct Contact	Child	Arsenic (100%)	2×10^{-7}	2×10^{-4}
		Adult	Arsenic (100%)	1×10^{-9}	2×10^{-4}
Northern Ground Water Plume	Ingestion	Child	Vinyl Chloride (100%)	5×10^{-3}	5×10^{-2}
		Adult	Vinyl Chloride (100%)	5×10^{-3}	5×10^{-2}
Southwestern Ground Water Plume	Ingestion	Child	Vinyl Chloride (14%) Arsenic (10%) PCBs (75%)	1×10^{-2}	7×10^{-1}
		Adult	Vinyl Chloride (14%) Arsenic (10%) PCBs (75%)	1×10^{-2}	7×10^{-1}
East Marsh Sediments		Child	Arsenic (100%)	4×10^{-7}	3×10^{-5}
		Adult	Arsenic (100%)	5×10^{-8}	3×10^{-5}
West Marsh Sediments		Child	Arsenic (100%)	1×10^{-7}	1×10^{-5}
		Adult	Arsenic (100%)	1×10^{-8}	1×10^{-5}

Table 11
 Lifetime Ground Water Ingestion Exposure
 (Future Conditions)
 Rose Township Site

Chemical	Most-Probable Case Concentration (ug/l)		Worst-Case Exposure Concentration (ug/l)	
	Southwest Plume	North Plume	Southwest Plume	North Plume
Benzene	0.2	-	2	-
Chlorobenzene	5.8	-	58	-
Isophorone	1.9	-	19	-
Methylene Chloride	**	-	**	-
Toluene	81	-	810	-
1,1,1 trichloro-ethane	19	-	190	-
Trichloroethylene	10	-	90	-
Vinyl Chloride	6	15	60	60
Di(2-ethylhexyl) phthalate	1.1	-	11	-
Naphthalene	0.38	-	3	-
Arsenic	0.07	-	0.7	-
Lead	2	-	20	-

Other Parameters

Years of Exposure:	Lifetime	Lifetime
Average Weight over Exposure Period:	70 kg	70 kg
Amount of Water Consumed:	2 l/day	2 l/day
Elapsed time:	270 years	270 years

J = Approximate

- = Not detected

** = Inconsistent plume: could not be accurately calculated

Table 12
 Summary of Risk Characterization
 (Future Conditions)
 Rose Township Site

Noncarcinogenic Effects

Medium	Exposure Route	Exposed Population	Significant Chemicals	Risk Ratio		Summary Hazard Index	
				Most Probable	Worst Case	Most Probable	Worst Case
Southwestern Soils	Direct Contact	Child	Chlorobenzene	—	14.4	0.1	24.0
			Toluene	—	3.53		
			Lead	—	5.47		
	Adult	Chlorobenzene	—	9.58	0.02	16.0	
			Toluene	—			2.35
			Lead	—			3.65

— = Less than 0.1

Other Chemicals. Exposure Routes show no significant risk

Table 12
 Summary of Risk Characterization
 (Future Conditions)
 Rose Township Site

Carcinogenic Effects

Medium	Exposure Route	Exposed Population	Significant Chemicals	Summary Hazard Index	
				Most Probable	worst Case
Southwestern Soils	Direct Contact	Child	PCBs (54%) Arsenic (46%)	1×10^{-7}	5×10^{-5}
		Adult	PCBs (54%) Arsenic (46%)	8×10^{-9}	3×10^{-5}
Northern Soils	Direct Contact	Child	Arsenic (100%)	4×10^{-8}	1×10^{-5}
		Adult	Arsenic (100%)	4×10^{-9}	7×10^{-6}
Northern Ground Water Plume	Ingestion	Child	Vinyl Chloride (100%)	1×10^{-3}	4×10^{-3}
		Adult	Vinyl Chloride (100%)	1×10^{-3}	4×10^{-3}
Southwestern Ground Water Plume	Ingestion	Child	Vinyl Chloride (91%) Arsenic (7%) Benzene (1%) TCE (1%)	4×10^{-4}	4×10^{-3}
		Adult	Vinyl Chloride (91%) Arsenic (7%) Benzene (1%) TCE (1%)	4×10^{-4}	4×10^{-3}

Thus, if the waters in either plume were to be used as a source of drinking water and consumed for a lifetime, unacceptable ($>10^{-4}$) cancer risk to the exposed populace would be posed under present conditions. Under modelled future conditions, with no remedial action undertaken, both plumes would continue to pose an unacceptable cancer risk. Although risks would be at a lower level than the present, they would be spread over a larger area.

C. Northern Soil Grid.

Of the seven chemicals of concern detected in the northern soils, only lead and arsenic pose unacceptable risks, and then only under worst-case conditions. Table 13 shows the parameters evaluated for the northern and southwestern soils. Table 10 presents the risks calculated for the indicator chemicals. Risk from direct contact with surface and sub-surface soils is low in the northern area due to the scattered nature of metallic contamination in this area.

D. Southwestern Soil Grid.

Twelve chemicals of concern are present in these soils. Under present realistic worst-case conditions, an unacceptable risk would be posed by dermal contact with lead. Incremental cancer risks would be within or exceed the target (10^{-4} to 10^{-7}) range for PCBs and arsenic under both most-probable and realistic worst-case conditions. Subsurface risks were calculated under the assumption that the soils would be exposed (by future erosion or excavation) with the absence of any site remediation. Under realistic worst-case conditions, significant risks would be posed by dermal contact with lead, chlorobenzene, and toluene. Incremental cancer risks would be within the target range for PCBs and arsenic. Thus, present risk is much higher than future risks, since contamination by lead, PCBs, and arsenic is much greater in surface soils.

The risk estimates presented above only consider dermal contact with the soils. Again, ingestion of soils was considered as an additional exposure route. However, the risk levels were estimated to be one to two orders of magnitude lower than dermal contact risks and were deemed insignificant.

The southwestern soils also present a continual threat to ground water contamination from the organic compounds above the water table. The presence of the organic chemicals would increase the duration of remediation of the ground water, for they would be a continual source of chemicals to the ground water plume during infiltration into the water table. If the present situation is allowed to persist, it is estimated that the VOCs would continue to significantly degrade the aquifer up to 600 years hence. The design phase of this project will better determine the duration and elimination of the organic contamination threat.

E. Marsh Sediments/Surface Water.

Risks calculated for ingestion of surface waters were very low. Sediments in the west marsh contained methylene chloride, PCBs, arsenic, lead, and pentachlorophenol as chemicals of concern. The

Table 13
 Direct Contact Exposure - Soils
 (0-2 feet, Present Conditions)
 Rose Township Site

Parameter	Most Probable Case		Worst Case Exposure	
	Child	Adult	Child	Adult
Frequency of Contact: (days/year)	12	2	24	8
Years of Exposure:	5	10	10	30
Absorption Fraction:				
VOCs	10%	10%	50%	50%
SVOCs, PCBs, and Inorganics	1%	1%	10%	10%
Average Weight over Exposure Period:	35 kg	70 kg	35 kg	70 kg
Amount of soil contacted (g/day)	2	1	3	4
Chemical contacted	Average Concentration (ug/kg)		Maximum Concentration (ug/kg)	
	Northern Site Area	Southwestern Site Area	Northern Site Area	Southwestern Site Area
Chlorobenzene	-	309	-	11,000
Isophorone	-	4J	-	330J
Methylene Chloride	15	62	110	840
Toluene	5	0.6J	90	36
1,1,1-trichloroethane	0.1	-	3	-
Trichloroethylene	-	1.0	-	71
Bis(2-ethylhexyl) phthalate	260J	10,077	2,000	618,700
Naphthalene	-	2,126J	-	81,000
Fluoranthene	-	30	-	2,400
Pentachlorocobenzil	-	124	-	8,200
PCBs	47	28,418	1,360	980,000
Arsenic	8,400	5,700	196,000	83,000
Lead (ppm)	101.1	150.2	2,778	1,485

J = Approximate
 - = Not Detected

Table 13 (continued)
 Direct Contact Exposure - Soils
 (2-20 feet, Future Conditions)
 Rose Township Site

Parameter	Most Probable Case		Worst Case Exposure	
	Child	Adult	Child	Adult
Frequency of Contact: (days/year)	12	2	24	8
Years of Exposure:	5	10	10	30
Absorption Fraction:				
VOCs	10%	10%	50%	50%
SVOCs, PCBs, and Inorganics	1%	1%	10%	10%
Average Weight over Exposure Period:	35 kg	70 kg	35 kg	70 kg
Amount of soil contacted (g/day)	2	1	3	4
Chemical contacted	Average Concentration (ug/kg)		Maximum Concentration (ug/kg)	
	Northern Site Area	Southwestern Site Area	Northern Site Area	Southwestern Site Area
2-butanone	-	7,835	-	130,000
Chlorobenzene	-	12,849J	-	570,000
Isophorone	-	156J	-	6,600
Methylene Chloride	-	250J	-	7,700J
Toluene	-	91,129J	-	4,700,000
1,1,1-trichloroethane	-	0.04	-	2
Trichloroethylene	-	333	-	10,000
Bis(2-ethylhexyl) phthalate	-	2,419J	-	76,000
Naphthalene	-	4,319J	-	67,000
Pentachlorophenol	-	624J	-	32,000
PCBs	-	5,176J	-	74,000
Arsenic	2,200	3,600	8,600	18,000
Lead	8,100	49,500	9,700	383,000

J = Approximate
 - = Not Detected

east marsh sediments showed methylene chloride, arsenic, lead, and bis (2-ethylhexyl) phthalate to be present. Risks associated with lead and pentachlorophenol were found to be insignificant under all of the hypothetical exposure routes in either marsh. Arsenic has an incremental cancer risk within the target level for both most-probable and realistic worst-case conditions in each marsh. The risk for PCBs is within the target range only for realistic worst-case exposure by a child in the west marsh. No calculated incremental cancer risks exceed the target range.

III(b). Risk to the Environment

Aquatic and terrestrial organisms onsite are potentially at risk of exposure to the hazardous chemicals present. In the wetlands, chronic AWQCs are exceeded for lead, chromium, and zinc. One sample exceeded the AWQC for PCBs:

<u>Chemical</u>	<u>AWQC</u>		<u>Maximum Level in Surface Water</u>	
	<u>Acute</u>	<u>Chronic</u>	<u>East Marsh</u>	<u>West Marsh</u>
Lead*	82 ug/l	3.2 ug/l	11.9 ug/l	28.6 ug/l
Chromium	16 ug/l	11 ug/l	15.4 ug/l	ND
Zinc	320 ug/l	47 ug/l	64.2 ug/l	ND
PCBs	2.0 ug/l	0.014 ug/l	ND	2.6 ug/l

ND = not detected

* = AWQC values assuming a hardness of 100 mg/l as CaCO₃

This information suggests that chronic (long-term) toxicity to fresh water organisms could be occurring in some sections of the marshes. (Some species are much more sensitive and some are much less sensitive to metals at the AWQC levels. Thus some chronic effects may or may not occur. No apparent toxicity effects were observed during the site visit by the biologist.)

Methylene chloride, a common laboratory contaminant, was the only VOC detected in wetland surface waters. Thus, either the processes of dilution, dispersion, and volatilization are presently reducing concentrations of VOCs in surface waters below levels which cause adverse effects to biota, or no VOCs are being discharged into the wetlands as yet. However, the southwestern ground water plume is advancing towards the west marsh and threatens to discharge VOCs into it at high concentrations. It is estimated that these effects will be negligible due to dilution, dispersion, biodegradation, sorption, and volatilization in the west marsh and no VOC toxicity should result.

Bioaccumulation effects on organisms are unknown. Although organisms may be exposed to low levels of PCBs, lead, arsenic, and barium in the marshes, the accompanying Bioconcentration Factors for each chemical are difficult to quantify. No apparent toxicity has been noted as yet, although no organisms were collected and tested for contamination. If contaminated soils are removed or treated during

any site remediation, additional chemical loading to the wetland would be eliminated and any current effects would thus be alleviated over time.

The presence of high surficial soil contamination in the site uplands (especially PCBs and lead) is a concern, as burrowing organisms will be exposed to contact hazards and, to a greater extent, invertebrates will be exposed to ingestion hazards. Further bioaccumulation up the food chain would thus result. Site soil remediation should eliminate additional exposure by onsite organisms, reducing environmental risks considerably.

IV. ENFORCEMENT

In October of 1982, seven potentially responsible parties (PRPs) were notified by U.S. EPA of their potential liability with respect to the Rose Site and of U.S. EPA's intent to undertake a RI/FS at the site. At that time, the PRPs were offered the opportunity to voluntarily undertake the RI/FS themselves. The offer was declined and U.S. EPA proceeded to undertake a Fund-financed RI/FS at Rose.

Following completion of the RI/FS, U.S. EPA issued special notice letters in June of 1987, to 29 PRPs identified at the Rose site. The letter notified the PRPs of their potential liability at the site and identified the preferred remedial alternative that had been proposed to remedy the site contamination. It also offered the PRPs the opportunity to voluntarily undertake the implementation of the remedy selected for the site. Pursuant to Section 122 of SARA, in an effort to facilitate an agreement with the PRPs, U.S. EPA agreed to delay any Fund-financed remedial action at the site for 60 days. If, during this 60 day period, U.S. EPA received from the PRPs a good faith offer to implement and conduct the remedial action selected for the site, it was further agreed that an additional 60 day delay in any Fund-financed remedial action would occur.

U.S. EPA held an informational meeting with the PRPs on July 17, 1987. At this meeting, attended by representatives of 11 PRPs and by State representatives, U.S. EPA explained the conditions and contaminants which exist at the site and also further explained the proposed remedial action selected for the site. U.S. EPA is currently engaged in negotiations with the PRPs, and a good faith offer is due from the PRPs by October 6, 1987.

V. COMMUNITY RELATIONS

The public comment period for the RI/FS commenced on June 29, 1987, and was due to end on July 29, 1987. However, the public comment period was extended to August 12, 1987, in response to public request (by the PRP committee) for additional time to submit comments.

A public meeting was held on July 1, 1987, to discuss the RI/FS and present the MDNR and EPA-proposed plan. During the public meeting, no opposition was raised against the proposed plan. With the exception of the PRPs, the public is supportive of the remedy. The attached Responsiveness Summary will detail any concerns raised during the public comment period.

VI. ALTERNATIVES EVALUATION

The Feasibility Study was initiated to evaluate appropriate remedial responses to the contamination at the Rose Site. The following areas have been identified as posing risks to human and environmental receptors on or near the site:

- ° Ground water plumes in the north and southwest areas of the site,
- ° Soil contamination in the southwest area and, to a limited extent, the north area, and
- ° drainage pathways to the wetlands.

a. Technologies Considered

A variety of technologies was identified to address each area of concern. The following (Table 14) is a listing of the considered remedial actions for the Rose site, and the initial evaluation which caused each alternative to be rejected or accepted for further consideration. Performance criteria, reliability factors, ease of constructability, and site applicability considerations were used to perform the initial screening.

Table 14
Identification of Potential Remedial Technologies

<u>SOILS</u>	<u>Technology</u>	<u>Description</u>	<u>Evaluation</u>
	Fencing	Chainlink to restrict site access.	Applicable. Easy to implement. Reduces contact hazards.
	Impermeable Cap	Liner to reduce infiltration, volatilization.	Applicable. Controls contact hazards. Source still remains.
	Land Treatment	Excavate soil and spread on surface to enhance volatilization and degradation.	Not applicable. Performance data not documented, PCBs not volatile. Increases inhalation hazards due to VOC exposure.
	Land Disposal	Excavate waste and place in onsite or offsite approved landfill.	Applicable, though not a permanent remedy. Land Ban requirements must be considered.

Table 14, (Cont'd)
Identification of Potential Remedial Technologies

<u>SOILS</u>	<u>Technology</u>	<u>Description</u>	<u>Acceptability</u>
	Soil Cover	Soil plus vegetation over current soil layers.	Applicable. Controls direct contact hazards. Source still remains.
	Solidification/ Fixation	Incorporates waste into solid form to reduce rate of leaching or volatilization.	Not applicable for VOCs. May be applicable for metals in incinerator ash.
	Soil Aeration	Excavate soils and vigorously mix to enhance volatilization.	Applicable - in conjunction with PCB and metal treatment technologies.
	Thermal Destruction	Thermally oxidizes and destroys organic contamination.	Applicable - onsite only due to large volume of wastes. Ash may need further treatment.
	<u>In Situ Bio-</u> <u>degradation</u>	Microbes mixed into soils consume and destroy wastes.	Not applicable - technology not well demonstrated for PCBs and metals.
	Vacuum Extraction	Pumping of soil gas from unsaturated zone.	Applicable - must be used in conjunction with other treatments to address entire source. PCBs not affected.
	<u>In Situ Vi-</u> <u>trification</u>	Electrodes in ground melt soils, form glassy block. Volatilized chemicals captured by hood.	Not applicable. Large scale technology not demonstrated. Gas pipeline onsite creates unacceptable hazard.
<u>GROUND WATER</u>	<u>Technology</u>	<u>Description</u>	<u>Acceptability</u>
	Air Stripping	Promotes exchange of volatile chemicals from water to air.	Applicable - well demonstrated. SVOCs not well removed.
	Carbon Absorption	Water is passed through bed of granular activated carbon to remove organics.	Applicable - on a small scale. Also used as polishing step with air strippers.

Table 14, (Cont'd)
Identification of Potential Remedial Technologies

Slurry Wall	Low permeable material keyed into bedrock to control ground water movement	Not applicable. Depth of bedrock or continuous layer of impermeable soils not reasonable.
Alternate Water	Variety of choices (below)	Not Acceptable/Applicable Source remains onsite:
a. Municipal Water	Village of Holly water supply hookup.	Nearest supply is six miles away.
b. Surface Water	Local lakes	Surface water not potable
c. Point of Use Treatment	(In Home)	Michigan Department of Public Health considers them inadequate on a long term basis.
d. Deep aquifer wells	Available aquifer nearby.	May be applicable, but source still present onsite.
<u>Soils and Ground Water</u> Flushing	Circulate water through contaminated soils, collect and treat leachate, recirculate.	Not applicable. PCBs are unaffected. Cold weather sensitive. Soils permeability varies too greatly to perform properly.

b. Response Objectives

Where applicable, Target Cleanup Levels (TCLs) for these technologies were calculated for each chemical of concern using either ARARs or risk calculations. Where no MCL exists for a given chemical, especially in the case of soils, risk calculations were used to target a 10^{-6} cumulative risk of exposure⁶ to a particular medium. For example, in ground water, the MCL for vinyl chloride is 2.0 ug/l. However, since vinyl chloride is a carcinogen, the risk calculation showed an incremental cancer risk of 1.3×10^{-4} . Setting the incremental cancer risk at 10^{-6} yielded a TCL of 0.015 ug/l for vinyl chloride.

The TCLs for the two plumes were found to be different, since vinyl chloride is the only carcinogen present in the northern plume and it is one of five in the southwestern plume. Since incremental cancer risk levels are additive, each corresponding

⁶Region V policy is to obtain a 10^{-6} incremental cancer risk objective if it is feasible.

chemical of concern will have a lower TCL than if it was the only chemical present. However, the vinyl chloride TCL is far below the detection limit for Special Analytical Services (SAS) through the Contract Lab Program (CLP). Thus, cleanup of vinyl chloride will essentially be to non-detection or background.

The target level for arsenic in soils for the 10^{-6} incremental cancer risk level is calculated to be 0.41 mg/kg. However, the naturally occurring (background) range for arsenic in these soils is 1 mg/kg to 14 mg/kg (Table 5), thus it was decided by EPA and MDNR to set the TCL at 14 mg/kg. Essentially, arsenic cleanup will be to background. The calculated risk level for this chemical at this TCL is 1.69×10^{-5} which is within the target range. Similarly, the TCL for soil PCBs was set at 10 ppm, a more technically practical level, yet still achieving the target risk range of 10^{-4} to 10^{-7} . The calculated risk level in southwest surface soils for PCBs is 3.49×10^{-6} at this TCL. Table 15 lists the TCLs determined for the Rose Site. The source of each TCL is listed also.

C. Applicable Alternatives

On the basis of identified applicable technologies for each site area of concern, five remedial alternatives were compiled. Each alternative meets the response objectives for the site areas (to remove or reduce to acceptable levels the risk of exposure to site chemicals) but all may not meet the calculated TCLs. Each of the remedial technologies that address the soil may be coupled with the ground water extraction and treatment module which is addressed separately. The following are the alternatives to be considered:

- no action, except for monitoring
- excavation (of contaminated soils), with offsite land disposal
- excavation, with onsite thermal destruction of organics and onsite disposal of ash
- excavation, with soil aeration to remove VOCs and offsite land disposal for metals and PCBs
- impermeable capping of site with in situ vacuum extraction of VOCs.

and for ground water:

- extraction and treatment by air stripping and carbon absorption, plus chemical coagulation to remove metals.

D. Description of Alternatives

Alternative 1: No-Action

The No-Action alternative would actually be a limited-action alternative. It would consist of a site monitoring program, erection of a security fence and provision for an alternative water supply. Site inspection would also occur.

Table 15

Final Target Cleanup Levels (TCLs)
Rose Township Site

Northern Ground Water Plume

Chemical	TCL (ug/l)	Source
Lead	50	MCL
Vinyl Chloride	0.015	Carcinogenic Risk Calculation

Southwestern Ground Water Plume

Chemical	TCL (ug/l)	Source
Arsenic	50	MCL
Lead	50	MCL
Chlorobenzene	60	Proposed MCLG
Benzene	0.133	Carcinogenic Risk Calculation
TCE	0.627	Carcinogenic Risk Calculation
Vinyl Chloride	0.003	Carcinogenic Risk Calculation
CBS	0.002	Carcinogenic Risk Calculation
Methylene Chloride	0.919	Carcinogenic Risk Calculation

Northern Surface Soils

Chemical	TCL (mg/kg)	Source
Arsenic	14	Background Level

Southwestern Surface Soils

Chemical	TCL (mg/kg)	Source
Arsenic	14	Background Level
PCBs	10	MDNR/EPA Decision
Lead	70	Noncarcinogenic Risk Calculation

Southwestern Subsurface Soils

Chemical	TCL (mg/kg)	Source
Chlorobenzene Isophorone Methylene Chloride 1,1,1-trichloroethane Trichloroethylene	Sum of the VOCs not to exceed 0.08 mg/kg	Derivation using TCLs for VOCs in the ground water and Koc for chemicals in the soils.

The proposed monitoring program would involve sampling of selected existing monitoring wells and the installation and subsequent sampling of eight additional monitoring wells as shown in Figure 13. Performed on a yearly basis due to slow movement of the ground water, the laboratory analyses would include lead, arsenic and the organic chemicals of concern in the ground water plume. The northern plume moves much faster, thus semi-annual sampling may have to be implemented.

The fence would be installed around the perimeter of the site. Consisting of six foot high chain link section with three-strand barbed wire, the total length of fencing would be about 8800 feet. Every 200 foot interval would have a sign that warns of hazardous chemicals.

The alternative water supply would only be implemented if monitoring indicates the movement of site-derived chemicals offsite. Since no suitable surface water exists nearby, the only practical alternative is to supply affected households with individual deep bedrock wells. The installation of shallow, up-gradient wells is not recommended since the hydrogeology is so complex that it would be impossible to predict how the high-yield wells would affect the contaminant plume.

Lastly, site inspection would occur yearly during the site monitoring sampling program, or more frequently, as needed. Monitoring wells or fencing will be repaired as required.

This alternative would be easily implemented since all technology is readily available. Construction of the fence is a relatively simple task, as would be the installation of any monitoring wells. Short term effectiveness in protection would be realized. However, long-term effectiveness is limited since compliance with site access restriction is voluntary. The presence of a fence has currently not been successful in preventing site access. The alternative does not remove or reduce the concentration or threat of site chemicals and their presence would still pose a substantial threat of release to the environment.

The capital cost of this alternative is approximately \$241,600. Annual costs of \$52,000 include ground water monitoring, site inspection and fence maintenance. Present worth over 30 years is \$732,000. The alternative water supply cost is uncertain, since implementation may occur far into the future. Current capital cost for the water supply for the six area homes is estimated at \$62,700, with an annual monitoring and maintenance cost of \$14,300. Construction would take one year or less to perform, while sampling and maintenance would occur for 30 years.

If no site ground water remediation occurs, Michigan Act 245 and the Safe Drinking Water Act would not be complied with, since the aquifer would otherwise yield potable water. The State would not concur with this remedy selection. Community acceptance would be nil, also. The overall level of protection of human health and the environment is low.

Ground Water Extraction and Treatment

The ground water extraction and treatment system is an integral part of Alternatives 2 through 5. The extraction system consists of a network of interconnected wells designed to intercept the north and southwest plumes. The contaminated water would be pumped to a treatment system designed for removal of chemicals to their TCLs prior to discharge.

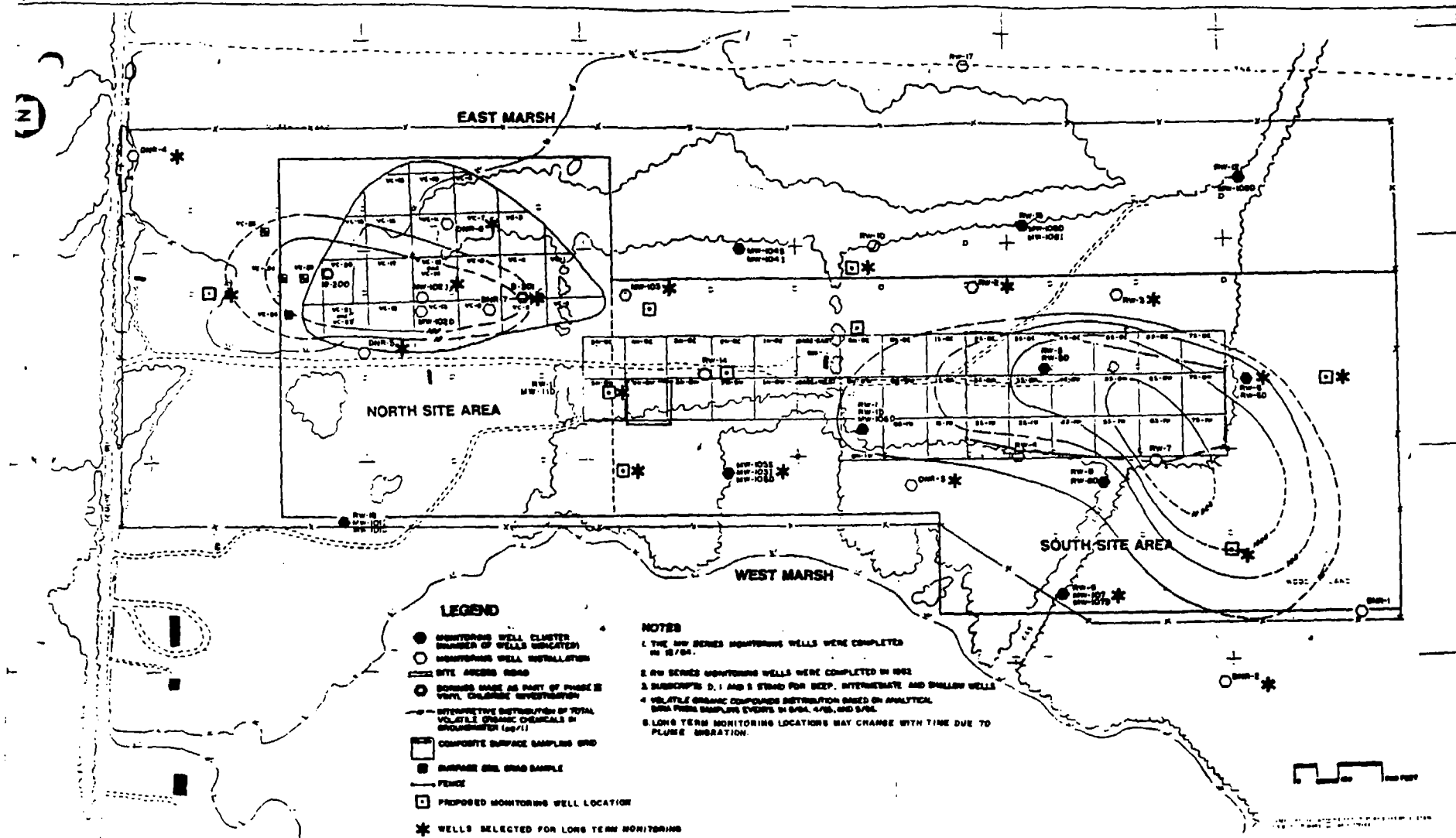


FIGURE 13
REMEDIAL ALTERNATIVE 1
NO ACTION
 ROSE TOWNSHIP - DEMODE ROAD SITE
 EC.JORDAN CO

An estimated total of 17 extraction wells (15 southwest, two north) would be used to withdraw 90 gpm from the contaminated aquifer. The water would be treated to remove VOCs as well as PCBs, lead and arsenic. Cleanup would be accomplished through the use of chemical coagulation and filtration prior to air stripping, followed by an activated carbon absorption polishing step to remove residual organics. The treated water should be clean enough to discharge to the west marsh if the lead levels do not exceed AWQC (3.2 ug/l). If not able to meet AWQC, discharge will not occur to the marsh. Instead, a POTW may be contacted to determine if it would accept the treated water, or, the water could be allowed to re-infiltrate into the ground water system onsite. However, these alternatives for discharge have not been addressed in the FS nor during the public comment period. Before implementation, the ROD would be re-opened for public comment to allow for public review of the needed discharge method. Treatability studies during the remedial design phase will address this concern. The resulting metal sludge would be tested to determine appropriate disposal practices. Figure 14 shows suggested extraction well locations.

Ground water extraction and the treatment system outlined above are all well demonstrated and proven technologies. Construction should occur with little difficulty. Prior to implementation, however, an aquifer pump test will be performed as well as pilot testing of the treatment system to determine optimum operating parameters.

The mobility, toxicity, and volume of hazardous chemicals in the ground water will be adequately reduced to lower public health risks associated with ground water ingestion. As mentioned previously, a potentially adverse effect on the wetlands may occur if the discharge exceeds AWQC or Michigan Rule 57 criteria for the protection of freshwater aquatic life.

The State and community would both concur with this phase of the remedial action. Both short-term and long-term environmental benefits will be realized, as the pumping will prevent the plumes from advancing offsite and treatment will eventually render the aquifer fit to drink from.

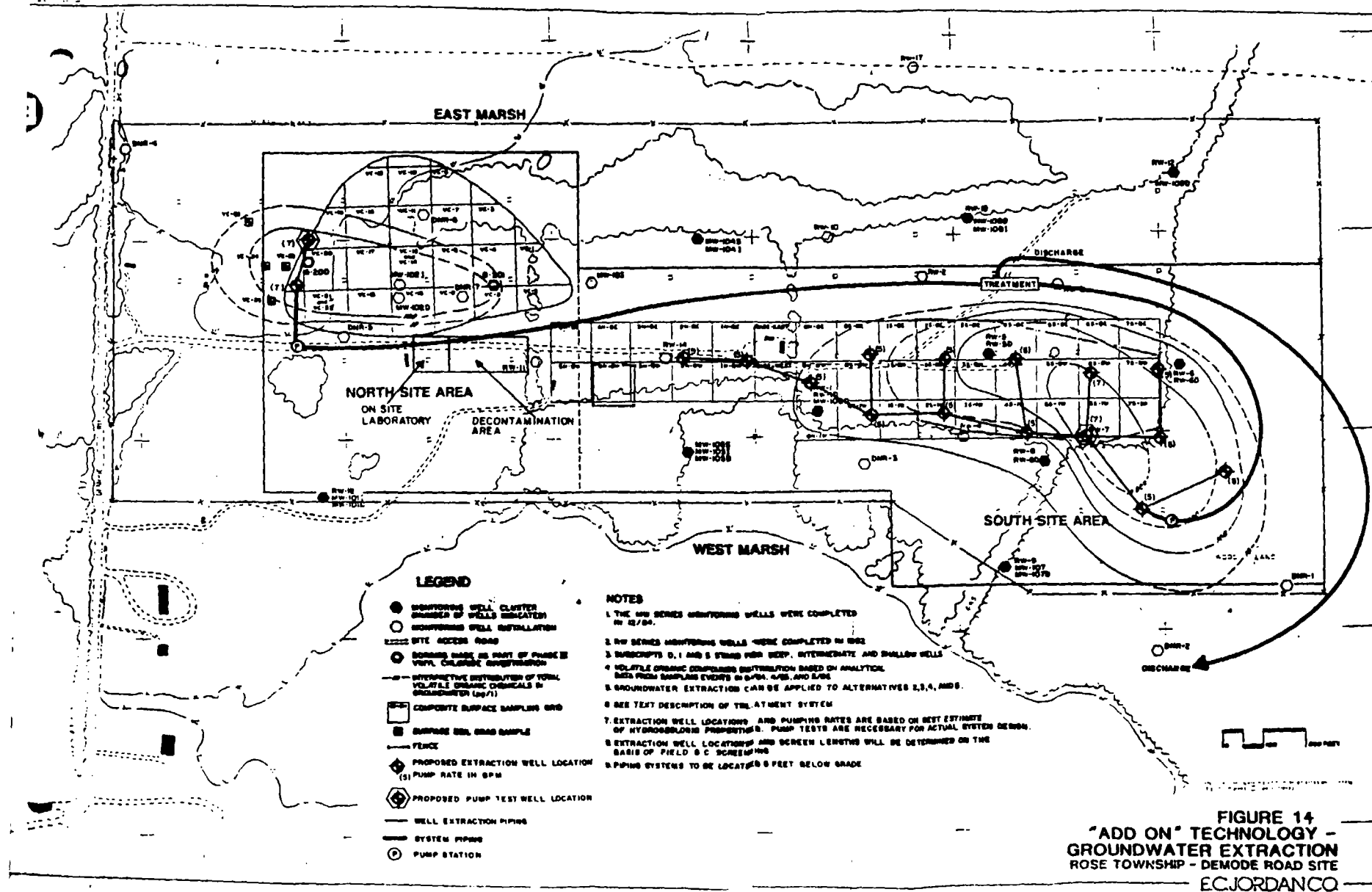
Ground water extraction and treatment is to be performed in conformance with the SDWA, CWA, Michigan Act 245, and the Michigan Air Act (treatment emissions).

Capital costs for this system are \$706,000. Annual costs are \$129,100 accounting for an estimated six to ten years of extraction and treatment, or longer as determined by monitoring data. (These costs have been built into Alternatives 2 through 5 already.)

Alternative 2: Excavation of Contaminated Soils, Offsite Landfill

Alternative 2 would consist of: excavation and offsite disposal of scattered waste piles and soils above their TCLs, ground water extraction and treatment, site monitoring, and site fencing. All site objectives would be met, as the hazards associated with surface and subsurface soils would be removed and the ground water plumes eliminated. However, since wastes are only transported offsite and landfilled in their present state, Alternative 2 cannot be considered a permanent remedy.

Excavation would consist of removing approximately 50,000 cubic yards of waste material. The majority (48,000 cy) of the excavation would be located within



the southwestern area grid (Figure 15). The remainder would consist of removing soils above the arsenic TCL (1700 cy) in the north grid area and removing waste piles (500 cy) scattered throughout the site. Excavation volumes were derived by applying the previously discussed TCLs for PCBs, arsenic, and lead, and the total residual VOCs allowable to eliminate the continual source to the ground water plumes. Additional soils sampling will need to be performed during the design phase⁷ to more precisely establish the volumes to be excavated. Materials excavated would be disposed of at a RCRA Subtitle C facility permitted to accept VOCs, SVOCs, and PCBs in the concentrations observed onsite. A facility located in Model City, New York, about 360 miles away, has been used in the cost estimate derivation for this site.

Site fencing has been described in the No-Action Section. Site monitoring has been described along with ground water excavation and treatment in the previous section.

The construction activities would require extensive mobilization and decontamination facilities onsite, using conventional earth-moving equipment. Implementation of this alternative is not expected to be complex. Excavation of wastes with similar characteristics has been successfully performed at other hazardous waste sites. Assuming all TCLs are met, the level of protection at the site utilizing this remedy is high, since all soil contact hazards would be removed. The ground water contamination would also eventually be reduced in concentration thus decreasing risk to receptors. Onsite toxicity, mobility, and volume of contaminants would be greatly decreased. However, transfer of the waste offsite does not permanently address the problem as the contaminants will not have been destroyed, immobilized, detoxified, or reduced in volume.

Onsite environmental impacts will be small and temporary. Erosion may increase chemical loading in the wetlands until the remedy is complete (in one year or less) and revegetation has occurred. Standard erosion control practices such as silt fences and mulch should reduce sedimentation in the wetlands. Once the contaminated soils are removed, exposure risks of terrestrial organisms shall be greatly reduced.

The present worth of Alternative 2 is \$29,167,000 based on capital costs of \$27,762,300 for fencing, monitoring, construction, and dumping fees. Also included is the ground water extraction/treatment system. Annual operation and maintenance costs are associated with the ground water system and monitoring costs for a 30-year evaluation period. These costs average \$108,000/year.

The community does not favorably view the transfer of wastes from one site to another, even though their "back yard" would be clean. The State does not wish to deal with future liability of landfilled wastes, instead preferring a more permanent remedy.

All relevant statutes would be complied with, including RCRA, SDWA, CWA, and Michigan Act 245. Onsite, overall protection of human health and the environment would be high, but the associated risks would only be transferred offsite with the landfilled soils.

⁷Including marsh soils

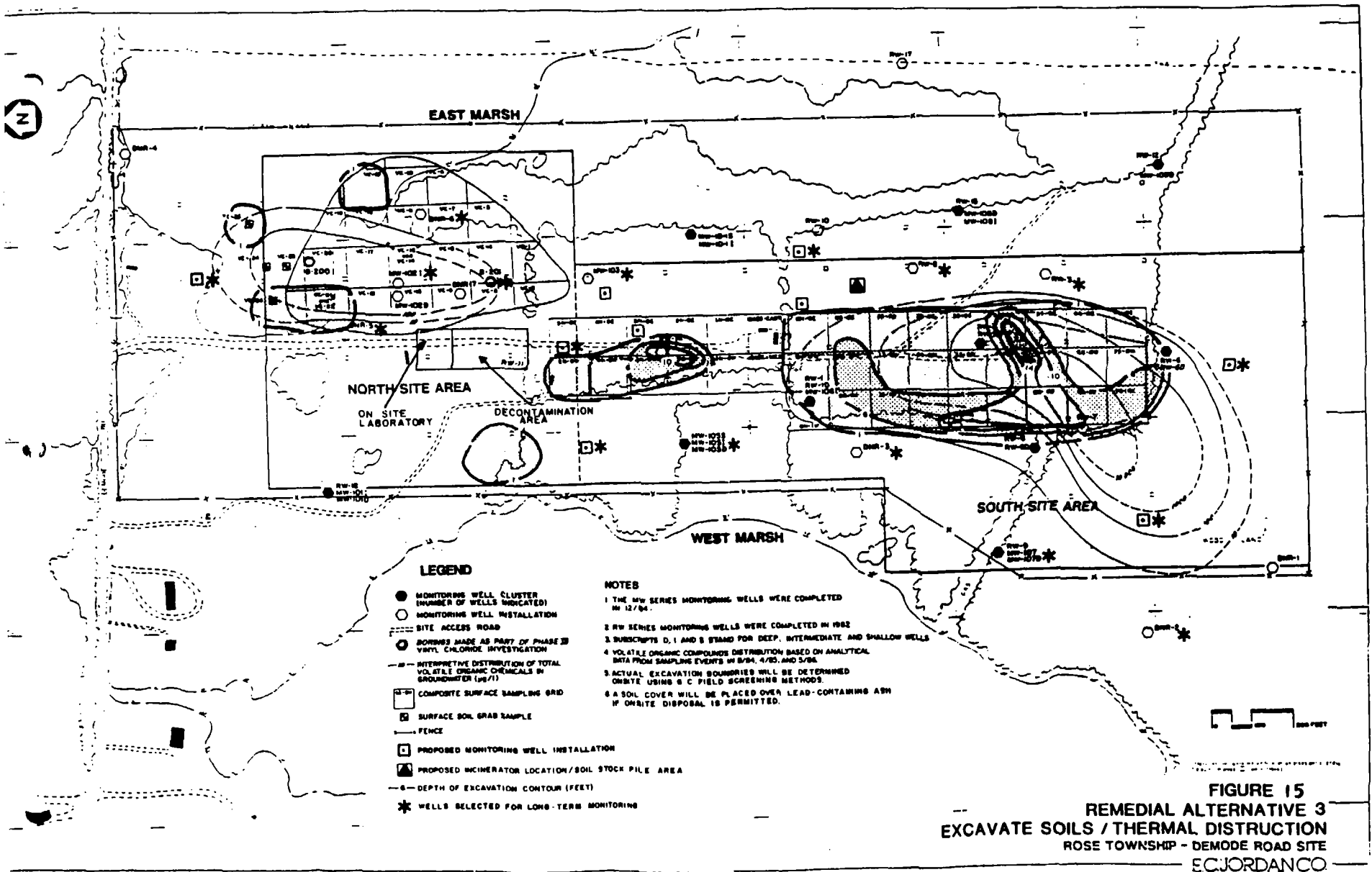


FIGURE 15
REMEDIAL ALTERNATIVE 3
EXCAVATE SOILS / THERMAL DISTRUCTION
 ROSE TOWNSHIP - DEMODE ROAD SITE
 EC/JORDAN/CO

Alternative 3. Excavation of Contaminated Soils, Onsite Thermal Destruction

Alternative 3 consists of the following components: excavation and onsite thermal destruction of the chemicals in the scattered waste piles and soils above their TCLs, ground water extraction and treatment, and site fencing and monitoring. Except for soils remediation, the other components have been discussed previously.

As described in Alternative 2, excavation of about 50,000 cy of soils to their TCLs would remove the dermal contact hazards of the PCBs and the continual organic chemical source of the ground water plumes. Two types of technology are RCRA-permitted to incinerate PCBs: rotary kiln and infrared. Both technologies are available as mobile, onsite-use units.

Ideally, an infrared unit will be used onsite, since it is estimated that it will have lower costs than a rotary kiln device. Destruction and removal efficiencies (DRE's) of 99.9999+% have been demonstrated for wastes with elevated PCB concentrations. Infrared units have been reported to "fix" heavy metals in the resulting ash, such that the ash passes EP toxicity tests for the metals. Lead is an example of a metal that has been reportedly "fixed" in the ash. Whether or not this is true, it will be an important factor in the disposal of the Rose site ash, due to the association of high levels of lead with the PCBs.

Along with the construction described in Alternative 2, additional siting and operating requirements are needed. The thermal destruction unit will be placed in proximity to the major excavation area, which calls for clearing and leveling of about 2 acres. Security fencing and outdoor illumination for a multiple shift operation would be needed. For a 24 hr/day shift, a limited stockpile of waste feed would be needed. RCRA temporary waste pile and temporary storage requirements would have to be met.

Prior to implementation, questions concerning treatment and disposal of ash and scrubber effluent, performance testing, and emission limits would need to be addressed. Thermal destruction does not destroy heavy metals, for metals are still found in the resulting ash and scrubber water. These process wastes are considered to be hazardous under RCRA, unless they are delisted. EP toxicity tests will be run on the ash to determine the method of onsite disposal. If the ash passes the test, it may be backfilled with a soil cover placed over it. If it does not pass, further treatment will be necessary before burial. Scrubber effluent would consist of salt brine and low concentrations of heavy metals. A Publically Operated Treatment Works is being contacted to inquire about the possibility of them handling the effluent. A test burn will be conducted to determine operating parameters and expected emissions. Emissions are expected to meet criteria set forth by the Michigan Air Pollution Control Commission.

Long-term environmental and public health effects will be very beneficial, as the hazards associated with the contaminants will be permanently removed. Initially, chemical loading in the wetlands may increase during excavation and incineration, but erosion controls should minimize the impact.

The capital cost for Alternative 3 is \$32,547,000, assuming no further treatment of the ash will be needed (as being shown by a test of this technology at a Region IV site). Annual costs consist of both operating and long-term monitoring costs until year 10, after which annual costs are limited to long-term monitoring costs. The present worth is estimated to be \$34,084,000, based upon annual costs of \$200,000/yr for year 0 to year 10 and \$70,000/yr for year 11 to year 30.

The State concurs with the scope of this remedy. The community also has no objections to this remedy.

Alternative 4: Excavation of Soils, Aeration of VOC Contaminated Soils, Landfilling of PCB/Metals Contaminated Soils.

Alternative 4 would consist of the following components: excavation of soils contaminated with PCBs, lead, and arsenic in excess of their TCLs and subsequent offsite disposal; excavation and soil aeration of VOC contaminated soils in the southwest grid area; ground water extraction and treatment; and site monitoring and fencing. Soil aeration is considered to be a permanent remedy for VOCs, only, since the hazards associated with PCB and metals containing soils would be transported to another site, rather than permanently addressed. The VOCs are not destroyed. The exposure risk is only reduced as the VOCs are transferred to the atmosphere from the soils.

Site fencing and monitoring and ground water treatment have been described previously. Approximately 25,000 cy of soils would be excavated and landfilled in the manner of Alternative 2. The remaining 25,000 cy of VOC containing soils would be treated by placing the wastes into an enclosed rotating drum. Heated air would be passed over the soil, causing volatilization of the organics. Exhaust gases would be passed through a treatment process before being emitted into the atmosphere.

Soil aeration has been proven effective in removing VOCs and SVOCs at the McKin site in Region I. Prior to implementation at the Rose site, pilot studies would be necessary to estimate process efficiency and expected duration of operation. Coordination of each construction phase would be a concern. The non-treatable waste would be excavated and removed prior to excavation for the aeration process. Stockpiling of VOC-containing soils would have to meet RCRA storage requirements. Any soils that do not respond to aeration would need to be drummed and landfilled as well. After aeration is completed, ground water treatment will commence.

This alternative will reduce the public health risks associated with direct contact and chemical leaching from the soils. Atmospheric exposure could possibly increase if emissions are too high, but this would be a short term risk as the estimated time for the aeration process to be completed is 10 to 12 months. Environmental effects may include chemical loading to the wetlands as discussed in earlier sections. This, too, should be of a short term nature. However, environmental exposure to hazardous chemicals will be greatly reduced when the remedy is completed.

Capital costs would total \$26,233,600 for this alternative. Average annual costs are estimated to be \$95,000/yr. The present worth of Alternative 4 is \$27,638,000.

The ground water remediation would comply with Michigan Act 245 and the Safe Drinking Water Act. For reasons discussed in Alternative 2, neither the State or the community would support a landfilling alternative.

Alternative 5: Soil Cap and In Situ Vacuum Extraction

Alternative 5 would consist of the following components: soil capping and vacuum extraction of VOCs in the southwest grid area, soil cover in the north grid area, ground water extraction and treatment, and site monitoring and fencing. This is the only alternative that relies completely on in situ technologies to meet the site response objectives. Site fencing, monitoring, and ground water treatment have been described previously.

Application of the in situ process is straightforward. Soil gas extraction wells are installed to the water table and screened for their entire length. A blower attached to the well creates a negative pressure, extracting gases out of soil pore spaces to the surface for treatment. The cap consists of clay, sand, and soil layers to: (1) seal the surface to help create a greater negative pressure; (2) decrease the contact hazard potential of PCBs, arsenic, and lead; and, (3) reduce moisture infiltration which in turn minimizes leachate from organics not extracted by the wells. The soil cover on the north site allows for revegetation. Figure 16 shows the planned location of extraction wells and soil covers.

Included in the site monitoring plan for this alternative would be inspection and repair of the caps as needed.

Short-term effectiveness of soil capping has been well documented. Effectiveness of the vacuum extraction method depends on the volatility and concentrations of chemicals present. However, the technologies are easily installed and capping would provide good short-term protection against soil contact hazards. Unfortunately, it would be difficult to determine if TCLs have been met in subsurface soils after application of vacuum extraction. Ground water contamination would still occur if infiltration continues into southwest area soils, as long-term cap integrity is suspect.

Short-term environmental risks from onsite construction would be lower for this remedy than for any of the alternatives requiring excavation. However, vacuum extraction would only transfer VOCs from the soils to activated carbon air filters, which in turn would need to be treated or disposed of safely.

Environmental exposure by terrestrial organisms would be reduced due to the clay and soil covers. Transport of PCBs and the heavy metals to the wetlands would be curtailed, as would the possibility of ground water contaminating the wetlands after the remedy is implemented. Long-term reliability is suspect, as the cap may fail and exposure would result.

The State would not concur if this remedy was selected by EPA. There are doubts as to the reliability of vacuum extraction methods on VOC removal, and SVOCs probably would not be removed at all. The community would also probably not concur, either, as they trust the State to perform the most protective remedy possible.

Alternative 5 cannot be considered a permanent remedy since PCBs and metals are left untreated. Treatment of VOCs in the soils attempts to address risk level reduction for these chemicals. Semi-volatile organic chemicals would not be removed and would remain a long-term ground water degradation source.

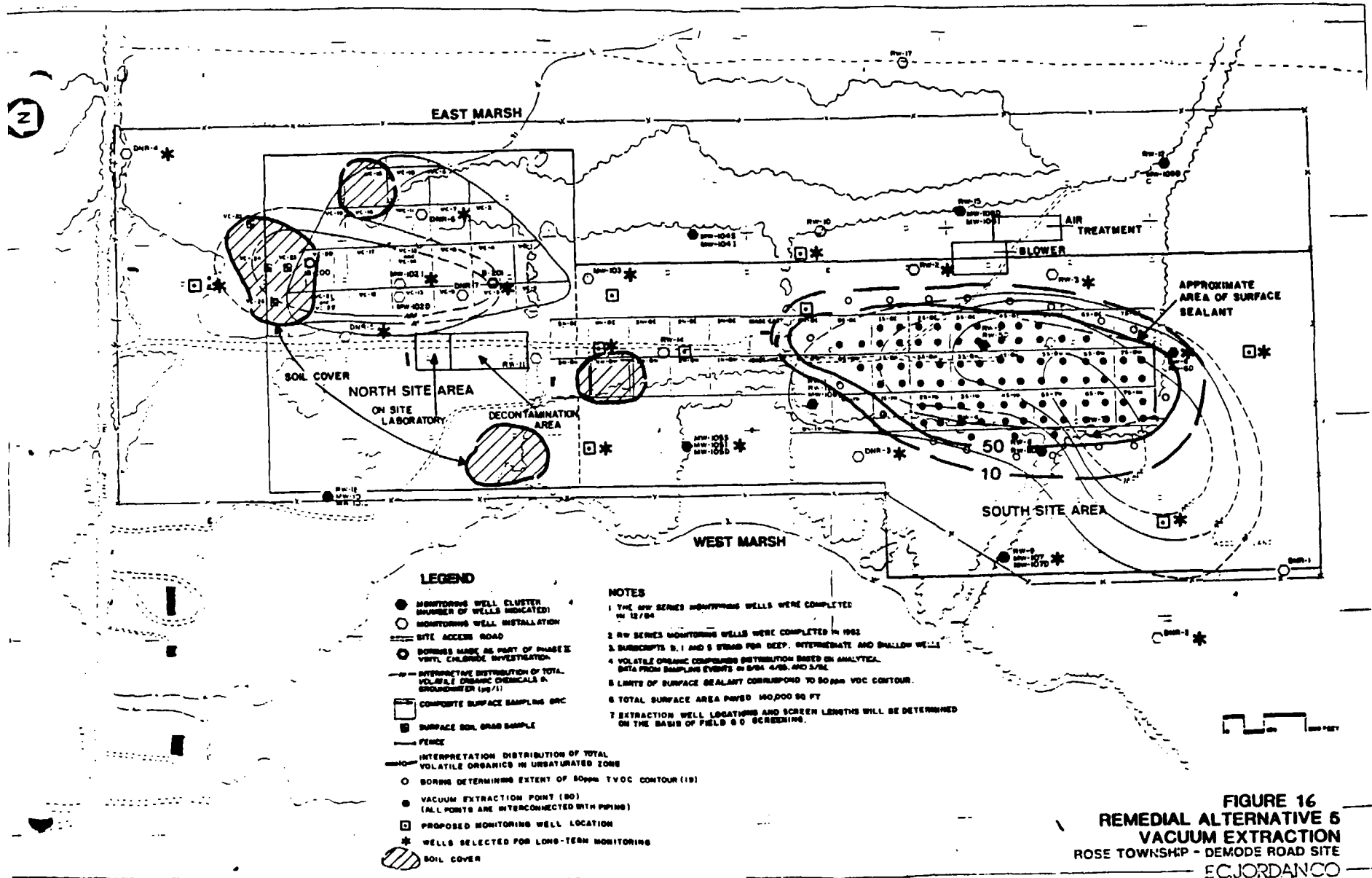


FIGURE 16
REMEDIAL ALTERNATIVE 5
VACUUM EXTRACTION
 ROSE TOWNSHIP - DEMODE ROAD SITE
 E.C. JORDAN CO

Capital costs of this alternative would be about \$3,735,700. The annual cost would vary over the life of the project, being greatest in the first five years when all processes are operational (\$547,900/yr). For years 6 to 10, annual costs would drop to \$212,100/yr, considering only ground water monitoring and cap, cover, and fencing maintenance. Total present worth over 30 years is estimated at \$6,789,000.

Section 121(b)(1)(A-G) Review

The following Table (16) lists the evaluated alternatives and their relative effectiveness versus the CERCLA Section 121(b)(1)(A-G) factors and the nine points listed in the OSWER directive dated July 24, 1987. (TITLE: Additional Interim Guidance for Records of Decision: #9355.0-21)

VIII. Selection of Remedy

The No-Action Alternative (#1) was considered as directed by CERCLA. Site exposure risks are too high to go unaddressed. This alternative proposed no responses that would address the release and threat of release of hazardous wastes in a long-term protective manner. Thus, it cannot be selected.

Of the four remaining alternatives, only one (#3) addresses the risks in terms of permanent destruction of contaminants. This alternative, Soil Excavation and Onsite Thermal Destruction along with Ground Water Extraction and Treatment, is the preferred remedy for the Rose Site contamination. Performance of this remedy, as compared to the others, will:

- (i) alleviate the long-term uncertainties of land disposal or capping in place (CERCLA - Section 121(b)(1)(A)), since there will be destruction of most of the organics and immobilization of the metals,
- (ii) eliminate the volume, toxicity and mobility to the greatest extent (Section 121(b)(1)), as explained in (i) above,
- (iii) attain or exceed all cleanup ARARs promulgated,
- (iv) greatly reduce the propensity to bioaccumulate hazardous substances to the greatest extent (Section 121(b)(1)(C)), since the PCBs will be destroyed and not capped or landfilled,
- (v) relieve the short-term and remove permanently the long-term potential for adverse health effects from human exposure (Section 121(b)(1)(D)), since the ground water plumes will stop advancing with the onset of pumping and treating,
- (vi) substantially reduce long-term maintenance costs (in comparison to Alternative 5) (Section 121 (b)(1)(E)), since there will be no cap to maintain if Alternative 3 is implemented,
- (vii) remove the potential for future remedial costs since the wastes would be destroyed, not left in place or landfilled elsewhere (Section 121 (b)(1)(F)); if the wastes are not destroyed, future leakage and contamination may result,
- (viii) not pose threats to human health due to transportation and redispal offsite (Section 121 (b)(1)(G)), as posed in Alternative 2 and 4,

Table 16

Summary of Remedial Alternatives Evaluation
 Rose Township - Demode Road Site, Michigan

Criteria	No Action	Offsite Landfill + Air Stripper	Onsite Thermal Destruction, Air Stripper	Offsite Landfill Soil Aeration Air Stripper	Capping, Vacuum Extraction, Air Stripper
Reduction of volume, toxicity, or mobility	None	Onsite: Complete Offsite: Low	High to Moderate (ash)	Onsite: Complete Offsite: Low	Low to Moderate
Implement- ability	Easily	G.W. : Easily Ldfl : Moderate	G.W. : Easily Therm: Moderate	G.W. : Easily Soil : Low	G.W. : Longer Vac : Low
Short term Effectiveness	Some	Moderate	Moderate	Moderate	Moderate
Long term Effectiveness	Very uncertain to none	Onsite: High Offsite: Low	High	Onsite: High Offsite: Low	Low to Moderate
State Concurrence	None	Ground water Treatment only	Full	Ground water Treatment only	None for Vacuum Extr.
Community Concurrence	None	Do not like landfilling	Full	Do not like landfilling	Lukewarm to low
ARARs Compliance	LOW: SARA SDWA, TSCA CWA, MI Act 245	Low: SARA High: SDWA, CWA, TSCA, MI Act 245	High: SARA, RCRA, SDWA, TSCA, CWA, MI Act 245	Moderate: SARA SDWA, TSCA, CWA, MI Act 245	Low-Moderate: SARA, SDWA, CWA Some: Act 245
Overall Protectiveness of Human Health, Environment	Slight	Onsite: Fully Offsite: Risks are Transferred	Fully to Moderate (ash)	Onsite: Fully Offsite: Risks are Transferred	Low to Moderate
Cost:Capital Annual Present Worth	\$309,300 64,800 921,000	27,760,000 110,000 29,179,000	32,550,000 122,000 34,100,000	26,234,000 110,000 27,640,000	3,936,000 183,000 6,790,000
Time to implement or complete action	Less than one year + yearly monitoring	Less than two years ground water treatment yearly monitoring	Less than three years will last up to ten years yearly monitoring	Less than three(?) years yearly monitoring	Uncertain for Vac. Extr. and ground water yearly monitoring

- (ix) have State concurrence and subsequent 10% cost-sharing,
- (x) present a cost-effective alternative since the cost is nearly the same as that of remedies offering similar levels of protection onsite (#2 and #4), (\$29.1 million for #2, \$27.6 million for #4 and \$34.1 million for #3),
- (xi) eliminate public (community) concern with toxics being left in place,
- (xii) present the only current method to destroy PCBs, providing for elimination of their potential to damage the environment,
- (xiii) remove contaminants from soils and from the ground water so that the aquifer will once again be of potential use as a potable water supply within a practical period of time (compared to Alternative #5), and
- (xiv) follow the Land Disposal Restriction rule, where applicable, to incinerate halogenated organic compounds when their concentrations reach or exceed 1000 mg/kg. (The highest PCB sample analyzed showed 980 mg/kg, which is essentially 1000 ppm.)

The scope of this remedy is as follows:

- ° As much as 50,000 cy of PCB, VOC, lead, and SVOC-contaminated soils will be excavated and thermally treated onsite to destroy the organic wastes.
- ° DRE will be 99.9999% (minimum) for PCBs, VOCs, and SVOCs. Estimated maximum time frame for completion of thermal destruction is 33 months.
- ° Half of the resulting ash (20,000 cy) is expected to contain lead and arsenic, and it will be tested for EP toxicity. If it passes, the ash will be classified as non-hazardous and backfilled onsite. If the ash is EP toxic, treatment will be necessary to reduce the ash to below EP toxicity levels before reburial onsite. The other 20,000 cy is estimated to already be non-hazardous (no metals of concern), but it will still be necessary to meet the substantive requirements for RCRA delisting due to the listed solvents it formerly contained.
- ° All emissions and effluent streams will be treated onsite to meet established ARARs.
- ° A ground water extraction system will remove 10-14 pore volumes (1 pore volume = 22 million gallons) of the southwestern plume and 6 pore volumes (1 pore volume = 8 million gallons) of the northern plume over a time period of six to ten years. These volumes are estimated to be necessary to bring the chemicals in the ground waters to their TCLs.
- ° the ground water extracted will be treated by chemical coagulation and filtration, air stripping, and activated carbon adsorption systems to remove chemicals to their TCLs. Discharge of treated waters will be to the west marsh if AWQC (especially for lead) are not exceeded. If found to exceed AWQC, a local POTW will be contacted to determine if they will accept the treated waters, or, the water may be placed in a pit onsite to allow it to infiltrate back into the ground water table. However,

only discharge into the marsh was considered in the FS and placed for public comment. If an alternate discharge method is needed, the ROD will be reopened for public comment before implementation of the ground water treatment remedy.

- ° Sludge produced by the ground water treatment process will be characterized and disposed of as appropriate.
- ° A site fence will be erected to provide a secure work environment and to prevent accidental exposure by unauthorized personnel.
- ° Site ground water monitoring will occur yearly until TCLs have been met.

To meet the scope of this remedy, the following design tasks, at a minimum, shall need to be performed:

- (i) Treatability study(s) concerning the ground water plumes - to determine expected metal residual levels before determining the method of discharge, and to determine flow rates in the air stripper and the carbon apparatus;
- (ii) Testing to determine the level of pre-incineration treatment needed, e.g., sifting, whether fuel oil addition will help with the burn, etc;
- (iii) Pilot testing to determine incineration parameters;
- (iv) Soils sampling in the wetlands to delineate PCB cleanup, if any, needed in the marshes;
- (v) EP toxicity testing of the ash to determine how the ash may properly be disposed of onsite pursuant to RCRA and also chemical analysis to show effectiveness of incineration;
- (vi) Ash treatability testing will be needed if it does not pass EP toxicity testing. Examples of treatability testing may include solidification/fixation, or the application of a metals leach liquor to the ash to remove mobile metals before retesting for EP toxicity;
- (vii) Aquifer pump testing to determine efficient flow rates for ground water extraction;
- (viii) Soils sampling in the northern grid area to determine extent of arsenic contamination and total need for remediation in this area;
- (ix) Testing of VOCs and SVOCs leach rate from soils; and,
- (x) Any other studies determined to be necessary to fully design, for bidding purposes, the remediation of the site.

VIII. Compliance with Environmental Statutes

Section 121 (d)(1) of CERCLA provides that selected remedial actions at a site must attain a degree of cleanup of hazardous substances which ensures protection of human health and the environment. In determining the level of cleanup to be achieved at a site, Section 121 of CERCLA states that applicable, or relevant and appropriate requirements found in other Federal or State environmental laws or

regulations must be met.

Applicable requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a site. A requirement is "applicable" if the remedial action or circumstances at the site satisfy all of the jurisdictional prerequisites of the requirement.

Relevant and appropriate requirements are cleanup standards, standards of control, and other environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a site, address problems or situations sufficiently similar to those encountered at a site that their use is well situated to that site.

While non-promulgated advisories or guidance documents issued by Federal or State governments do not have the status of potential ARARs, they may be considered in determining the necessary level of cleanup for protection of human health and the environment.

Table 17 lists the operational ARARs for the Rose Township site. MCLs established under the Safe Drinking Water Act (SDWA) were used to set target cleanup levels (TCLs) at the Rose site. A proposed MCLG (Maximum Contaminant Level Goal) for chlorobenzene was used as a TCL because no MCL for chlorobenzene has been established. Chemicals without any type of MCL use health based, calculated target cleanup levels.

MCLs are "relevant" to the remedial action at the Rose site because the aquifers are or may be used for drinking water. MCLs are "appropriate" because they set enforceable drinking water standards for public water supplies. As MCLs apply to water at its point of distribution ("at the tap"), these levels are appropriate for ground water at this site because residential wells that would use this aquifer would have minimal or no treatment⁸.

Several other environmental statutes are ARARs due to the remedial action proposed at the Rose site. Since hazardous wastes will be treated and stored on-site, the substantive requirements of the Resource Conservation and Recovery Act (RCRA) and Michigan Act 64 are applicable requirements which must be met.

RCRA regulations concerning the design, construction, operation and maintenance of incinerators are also applicable regulations which must be complied with. In addition, storage of PCB contaminated soil for incineration must comply with the requirements found in the Toxic Substance Control Act (TSCA). These are specifically identified in Table 17 hereto.

⁸Since the aquifer at the Rose site may be used for drinking water, MCLG's may therefore be relevant. However, under Agency Guidance (7/9/87 from Winston Porter), MCLs are fully protective as they are the standard for public water supplies. Therefore, except for chlorobenzene discussed above, MCLs rather than MCLGs are considered both relevant and appropriate where they exist.

TABLE 17
 POTENTIAL ARARs
 ALTERNATIVE 3 - EXCAVATE/THERMAL DESTRUCTION
 REMEDIAL INVESTIGATION/FEASIBILITY STUDY
 ROSE TOWNSHIP - DEMODE ROAD SITE, MICHIGAN

Phase III ARARs	Requirement Synopsis	Action to be Taken to Attain ARARs
RCRA - Standards for Owners and Operators of Permitted Hazardous Waste Facilities (40 CFR 264.10 - 264.8)	General Facility requirements outline general waste analysis, security measures, inspections and training requirements.	Any facilities will be constructed, fenced, posted, and operated in accordance with this requirement. Process wastes will be evaluated for the characteristics of hazardous wastes to assess further landing requirements.
RCRA - Manifesting, Recordkeeping, and Reporting (40 CFR 264.70 - 264.77)	This regulation specifies the recordkeeping and reporting requirements for RCRA facilities.	Any off-site disposal of hazardous waste will be properly manifested.
RCRA - Groundwater Protection (40 CFR 264.90 - 264.109)	This regulation details requirements for a groundwater monitoring program to be installed at the site.	While not "applicable" since there was no treatment, storage, or disposal of hazardous waste after November 19, 1980, these standards are relevant and appropriate to determining the level of groundwater cleanup. TCLs will meet maximum concentration limits set forth at 40 CFR §264.94(a)(2) where such levels exist. Where they do not exist, the health-based cleanup levels that have been selected will constitute alternative concentration limits pursuant to 40 CFR §264.94(b). Since these levels do not assume a point of exposure beyond the site boundary, the restrictions in Section 121 (d)(B)(ii) of SARA do not apply.
RCRA - Closure and Postclosure (40 CFR 264.110 - 264.120(e); - 264.310)	This regulation details specific requirements for closure and postclosure of hazardous waste facilities.	Under the proposed remedy, it is expected that all hazardous substances will be removed from the site with the possible exception of ash from incineration. RCRA closure regulations are generally relevant and appropriate to this site since known hazardous substances in significant quantities were disposed of at the site. (Since this disposal occurred prior to November 19, 1980, these regulations are not "applicable" under SARA.) The proposed remedy will have the effect of removing all hazardous waste pursuant to 40 CFR §264.113(a). Because

TABLE 17 (continued)

Michigan Hazardous Waste Management Act (Act No. 64, P.A. 1979)

This regulation outlines general requirements for management of hazardous waste facilities in Michigan.

all hazardous waste will be removed, the land-fill closure regulations at 40 CFR §264.310 are neither relevant nor appropriate. As discussed in the text, the ash from the incinerator will be disposed of in accordance with RCRA regulations in the event it is determined to be a hazardous waste.

During the implementation of any site activities, these requirements will be considered and followed when appropriate.

Michigan Water Resources Commission Act (Act No. 245, R323, Part 22) Groundwater Quality

This regulation outlines the rules to protect the public health and welfare and to maintain the quality of groundwater in all usable aquifers for individual, public, industrial and agricultural water supplies.

Actions required to maintain ambient quality of the groundwater onsite.

Michigan Wetlands Protection Act (Act No. 203, P.A. 1979)

Outlines requirements for conservation of wetlands whose capacity for erosion control serves as a sedimentation area and filtering basin absorbing silt and organic matter.

Actions required to maintain the soil erosion control capabilities of the wetlands onsite.

CWA - 40 CFR Parts 401 and 403, or any applicable stricter local limit contained in the ordinance adopted by the POTW.

Set standards for discharges to a publicly owned treatment works facility.

Any discharge to a POTW must meet these standards.

TABLE 17 (continued)

<u>Phase III ARARS</u>	<u>Requirement Synopsis</u>	<u>Action to be Taken to Attain ARARS</u>
RCRA - Incinerators (40 CFR 264.300 - 264.339)	These regulations detail the design, construction, operation, maintenance performance standards, operating requirements, monitoring and inspection of a RCRA hazardous waste incinerator.	The onsite incinerator must achieve a destruction and removal efficiency of 99.9999% of the Principal Organic Hazardous Constituent (PCB) and 99.99% for other organics. HCl stack emissions will be controlled to no greater than the larger of 1.8 kg/hr or 1% of the HCl in the stack gas prior to pollution control equipment.
CWA - 40 CFR Parts 122,125	Any point source discharges must meet NPDES permitting requirements which include: compliance with applicable water quality standards; establishment of a discharge monitoring system; and routine completion of discharge monitoring records.	Groundwater which has been treated by onsite treatment processes will be discharged to surface waters onsite. Treated groundwater will be in compliance with applicable water quality standards. In addition, a discharge monitoring program will be implemented. Routine discharge monitoring records will be completed.
SDWA - 40 CFR Part 144	These regulations restrict injection into the groundwater by means of certain categories of wells.	In the event that extracted groundwater is injected into the groundwater, the Underground Injection Control regulations set forth in 40 CFR Part 144 must be complied with. It is expected that any such discharge will comply with applicable regulations that ensure there will be no adverse impact on health as a result of such discharge. Compliance will be reviewed depending upon analysis of the extracted water.
TSCA - Marking of PCBs and PCB items (40 CFR 761.60 - 761.79)	PCB storage areas, storage items, and transport equipment must be marked with the M _L mark.	All storage areas, drums and equipment used for PCB contaminated soils will be labelled appropriately.
TSCA - Storage and disposal (40 CFR 761.60 - 761.79)	This regulation specifies the requirements for storage of PCB articles in excess of 50 ppm.	Storage areas containing PCB contaminated soils in excess of 50 ppm will be constructed to comply with this requirement.

TABLE 17 (continued)

SCA - Records and Reports
40 CFR 761.18 - 761.185;
29.105,750)

This regulation outlines the requirements for recordkeeping for storage and disposal of >50 ppm PCB-contaminated items.

Records will be maintained during remedial action in compliance with this regulation for all materials containing PCB concentrations in excess of 50 ppm.

CAA - NAAQS for Total Suspended Particulates
40 CFR 129.105,750)

This regulation specifies maximum primary and secondary 24-hour concentrations for particulate matter

Fugitive dust emissions from site excavation activities will be maintained below 260 ug/m³ (primary standard) by dust suppressants, if necessary.

Protection of Archaeological Resources (32 CFR Part 229,4; 13 CFR Parts 107, 171.1 - 171.5)

These regulations develop procedures for the protection of archaeological resources.

If archeological resources are encountered during soil excavation, work will stop until the area has been reviewed by Federal and state archaeologists.

D.O.T. Rules for the Transportation of Hazardous Materials (49 CFR Parts 107, 171.1 - 171.5)

This regulation outlines procedures for the packaging, labeling, manifesting, and transportation of hazardous materials.

Contaminated materials will be packaged, manifested, and transported to a permitted offsite disposal facility in compliance with these regulations.

Michigan Surface Water Discharge Permits (MWA PDES)

Outlines measurements for getting a surface water discharge permit in the State of Michigan.

Actions required to meet Michigan NPDES requirements will be similar to those discussed as part of CWA-40 CFR Parts 122 and 125. These actions will include compliance with water quality standards, implementation of a discharge monitoring system and completion of discharge monitoring records.

RCRA - Identification and Listing of Hazardous Waste (40 CFR 261)

This regulation specifies the characteristics of Hazardous Wastes (CHW).

Process ash must be evaluated for CHW prior to disposal (onsite or offsite) or treatment.

Michigan Air Pollution Control Commission Act (Act No. 348, 19336, Part 9) General Rules

Outlines requirements for prohibiting emission of air contaminants or water vapors in quantities that cause, alone or in reaction with other air contaminants, either of the following: (a) Injurious effects to human health or safety, animal life, plant life of significant economic value or property. (b) Unreasonable interference with comfortable enjoyment of life and property.

Actions required to limit emissions from onsite units that will adversely affect ambient air quality.

TABLE 17 (continued)

Michigan Air Pollution Control
Commission Act (Act No. 348, R336,
Part 2) Air Use Approval

Outlines permitting requirements to
install, construct, reconstruct, re-
locate, or alter any process, fuel-
burning equipment, or control equip-
ment which may be a source of an
air contaminant.

Actions required to obtain necessary permits
for onsite units producing emissions.

Discharge of any treated ground water to the west marsh will have to meet or exceed the water quality criteria or other specified levels found in the Clean Water Act, the Michigan Wetlands Protection Act, and Michigan Act 245. The emission control requirements of the Clean Air Act (CAA) and the Michigan Air Pollution Control Act are applicable to any incinerator emissions. Parameters of concern are sulphur oxides (SOx), nitric oxides (NOx), VOCs, other gases and particulates. Air pollution control is a part of the ground water and soils remedial action.

RCRA regulations for the identification of hazardous waste will be used to determine whether or not the incinerator ash can be disposed of onsite. If the incinerator ash is determined to be a hazardous waste under RCRA, or if any other hazardous wastes are transported off-site, Department of Transportation Rules for the Transportation of Hazardous Materials will be applicable to any off-site transportation of the hazardous wastes. Any hazardous waste must be also be disposed of pursuant to RCRA.

The proposed remedy involves placement and treatment of soils and debris wastes. Placement of wastes or treated residuals is prohibited under RCRA Land Disposal Restrictions (LDR) unless certain treatment standards are met. LDR standards have not been promulgated for soil and debris wastes, but when published, the standards may be applicable or relevant and appropriate. Despite the absence of specific treatment standards, the treatment method employed as part of this remedial action satisfies the statutory requirement to, ...'substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from the waste so that short-term and long-term threats to human health and the environment are minimized.' [Section 3004 (m) H.S.W.A.]

IX. Further Considerations

A Superfund Innovative Technology Evaluation (SITE) program test of an alternative technology will occur onsite in October 1987. An infrared thermal destruction unit will be tested to determine its effectiveness in destroying PCBs associated with a lead-contaminated soil. The ash will be tested for EP toxicity, and if passing, will enable it to be disposed of onsite. The amount of lead presently contaminating the soils is insufficient to warrant reclamation efforts.

Another alternative for ash disposal would be offsite landfilling of the 20,000 cy not passing EP toxicity testing, although this is a remote possibility. Landfilling would add another \$7,000,000 to the present worth of Alternative 3 (\$41,000,000). Further onsite treatment would cost less, but further testing is needed before cost estimation can be made.

If the treated ground water is not dischargeable into the marshes, it may have to either be sent to a local POTW or reintroduced into the ground water system. Reintroduction into the ground water onsite may lead to a variation of the thermal destruction remedy, if the treated waters are allowed to percolate back into the water table through the excavation pit. In this scenario, the PCB-contaminated soils are excavated and incinerated as planned. The treated waters, meanwhile, are drained into the excavated pit where, in theory, the VOCs and SVOCs in the soils are flushed out into the ground water. After the PCBs have been incinerated, the flushing mechanism will be evaluated to see if it has reduced the volume of VOC-contaminated soils to be

incinerated, which may result in a less expensive remedy. The chemicals which may have been flushed into the ground water in this manner will be removed by the ground water treatment technology already in place. After soils leachability tests during design, if this alternate method of VOCs cleanup is found to be practical, the ROD will be reopened for public comment before implementation of the flushing variation.

In considering reopening the ROD to provide for a flushing variation, the following criteria will be evaluated:

- (i) economy of scale - depending on the amount of PCBs that needs to be incinerated, it may be more efficient to run the VOCs-containing soils through as well;
- (ii) community acceptance;
- (iii) cleanup time - total site remediation time is estimated to be less than 10 years. Leaving VOCs in place may extend this time far into the future if it causes longer ground water remediation time. (Note: experience during design and remediation will provide a more accurate basis for determining cleanup time with respect to a flushing variation);
- (iv) land ban regulations state that incineration is the remedy for halogenated organic compounds in excess of 1000 mg/kg. The PCBs appear to meet this criteria in some spots. Chlorobenzene is present at a maximum of 570 ppm, which could be a low analysis. If so, incineration of the soils containing this level of chlorobenzene would tend to be favored, leading back to the economy of scale point earlier made.
- (v) reliability of the flushing variation;
- (vi) implementability - the water going into the excavation pit will result in sloppy working conditions and higher incineration costs due to wet soils; and,
- (vii) clean closure - would be most reliably accomplished by complete site remediation through thermal destruction of PCBs, VOCs, and SVOCs in the Rose soils; and,
- (viii) cost effectiveness.

X. Schedule:

The estimated schedule of future events is outlined below:

<u>Action</u>	<u>Date</u>
ROD Signature	9/30/87
Design Award	FY 1988 Q1
Design Completed	FY 1989 Q1
Start Construction	FY 1989 Q2
Complete Thermal Destruction	FY 1992 Q2
Complete Ground Water Treatment	FY 1995 - 1999

After ground water extraction and treatment operations cease, a risk assessment will be performed to reflect the completed remedial actions, and site delisting procedures will be initiated.

Rose Township - Demode Road

Responsiveness Summary

INTRODUCTION

A public comment period was in effect from June 22, 1987 until August 12, 1987 to provide for public review of the Remedial Investigation/Feasibility Study (RI/FS) for the Rose Township - Demode Road Superfund site. The RI/FS had been prepared to evaluate information on the contaminants on the Site property and to evaluate whether cleanup operations were needed to protect human health and the environment. Copies of the RI/FS were available at the Rose Township Hall and the Holly Library for review. A public meeting was held on July 1, 1987. Staff from the Michigan Department of Natural Resources (MDNR) and the U.S. Environmental Protection Agency (U.S. EPA) explained the RI/FS to local residents and other interested parties, answered questions, and received comments.

This responsiveness summary outlines comments and questions posed at the public meeting, comments received in writing, and Agency responses.

BACKGROUND

The Rose Township Superfund Site is located on Demode Road in Rose Township, Oakland County, Michigan. Currently it is ranked #161 on the National Priorities List.

It has been documented that from 1966 to 1968, and possibly until 1971, a portion of the property was being used for disposal of waste materials. Both liquid and solid industrial wastes were dumped at the site.

Site investigation work has revealed ground water contamination under the site. Soil boring and test pitting operations showed that extensive soil contamination exists as well. The contamination provides risks to receptors in the form of potential ingestion of contaminated ground waters and potential contact with contaminated soils.

The RI/FS evaluated a number of alternatives and recommended the use of a cost effective, fully protective, permanent remedy to reduce the risks to receptors to acceptable levels.

COMMENTS AND RESPONSES

A. Public Comments.

The only written public comments addressing the RI/FS and the proposed remedial action plan were received from the Potentially Responsible Party (PRP) Committee. These are addressed in Part B. Because the public meeting also concerned the Superfund Innovative Technology Evaluation (SITE) test of an infrared thermal destruction unit at the Rose Site, comments dealt with both the proposed plan in general (incineration) and the technology in detail. The following verbal comments, expressed at the July 1, 1987 public meeting, were addressed by either the MDNR or U.S. EPA and are documented below:

(Note: The comments are taken from a transcript of the public meeting. Directly quoted comments are marked by quotation marks (" "); lengthy quotations are paraphrased and are marked by apostrophe (''). The original phrasing is left intact, however. Responses shown are also taken from the transcript.)

1. "You said there are moderate lead levels. Ten thousand parts per kilogram is moderate?"

Actually, the greatest amount of lead measured (in the Rose site soils) is 1400 ppm. In comparison to another site test (to which this comment refers) with the infrared device, this is a moderate level. At the Peak Oil Site in Florida, lead levels are greater than 10,000 ppm.

2. "You talk about the lead would become immobile and if I understand it correctly, if the demonstration is successful then the soil would be actually left right at the site. Is that correct?"

If the lead is immobilized such that the ash passes the EP toxicity test, the ash will be backfilled on site. If the ash does not pass EP toxicity, further treatment (not incineration) or land disposal will be necessary.

3. "What's going to be contained in the steam plume [of the infrared unit]?"

Oxygen, carbon monoxide, carbon dioxide, water, and possibly oxides of sulfur and nitrogen.

4. "Is that going to be monitored?"

Yes, continuously.

5. "...with an alarm?"

Yes. The presence of only those gases (in comment 3, above) is evidence of complete combustion. If, for example, a low O₂ sensor would be tripped, the soil would stop feeding into the unit until O₂ rises to acceptable levels.

6. "If you condense the entire amount of product [lead] in the soil, how big of a brick would that make?"

(An estimate of the amount of lead present was sent to the questioner.)

7. "Once the thermal destruction unit is in steady state operation what is the emitted noise level?"

No ear protection is required. It's very quiet. What you'll hear are motors and blowers for the most part (according to the Shirco manufacturer's representative).

8. 'How long to thermally treat the entire 50,000 cu. yards?'

Between two and three years, at most.

9. 'What are the capital cost considerations for this technology?'

Capital costs are based on contractor installation, labor and machine purchase costs, electrical costs, and other services and chemical costs. For a breakdown, see Appendix K of the RI/FS.

10. 'According to your literature, you'll end up with ash and scrubber water wastes. Either one could still be contaminated and have to be hauled from the site or stored onsite. Why bother burning it up? Why go through the \$34 million if you're going to have the same stuff there?'

The purpose of thermal destruction (or any remedy) is to reduce the hazards on site. Incineration will destroy PCBs and VOCs, both major hazards. True, the metals won't be destroyed, but what may happen is they will be rendered immobile and thus less hazardous. Further treatment may be necessary for the waste water and/or ash. This will be determined during the SITE test.

11. 'The typical excavation doesn't go more than 14 feet deep either, right?'

For this site, maximum excavation depth is 14 feet in a limited area.

12. "Now your test well showed contamination down to 90 feet."

Yes, in the ground water.

13. 'Heavy metals will still be present in the soils after the plume is extracted to re-contaminate the ground water.'

Metals tend to leach very slowly. Once the surface contamination is treated to pass EP toxicity, risks from heavy metals will be minimized.

14. 'Why can't the site be fenced immediately, rather than waiting, no matter what the chosen alternative is? The cost is lower now than what they will be a year from now.'

True, costs will be lower now, but a design phase must be conducted first. The most hazardous spots have been fenced already, however. The proposed fence is mainly for safety's sake during construction and operation and maintenance.

15. 'Why can't the additional monitoring wells be sunk now [to provide more data to evaluate during design]?'

U.S. EPA can't fund this until the design phase. MDNR doesn't have the manpower to do it by themselves.

16. "What's the chance in getting it [design] started and the Superfund drying up again?"

Very low. There are 4 1/2 years left and \$8.5 billion allocated for this appropriation. Money has been planned for and set aside for the design.

17. "Is that money allocated where it can't be sponged off for another project?"

Although there have been problems in previous years due to Superfund drying up, the present authorization should be adequate to fund all sites that are ready to start during the next 4 years.

18. 'What is the schedule for the next steps in the cleanup process?'

After signing of the Record of Decision in September, the State will apply for a Cooperative Agreement for design funding in October. Design should take 1 year or less. Remedial Action is planned to start in late 1988.

19. "Would it be safe to double those times based on past performances?"

These scheduled times should remain fairly firm.

20. "How often are you testing the monitoring wells?"

Testing will occur yearly. Domestic wells are due to be tested by the Health Department in July (1987).

21. "What kind of flap do you anticipate ... from surrounding communities ... like Springfield Township who will be downwind of that, White Lake and all others?"

The remedy has been widely advertised in local papers and the Detroit News in an attempt to gauge public sentiment. Only twenty to thirty citizens showed up at the open house (held June 30, 1987) and none seemed dead set against the SITE test or chosen remedy.

22. 'Which soils do you plan to test, the most highly contaminated or the more moderately contaminated?'

The soils that are most highly contaminated with PCBs and lead will be tested in the infrared unit.

23. 'What other incinerator units have been looked at to satisfy the chosen remedy?'

Rotary kiln incinerators are also permitted to destroy PCBs.

24. "Are we going to have any kind of liaison between the township or the officials and the residents and yourself if this site goes in operation so we know more what's going on?"

There's going to be several MDNR personnel to contact. Thor Strong is the public involvement specialist for this site.

25. 'What are the plans as far as emergency action if there is a problem with the unit?'

A site safety plan will be drawn up before operation, and it will include fire department coordination.

26. 'Will we have another public meeting prior to any action?'

When the full scale unit goes onsite, another public meeting will be held.

27. 'Why not remove the PCBs and metals and sell them to someone else?'

The concentrations of site chemicals are not high enough to warrant recycling. PCBs are not sold any longer. Lead is present in a low enough concentration that is it less bothersome to treat the soil and leave the metals in place.

28. 'With the pre-burner in the unit at 1850°F - isn't that hot enough to release that lead right out of there?'

Since the furnace will be operating at 1600° F the lead should stay right in the soil. The SITE test should show that.

29. "Higher temperatures could be more efficient for removing the compounds wouldn't it?"

No. Higher temperatures require higher energy input levels. Thus, lower temperatures would cost less.

30. 'Why doesn't the DNR buy their own infrared unit to take from site to site for cleanup?'

Competition with private industry is not favored by State law. Also, the MDNR is unwilling to assume any liability due to their cleanup performance.

31. "Earlier you talked about cost recovery efforts. Are you thinking about litigation?"

Yes. Both the State Attorney General's Office and U.S. EPA Regional Counsel are involved.

32. 'How does the site compare to others-is this one of the first to be cleaned up under your program?'

This site is one of three to come this far through public comment on a final RI/FS. (Others are Novaco and Burrows)

33. "Are there large viable companies involved with this site?"

Yes.

34. Two local residents were interviewed by Channel 7 (of Detroit) as to their views concerning the site remedy. One remarked that the cleanup levels 'exceeded all her expectations for action at the site.' The other remarked that he thought 'it was the best thing to happen to the site in a long time.' The interviews aired July 1, 1987 on the local news program.

The U.S. EPA acknowledges the public support for the chosen remedy.

B. PRP Public Comments.

The joint PRP Committee has provided three volumes of comments on the RI/FS and the recommended alternative. One set of comments specifically addressed the RI/FS and provided the PRP's own risk assessment and feasibility study. Another set rails against the proposed plan as being (1) inconsistent with the law, and (2) arbitrary and capricious. Since the Rose project is a State lead, the MDNR will address the technical issues (part 2). Part 1 deals with the selection of alternative comments.

1. Selection of Alternative

The comments contained herein are from the document entitled: "Comments Submitted to EPA Region V On Behalf of the PRP Group at the Rose Township - Demode Road Site" ("the document").

- a. Page 1 of the document determines 'that the selection of thermal destruction as a remedy for the Rose Site is inconsistent with the law (CERCLA as amended by SARA) and is arbitrary and capricious. The costs of implementing this remedy cannot be recovered by the EPA as a result.'

The decision to remedy the site using thermal destruction will be defended in the following section as comments are responded to point by point. Thermal destruction was not arbitrarily arrived at as a remedy. EPA believes that cost recovery will not be denied as a consequence.

- b. 'The major flaws in the Record include EPA's:

- (i) Failure to obtain sufficient data before selection of remedy
- (ii) Failure to identify PRPs adequately
- (iii) Failure to provide for meaningful PRP participation in the formation of the administrative record
- (iv) Failure to place all decision-making data into the administrative record for the PRPs.'

(Responses)

- (i) Based upon EPA, MDNR and E.C. Jordan's (RI/FS contractor) best professional judgement, sufficient information is available concerning the Rose site to show that (1) potential substantial risks to receptors exist on site, (2) chemicals causing these potential risks need to be rendered risk-free (within established limits) to receptors, and (3) appropriate methods to deal with the chemicals may be identified and one or more selected to be implemented. The NCP does not list the exact number of water samples (for example) needed for a complete RI/FS. Instead, §300.68 (e) (2) deems that the factors (i through xvii) listed shall, as appropriate, be assessed in determining whether and what type of remedial (and/or removal) actions will be considered. Selection of a remedy [§300.68(i)] is based upon

determining a cost-effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of public health and welfare and the environment.

The Superfund Amendments and Reauthorization Act (SARA), which supercedes the NCP, iterates the need for treatment of contamination in a permanent manner (Section 121).

- (ii) Section 113(k)(2)(D) provides that the President "shall make reasonable efforts to identify and notify PRPs as early as possible before selection of a response action. Nothing in this paragraph shall be construed to be a defense to liability."

U.S. EPA notified seven of the PRPs of their potential liability at the Rose Township site in October of 1982. U.S. EPA has reviewed MDNR files and the court files from private lawsuits in an attempt to notify all PRPs. U.S. EPA has also told the identified PRPs that if they have any information linking more parties to the site, it would be reviewed and appropriate action would be taken. If the PRP committee knows of additional evidence linking other parties to the Rose Site, U.S. EPA welcomes its receipt.

- (iii) U.S. EPA has told the PRP committee that its comments on the proposed plan made to U.S. EPA prior to the closure of the Administrative Record will be incorporated into the Record.
- (iv) The Administrative Record for the Rose site will include all of the data upon which U.S. EPA based its decision.

c. 'The remedy selection decision is arbitrary and capricious because it:

- (i) fails to consider cost as required by CERCLA, the NCP, and EPA guidance, especially an unproven technology as selected
- (ii) fails to properly assess present and future risk
- (iii) fails to compare risks of the selected alternative's performance versus performance of other alternatives
- (iv) fails to consider all risks associated with construction and transportation activities of each alternative
- (v) fails to consider further in situ containment remedies
- (vi) improperly rejected in situ containment remedies during the selection process
- (vii) fails to recognize the diminished benefit of thermal destruction technologies at this site
- (viii) uses an inappropriate ground water contaminant model to predict future concentrations of chemicals which may be migrating from the site.'

(Responses)

- (i-viii) All relevant statutes and guidances were followed in evaluating risks, costs, and health benefits during screening of alternatives and the subsequent identification of onsite thermal destruction as a preferred remedy. Since these comments are vague as presented here and are expanded upon later in the document, the individual points will be responded to at that time.
- d. 'The administrative record and the RI/FS do not follow general principles of administrative law, in that they:
- (i) contain an inadequate level of detail;
 - (ii) do not describe the technical rationale for each conclusion reached;
 - (iii) do not provide an explanation of the weight that EPA placed on each factor in the NCP and CERCLA, as amended by SARA; and,
 - (iv) do not indicate when professional judgement was relied upon nor do they identify whose professional judgement was relied upon.'

Section 113(k)(1) of CERCLA requires that an administrative record be established upon which the selection of a response action will be based. Pursuant to this section, an administrative record has been prepared for the Rose site. U.S. EPA feels that this administrative record contains sufficient information to support U.S. EPA's proposed plan for this site.

The following section addresses more specific comments.

- e. The PRP group suggests that 'two months of official public comment time is within the reasonable time frame to comment as required by Congress. Without inclusion of requested documents in the Record, EPA's decision will be based on a defective Record and will be arbitrary and capricious.'

According to the NCP (§300.67 (d)), public comment periods are to last not less than 21 days. Public meeting(s) shall be held during this time period. The RI/FS was available to the public on June 22, 1987. Officially, public comment started June 29, 1987 as advertised in a local newspaper (Holly Times). As noted by the PRPs themselves, the comment period was extended to August 12, 1987 from July 29, 1987. Thus, an official comment period of 44 days was available to interested parties, more than twice the mandatory time period. SARA does not set a time period for public comment, only allowing a "reasonable" time period to comment (Section 113 (k)(2)(B)).

The PRP Committee must also be reminded that some of the PRPs were notified of their potential liability in 1982. Depositions taken in private lawsuits in 1981 and 1982 also made the PRPs aware of their potential liability at the Rose site. The RI/FS start was a matter of public record. If technical data were needed for review, all the Committee had to do was request them. It is unfair for the PRPs to wait over 40 months to request the data and then claim that U.S. EPA is at fault for their (PRP's) inability to review all of the technical data.

- f. 'Failure of the EPA to take all comments into account "at all stages of remedial action" is a violation of due process. Surely it would be a deprivation of due process to require PRPs to pay \$42 million without any hearing and with little opportunity to evaluate EPA's technical position, no less confront EPA's experts.'

Sections 113(k) and 117 of CERCLA outline the procedures that U.S. EPA must follow concerning public participation in the RI/FS process. Section 113(k) requires that U.S. EPA prepare an administrative record upon which the selection of a response action will be based. Section 113(e)(2)(B) provides that interested persons be allowed to participate in the development of the administrative record. Section 117 states that before the adoption of any remedial action, U.S. EPA must publish notice of the planned remedial action, provide for a reasonable opportunity for submission of written and oral comments, and provide an opportunity for a public meeting at or near the facility regarding the proposed remedial action.

As stated earlier, U.S. EPA has prepared an administrative record for the Rose Township site. U.S. EPA has also notified and provided the public with an opportunity to comment on the RI/FS. U.S. EPA held a public meeting on July 1, 1987 to discuss the proposed remedial action for the site. In addition, U.S. EPA has told the PRP group that prior to closure of the administrative record, all of the comments made by the PRP group during negotiation sessions with U.S. EPA concerning the selection of remedial action at the site will be part of the administrative record.

The PRP group seems to suggest in their comment that their due process rights would be violated if they are not afforded a hearing and an opportunity to confront EPA's experts. However, Section 113 (j) of CERCLA specifically states that "In any judicial action under the act, judicial review of any issues concerning the adequacy of any response action taken or ordered by the President shall be limited to the administrative record".

Recently, in United States v. Seymour Recycling Corp., et al., IP 80-457-C, the United States District Court for the Southern District of Indiana, Southern Division, specifically held that "judicial review of EPA's remedy selection on the basis of the administrative record will be in accord with the requirement of due process". (See court order of July 14, 1987).

- g. 'EPA did not comply with CERCLA, SARA, and the NCP in selecting the remedial alternative at the site. In selecting a remedy, EPA must consider:
- (i) alternatives which do not attain, meet, and exceed Federal and State ARARs;
 - (ii) alternatives which give a preference to remedial actions in which treatment which permanently and significantly reduces the volume, toxicity, and mobility of the hazardous substances, pollutants, and contaminants is a principal element;

- (iii) the short and long-term potential average health effects;
- (iv) the feasibility of alternatives;
- (v) the significant adverse effects and environmental benefits of each alternative. CERCLA, as amended by SARA, specifically requires the consideration of the potential risks associated with excavation and transportation of wastes and contaminated soil.
- (vi) the long-term uncertainties associated with land disposal and the goals, objectives, and requirements of the Solid Waste Disposal Act;
- (vii) the persistence, toxicity, mobility and propensity to bioaccumulate of the chemicals involved;
- (viii) the costs; and
- (ix) the degree of support for the alternative by parties interested in the site.

(Responses)

- (i) See the No-action alternative as described in the RI/FS.
 - (ii) Alternative 3, which addresses this issue, is described in the RI/FS.
 - (iii) All alternatives discuss this in the RI/FS.
 - (iv) See the FS.
 - (v) See the discussion for each alternative. Section 121(b)(1)(G), as partially quoted in the comment above deals with the consideration of risks involved with excavation and transportation (of contaminants) for redisposal or containment, which was done in the FS for Alternatives 2 and 4.
 - (vi) See the Alternatives Analysis in the FS.
 - (vii) See Section 7.5.2 of the RI/FS for discussion of bioaccumulation.
 - (viii) See the Detailed Analysis of Alternatives in the FS.
 - (ix) As a proposed, not chosen, remedy was presented to the public at the July 1, 1987 public meeting, the degree of support by parties interested in the site is being gauged. Recall in part A, comment 34, that two local residents were interviewed concerning the proposed plan and they expressed their support for the proposed project.
- h. EPA may also select an alternative that does not meet ARARs when:
- (i) The alternative is not the final remedy but will become part of a more comprehensive remedy;
 - (ii) The remedial action will attain a standard of performance equivalent to the ARARs;

- (iii) The State has not consistently applied (or demonstrated the intention to consistently apply) a State ARAR in similar circumstances at other sites within the State; and,
- (iv) The need for protection of public health and welfare and the environment at the site is out-weighed by the need for action at other sites which may present a threat to public health or welfare or the environment, considering the total amount of money in the Fund.

EPA must consider and weigh these various factors and select a remedy that protects public health and the environment and is cost-effective.'

(Responses)

U.S. EPA has weighed all pertinent factors before recommending the proposed plan. See the RI/FS and the Record of Decision for a thorough review. Recall that:

- (i) The proposed plan is intended to be a final remedy. While EPA may consider such an alternative (that does not meet ARARs), the proposed plan is more protective of long-term public health and the environment.
 - (ii),(iii) U.S. EPA may consider, but is not bound to select such an alternative (Section 121(d)(4).)
 - (iv) This site presents a potential risk to human health and to the environment. The proposed plan provides a cost-effective remedy for these risks.
- i. 'Containment is a legally permissible remedy. The pre-SARA CERCLA did not prohibit containment as means of remedy dealing with inactive landfills.'
- Post-SARA CERCLA does not prohibit the containment option, either. However, Section 121(b) relates that treatment options are to be preferred over non-treatment options. Please note that the Rose site involves a "midnight dumping" site, not an inactive landfill.
- j. 'SARA does not require a permanent remedy in every case. SARA expresses a preference for such a remedy, but only when it is cost-effective.'

True, SARA does not require a permanent remedy (see response to i). It does require us to consider the long-term uncertainties associated with land disposal, and the potential for future remedial action costs if the alternative remedial action in question were to fail. Containment remedies fit these categories, thermal destruction does not. (Section 121(b)(1)(A) and (F)). For a discussion of remedy selection and cost-effectiveness, see Section VIII of the ROD.

- k. 'In the "real world" decision making required by SARA, one must balance the facts: (a) there is limited incineration capacity; (b) the infrared thermal destruction units are of an innovative nature and unknown reliability; (c) the cost of thermal destruction is substantial, and (d) the benefit of thermal destruction of some wastes, particularly soils containing non-homogenous wastes, which include VOCs and metals, is questionable.'

The ROD does not specifically choose an infrared thermal destruction unit as the remedy. The ROD chooses onsite thermal destruction as the remedy. If an infrared device will not perform adequately, a rotary kiln device is an alternative. The infrared device is preferred, because it affords the same degree of VOC and PCB destruction as the latter device, although at an apparently lower cost. The estimated cost of thermal destruction is somewhat higher than the non-proposed remedies. However, the remedy is cost-effective due to its capability to permanently destroy major contaminants onsite. SARA does not preclude the use of an innovative and unknown technology, but rather encourages its use depending on the degree of "interested party" support (Section 121 (b)(2)). The question as to whether an infrared unit will perform adequately has been answered by previous testing. After the SITE program to be held onsite in October 1987, the time EPA and MDNR will assess whether the technology will effectively handle the Rose site waste.

- l. 'An in situ containment remedy is consistent with a "permanent" remedy since it would significantly reduce the mobility of any contaminants present at the site.'

EPA acknowledges the possibility of an in situ containment remedy being applicable if a permanent technology were not implementable at the site. However, the recommended remedy does a better job (and thus is "preferred" by Section 121 (b)) in reducing the volume and toxicity (and even the mobility of the indestructible metals) than any in situ containment remedy that is currently technically feasible. Please recall that the possibility of future remedial action (and costs) would exist if the waste would still exist in its present form (Section 121(b)(1)(F)). Also, containment would not prevent the migration of contaminated ground water offsite.

- m. 'EPA must "indicate the extent to which the release or threat of release may pose a threat to public health or welfare or to the environment." It must also consider the "extent to which Federal environmental and public health requirements are applicable or relevant and appropriate to the specific site, and the extent to which other Federal criteria, advisories, guidance and State standards are to be used in developing the remedy" (40 CFR §300.68 (e)(1)).'

U.S. EPA has considered these points, as found in the RI/FS and the Record of Decision.

- n. 'EPA must assess "the extent to which the alternative is expected to effectively present, mitigate, or minimize threats to, and provide adequate protection of public health and welfare and the environment." (40 CFR §300.68 (h)(2)(iv)).'

See response to comment m, above.

- o. 'EPA is also required by CERCLA to compare risks of the alternatives to ensure that the risks of implementing a remedy do not outweigh its benefits. The NCP provides that an alternative which does not meet ARARs or standards may be chosen if a remedy which satisfies all ARARs or standards would pose greater risks.'

40 CFR 300.68(g)(3), cited in the document, states that "if an alternative has significant adverse effects, and very limited environmental benefits, it shall also be excluded from further consideration." The recommended alternative has great environmental benefit in that the organic contaminants will be permanently destroyed and the heavy metals will possibly be immobilized.

- p. 'Consideration of costs is a central factor in selecting CERCLA remedies.'

Consideration of cost is one of several central factors in selecting site remedies. See especially Section 121(a) and (b) of SARA.

- q. 'The NCP specifically requires the "selection of a cost-effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of public health and welfare and the environment."'

EPA agrees with the above comment, and adds that SARA (Section 121) mandates preference for selection of such alternatives.

- r. 'The NCP specifically lists costs first among the factors to be considered in selecting among remedies which adequately protect public health and the environment.'

Comment noted. See response to p., above.

- s. 'Cost is also considered when determining whether the alternative is technically practical to implement at the specific site. This is particularly true where the purported benefits of an innovative technology may not be realized (i.e) having to landfill soils subjected to thermal destruction due to their content of heavy metals.'

Once again, Section 121(b)(2) of SARA allows EPA to select a remedial action yet unproven at another site. Section 121(b)(1) encourages the use of permanent solutions and alternative treatment technologies. Based on available data, the infrared unit has been proven to perform well on Rose-type wastes. Therefore, it is likely that infrared thermal destruction will effectively and cost-effectively clean up the site. If the pilot test proves otherwise, a rotary kiln device will be tested. If thermal destruction proves to be impractical, EPA will have to consider implementing another remedial alternative.

- t. 'Cost also is important in deciding whether CERCLA's Fund balancing test applies.'

EPA agrees with the comment.

- u. 'EPA draft guidance also states that:

"Where the leachate migration potential from contaminated soils or mixed waste is small, and/or the toxicity of the leachate is low, land disposal will be the cost-effective, highly reliable management alternative. [From interim criteria for Selecting Alternative Technologies, February 6, 1986, Henry Longest II, Director's Office of Emergency and Remedial Response, to Waste Management Directors and Regional Counsels.]"

The above quoted memorandum has been superceded by an Office of Solid Waste and Emergency Response (OSWER) Final Directive entitled: Interim Guidance on Superfund Selection of Remedy, dated December 24, 1986. (Directive Number 9355.0-19) The directive is from J. Winston Porter, Assistant Administrator, to Regional Administrators, Directors of Waste Management Divisions, and Regional Counsels. It states that "cost is an important factor when comparing alternatives which provide similar results." And, "cost may be used to discriminate among treatment alternatives, but not between treatment and non-treatment alternatives" (p5). In other words, in situ non-treatment of soils, favored by the PRPs, is not the better alternative solely because it is less costly than the EPA recommended alternative.

- v. 'In consideration of the Public preference for a remedy, nothing in CERCLA or its legislative history indicates that Congress intended that EPA abdicate its responsibility to make informed remedial decisions and simply allow the public or a state agency to thrust a remedy upon it. Congress did not intend by including Section 121 (b)(2) in SARA that EPA ignore or give less weight to the other factors in SARA, particularly costs. EPA cannot select a non-cost-effective remedy simply because the State of Michigan or some member of the public demands it.'

EPA realizes that public preference (Section 121 (b)(2)) is not the only deciding factor in selecting a remedy for a site. Recall that EPA and the State present the alternatives to the public and show which remedy is recommended. The public's role is to provide comments with respect to the proposed plan (Section 117). No member of the public nor of the State Agency "demanded" that thermal destruction be used onsite. Rather, it is an alternative that they generally agree on as being the appropriate cleanup remedy for this site that satisfies the requirements of the NCP and of SARA.

- w. 'EPA also should not ignore the concerns of the community members who live near the site. It is likely that the enthusiasm for excavation and thermal destruction of the wastes would be considerably less among those citizens.'

From the response at the July 1, 1987 public meeting held in Rose Center, Michigan, it appears that the citizens who live closest to the site are very enthused about onsite thermal destruction in contrast to the responsible parties who live far removed from any dangerous wastes.

- x. 'In sum, EPA must balance the needs of all the public, not just those of the state officials or citizens who live in the immediate vicinity of the site. Herein, the PRP groups raise substantial concerns about the soundness of EPA's preferred remedy. Each individual error is enough to make EPA's decision arbitrary and capricious. The sum total of these errors renders EPA's decision fatally flawed.'

The preferred remedy has been chosen according to statutes and EPA guidelines. Public opinion has been weighed carefully. Our proposed plan has not been arbitrarily chosen and the decision is based upon Congressional intent to cleanup and destroy (where possible) wastes rather than leave them in the ground where found.

- y. 'The lack of data to connect the chemical-bearing aquifer to the aquifer in which the closest domestic drinking water wells lie (is the reason that) EPA's premise that protection of a drinking water supply is the basis for selection of an excavation and thermal destruction remedy is unsound.'

The connection of the aquifers is logically inferred at this point. It should be noted that ground water contamination was not the primary reason for recommending the thermal destruction alternative. The hazards posed by the PCBs onsite, as well as the SVOCs threatening the water table both contributed to its selection. The ground water, to be treated by extraction and air stripping, is protected by Michigan Act 245, enacted to preserve all potable aquifers, currently in use or not.

- z. 'Many of the backup documents for the calculations in the RI/FS are not present on the face of the document.'

As stated in the comment document, the PRPs have submitted a FOIA to remedy the situation.

- aa. 'The decision to select the alternative was not made in accordance with the law and is arbitrary and capricious.'

Response to this general comment has already been made in previous sections.

- bb. 'E. C. Jordan's RI/FS fails to follow EPA guidance, and is so conclusory and vague that it provides no basis for EPA's decision or for subsequent judicial review.'

The RI/FS adequately follows the guidance and allows for a decision that hazardous chemicals have degraded the environment and they are also a risk to potential receptors. The ROD provides the reasoning behind the remedy selection process.

- cc. 'Specifically, the RI/FS is arbitrary and capricious because it:

(i) fails to make findings required by CERCLA;

(ii) provides inadequate information upon which to base any remedial decisions;

(iii) ignores the Congressional mandate for selection of cost-effective remedies;

(iv) fails to evaluate, in a meaningful manner, the other remedial alternatives particularly in situ containment alternatives;

(v) contains an inadequate and flawed Risk Assessment which fails to consider the present threat to public health from the site; and

- (vi) considers local, state and federal permits (and) institutional requirements for onsite remedial alternatives despite the fact that the NCP clearly requires no permits.

The cost of implementing the chosen alternative thus cannot be recovered by EPA. EPA must initiate a new remedy selection process which cures these defects in conformance with the NCP.'

(Responses)

- (i) EPA feels otherwise. The findings are in the ROD and the Administrative Record.
- (ii) See response to previous comment (bb).
- (iii) Cost-effectiveness does not mean the least-cost remedy. The "Interim Guidance on Superfund Selection of Remedy", dated December 24, 1986, indicates that cost is to be considered when comparing alternatives providing the same level of protection. That is, the findings of cost effectiveness requires ensuring that the results of a particular alternative cannot be achieved by less costly methods.
- (iv) Most in situ alternatives were screened out in the FS as being impractical and/or not protective enough of the public health and the environment. Note that Alternative 5 is a containment remedy.
- (v) Rose Township is a remedial site. As such, a present and future Risk Assessment is conducted for the site conditions.
- (vi) Section 121(e) of SARA requires no permits for onsite remedies. EPA agrees that none are needed.

Overall, the RI/FS, the ROD, and the Administrative Record demonstrate the procedures used by EPA, MDNR, and other Agencies to evaluate alternatives and select a final remedial plan. This process is intended to avoid an arbitrary and/or capricious selection.

dd. ' A review of the RI/FS demonstrates that EPA failed to assess risks adequately and correctly as required by law. The risk assessment inadequacies are:

- (i) an incorrect assessment of exposure from a hypothetical well located in the center of each plume rather than from the nearest downgradient drinking water well as required by EPA guidance;
- (ii) failure to follow the indicator chemical selection procedures;
- (iii) utilization of a chemical transport model which assumes an instantaneous input of contaminants into the aquifer rather than the more realistic assumption of continuous input over time;
- (iv) the ignoring of the data which indicates (sic) that no contaminants are presently migrating from the site;
- (v) utilization of MCLGs rather than MCLs as required by EPA guidance;

((vi) failure to compare the risks of incineration to those of containment.'

(Responses)

- (i) Risks are assessed as both present and potential exposure to receptors. The placement of a well in the center of the plume is a worst-case scenario and is supported by enforcement of Michigan Act 245. Act 245 serves to protect the present or future use of a potable aquifer (as the Rose site aquifer would be if not contaminated by PRP wastes).
 - (ii) The selection process for indicator chemicals as outlined in the Public Health Evaluation Manual (PHEM) is a general guideline and not a mandated approach. This comment is addressed further in the Technical Section (Part 2) of the Responsiveness Summary.
 - (iii) The rationale for use of the chemical transport model is discussed in the RI/FS.
 - (iv) Data which indicate that no contaminants are presently migrating from the site are non-existent. Some PCBs are found in the marsh sediments, lead exceeds its AWQC in the surface waters, and the northern vinyl chloride plume threatens to reach Demode Road in the very near future. Seepage to the marshes is contaminated as well.
 - (v) Where MCLs exist, they were used. The only chemical of concern which used its MCLG was chlorobenzene. It has no MCL, thus, the target cleanup level (TCL) for chlorobenzene was to be calculated based on risk indices. Since a MCLG is a health-based criterion, it is appropriate to use it as a target cleanup level in this case.
 - (vi) The risks of containment were not compared further since this alternative was screened out in the Initial Screening of Alternatives Section in the FS.
- ee. 'The risk assessment in the RI/FS at this site fails to comply with EPA policy, methodology and guidance. It should provide a qualitative sense of the magnitude of the existing risks presented by the site and the risk that might be presented if a reasonable containment alternative is implemented, along with an understanding of which factors control the risk.'

The risk assessment does provide a sense of the magnitude of the existing and potential risks posed by the Rose site. In the detailed analysis of Alternative 5, a containment remedy, discussion of the risks of implementability is presented.

- ff. 'The methodology of the ground water risk assessment is incorrect - it should evaluate the risk of ingestion of water from the nearest downgradient drinking water well, not from such a well in the center of each plume.'

(As the PRPs noted in their comment (p28) document, EPA guidance requires that the exposure point will be the geographic point of highest individual exposure for a given release source/transport medium combination. This

was done for the PCB/metals exposure routes for soils. Since ground water is not the only significant risk onsite, a conservative approach was used to estimate the risk to receptors. The risk to receptors at downgradient domestic wells is a potential risk, not a present risk.

- gg. 'An objective review of the site data indicates that there is no present significant risk.'

The comment document provides no supporting risk calculations to back this statement. Seemingly, it ignores the contact hazards of the PCBs and lead, plus environmental damage due to those chemicals. Our proposed plan is based on potential and probable risks to receptors.

- hh. 'The future risk according to EPA calculations, even if no remedy is implemented, would be virtually zero for over 250 years. After 250 years, the risk, at worst, would be low in an absolute sense; lower than the risk levels typically considered by EPA as unworthy of regulatory action; and lower than the levels permitted in EPA's guidance for determining cleanup levels. Even this de minimis and remote risk, however, would be virtually eliminated through the implementation of cost-effective in situ containment measures.'

The future risks to potential receptors have been shown (in the Risk Assessment) to exceed the target risk range (10^{-4} to 10^{-7}) far into the future. The ground water plumes are spreading and migration offsite will occur. The U.S. EPA would be remiss in its duties to protect the environment if it were to allow a known treatable source to further degrade a large expanse of a potable aquifer. Soil contact risks are ignored in this comment. These also are not zero at present or in the future. EPA questions whether an in situ containment remedy will prevent ground water plumes from migrating downgradient in the future.

- ii. 'The most significant errors in EPA's assessment of risk include the improper use of EPA maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) as ARARs.'

Where found, noncarcinogen MCLs were used as target cleanup levels (TCLs) for the Rose site. Where multiple contaminants exist, the MCLs were reduced accordingly to allow for these multiple risks. For carcinogens, MCLGs are all zero, which of course, are technically impractical. MCLs yielded unsatisfactory risk levels for the target chemicals in the plumes. Thus, risk-based target cleanup levels were calculated. Vinyl chloride, for example, has a 10^{-6} health risk-based TCL of 15 ppt (northern plume), but the detection limit is higher than this value. Thus, the TCL is essentially at non-detectable values for this chemical.

- jj. 'EPA failed to use the 100 ppm arsenic soil advisory level determined by ATSDR as "safe". Even though 10 ppm is within the range of the background level of arsenic (1 to 14 ppm), actual measurements of uncontaminated soil may indicate a higher background. EPA failed to adequately characterize the background levels of arsenic, which may result in EPA excavating and incinerating larger quantities of soil containing no chemicals attributable to the site (i.e. arsenic).'

Currently, EPA is re-evaluating the arsenic soil TCL in light of this comment. The matter will be resolved before a ROD is signed. Arsenic in the ground water does have a MCL of 50 ppb, however.

- kk. 'Additionally, EPA failed to consider its own 25 ppm soil cleanup advisory level for PCBs. Although recently characterized by EPA as not presenting an unreasonable risk, the RI/FS arbitrarily uses 10 ppm (as a TCL).'

Again, the PCB TCL is a health-based cleanup level. EPA has also received comment from the U.S. Department of the Interior Fish and Wildlife Service concerning the PCBs on the Rose site. Before it will release natural resources liability, the Fish and Wildlife Service would like to see a PCB TCL of 0.1 mg/kg for soils on site. (This value is based on protection of wildlife).

- ll. 'The following criteria cause a failure to properly assess present and future risk due to site contamination and subsequently exaggerated the risk from the site. This causes EPA to propose a non-cost-effective remedy to protect against this exaggerated risk:

- (i) The use of chemical contamination levels in the center of the ground water plume to estimate the present and future risk, rather from the nearest drinking water well;
- (ii) Faulty selection of indicator chemicals in performing the risk assessment; and
- (iii) The use of questionable chemical transport model and faulty input parameters to establish future risks;

(Response)

Each of these parameters have previously been discussed and need not be treated further.

- mm. 'The PRPs question the value of the risk assessment since the linear extrapolation model for estimating carcinogenic risk from exposures at low chemical concentration levels is uncertain.'

The MDNR and EPA choose to handle risk assessments with methods that are scientifically documented and currently used in the Toxicity field. The linear multi-staged extrapolation model is one of the few well-established models currently in use. As the PRPs noted in their comment document (p37), the results of a risk assessment are not a measurement of the "real" concern risk but a "plausible upper limit to the risk [calculated for regulatory purposes] that is consistent with some proposed mechanisms of carcinogenesis..."

- nn. 'Virtually all EPA and other federal regulations require action to reduce risks only when the lifetime upper-bound cancer risk is in the range of 10^{-4} to 10^{-7} level. EPA often uses the 10^{-5} cancer risk level as an acceptable risk management level.'

Region V policy is to attain the 10^{-6} risk level for complex contaminant mixtures where technically feasible and cost effective.

- oo. 'EPA's suggestion that the public health is threatened by the Rose Township site is not supported by the Record, in that:

- (i) the present risk is virtually zero,

- (ii) future risk would be zero for over 250 years,
- (iii) after 250 years, the risk would be lower than that which requires regulatory action.'

(Response)

These comments have been addressed previously.

- pp. 'Even assuming that the public health was threatened, the proposed remedy of thermal destruction would simply expend limited financial resources only to concentrate the chemicals of primary concern, heavy metals, in the ash, which would then need to be reburied [presumably means landfilled] elsewhere. Reburial of the concentrated metals would present the same risks as in situ containment of the original soils. Thus, nothing in the record supports the inordinately expensive remedial measures being contemplated for this site. Its selection is arbitrary and capricious.'

The public health is threatened, as are the environmental surroundings. Thermal destruction is the primary treatment to deal effectively with PCBs. Reburial of lead-containing ash that passes EP toxicity test does not present the same risks as in situ containment remedies, as explained in the FS. The remedy is expensive, yet cost-effective when considering alternatives affording the same level of protection. Note that the proposed plan will remove the continual source of ground water degradation as well.

- qq. 'The risks of performing the various alternatives have not been adequately compared as required by CERCLA and the NCP (Section 121(b)(1)(G)). The record does not contain:

- (i) Adequate discussion of risks associated with excavation and onsite thermal destruction.
- (ii) A discussion of the residual risks which could remain after the implementation of a reasonable containment remedy,
- (iii) A review of the risks of transportation offsite.'

(Responses)

- (i) See the discussion of Alternative 2 and 3 in the FS for evaluation of excavation risks and thermal destruction risks.
 - (ii) A discussion of containment risks was presented in the detailed discussion of Alternative 5. The risks include future continual ground water degradation, remedy failure, and bioaccumulation and subsequent human exposure due to ingestion of contaminated biota.
 - (iii) See Alternative 2 in the FS.
- rr. 'EPA has admitted the potential of significant risks from excavation and incineration (in the RI/FS).'

Yes, there are potential risks with incineration. All OSHA regulations will be followed to protect personnel and the environment from harm.

If risks are shown to be too great, another alternative may need to be chosen. However, these are mainly short-term risks associated with thermal destruction versus long-term threats and risks associated with containment remedies. Section 121(b)(1)(A-G) of SARA tends to favor low, short-term technological risks versus long-term health risks on site.

ss. 'Excavation and thermal destruction are:

- (i) inherently risky,
- (ii) extremely costly,
- (iii) time consuming, and
- (iv) unproven (thermal destruction) on non-homogeneous waste soils.'

(Responses)

- (i),(ii) These have been previously addressed.
- (iii) Only 3 years should be needed to complete this part of the remedy.
- (iv) This will be addressed by the SITE program test and during remedial design.

tt. 'Excavation may also present significant risks resulting from:

- (i) The disturbance of soil and release of chemicals into the air,
- (ii) The exposure of wastes to greater moisture infiltration which would increase chemical migration into the ground water,
- (iii) Greater risks from volatilization of chemicals from the large volumes of water which would need to be collected and treated,
- (iv) The exposure of workers to chemicals,
- (v) Accidents during operation of the heavy equipment.'

(Responses)

- (i) This is addressed in the FS and in response to comment rr.
- (ii) Ground water treatment will be occurring anyway.
- (iii) The additional risk from air stripper emissions has been calculated by the EPA to be on the order of 10^{-8} to 10^{-9} . (See Appendix L).
- (iv, v) Safety procedures must and will address these possibilities.

uu. 'Additional risks from disposal of ash offsite will occur. These are:

- (i) Accidents and subsequent spillage during transportation,

- (ii) Chemicals tracked offsite by tires of trucks leaving the site,
- (iii) Inhalation of vapors and dusts at the incinerator and at the ash reburial site, and
- (iv) Disposal risks.

Failure to account for these risks is arbitrary and capricious. The selection of EPA's preferred remedy is inherently flawed.'

(Responses)

These concerns have been addressed herein. Also, see the discussion of Alternative 2 in the FS. The same principles apply for possible ash disposal in Alternative 3.

- vv. 'At Rose, the costs of the alternative chosen far exceed the costs of containment and fails to provide any greater public health or environmental protection.'

The costs are higher for the recommended alternative, yet it is cost-effective because it protects the public health and the environment over the long-term versus short-term for containment. See Section 121(b)(1)(F) of SARA.

- ww. 'The technical reliability of infrared thermal destruction is uncertain. Its unreliability is underscored by the fact that EPA is utilizing its Superfund Innovative Technology Evaluation Program (SITE) to test this technology. It is one thing for EPA to perform research in furtherance of its overall mandate, but it is quite another to require PRPs to pay for research rather than remediation.'

Data from use of infrared technology on other Superfund sites and laboratory tests have proven the unit's effectiveness on PCBs and (possibly) in the fixation of lead. Contrary to what the PRPs believe, they are not being charged for the SITE program test to be run at the Rose site.

- xx. 'The preference for thermal destruction at this site is arbitrary and capricious. Thus, the only choice supported by the Record is some type of containment.'

EPA's preference for thermal destruction has been previously justified. The PRPs allegation that "the only choice... is some type of containment" is arbitrary itself, since no supporting data were presented with this statement.

- yy. 'A containment remedy at this site could eliminate any potential for public exposure to contaminated soils and minimize migration of chemicals into the ground water.'

The uncertainty of public protection by containment remedies caused them to generally be screened out during the initial screening of alternatives.

Section 121(b)(1)(F) of SARA, as discussed earlier, is relevant here, also. SARA calls for the EPA to prefer remedies that use treatment to

permanently and significantly reduce toxicity, mobility, or volume of waste over remedies that provide protection through prevention of exposure.

- zz. 'Congress did not mandate excavation and thermal destruction in SARA. Rather, SARA requires a reasoned and public decision-making process which encompasses consideration of all reasonable alternatives, including containment.'

Congress did not mandate any specific remedial alternatives for site cleanup. However, they did mandate that EPA prefer treatment remedies and permanent solutions over those which do not reduce the toxicity, volume, or mobility of the waste. Thermal destruction was recommended as a remedial action after carefully considering all types of alternatives in accordance to statutes and EPA guidance.

- aaa. 'EPA's consideration of the need to comply with state permits is contrary to the NCP, EPA policy, and SARA. (Table 10-5 of the RI/FS suggests that state permits may be required for implementation of on-site remedies.)'

If the remedial process is delayed because of permit applications, then they will probably not be sought. However, EPA wishes to foster good relations with the states and is willing to go through permitting processes when it is able. In any event, EPA will meet the technical requirements of the permits.

- bbb. 'EPA must consider reasonable alternatives during the process of selecting a remedy at a CERCLA site, therefore rejecting reasonable onsite containment as a remedial alternative is improper.'

This comment has been discussed previously. See the FS for alternative consideration and screening.

- ccc. 'Both CERCLA and RCRA contemplate the need to take action short of excavation, including a containment scheme which is designed to protect public health. Action other than slavishly meeting the technical landfill design agreements of RCRA will accomplish the common goal of CERCLA and RCRA - the protection of public health. Such actions are permitted by EPA regulations.'

EPA feels that its proposed plan is more protective of human health and the environment for reasons already discussed.

- ddd. 'The PRP Group requests that EPA:

- (i) revise the RI/FS so that it evaluates all appropriate factors [particularly comparing onsite thermal destruction with containment] before selecting a remedy;
- (ii) revise the RI/FS to adequately and properly consider all reasonable alternatives, including in situ containment, according to the factors set forth by SARA and the NCP;
- (iii) Comply with CERCLA, as amended by SARA, the NCP, and general principles of administrative laws; and
- (iv) recommend a cost-effective remedy which will adequately protect the public health.

If EPA fails to address the flaws in the RI/FS, its costs of implementing the selected remedy cannot be recovered.'

(Response)

EPA has performed its statutory requirements to the fullest extent practicable. A cost-effective remedy which is fully protective of long-term public health has been recommended for implementation.

2. Technical Comments

The following comments are taken from a document submitted by the PRP Committee entitled: "Fred C. Hart Associates, Inc. Review of the E. C. Jordan Final Report." The document evaluates the work performed by E. C. Jordan which was used to develop the RI/FS and it presents a summary of conclusions based upon the evaluation. The MDNR addressed the majority of the technical comments.

- a. "Jordan's assessment of the Site shows that there is no present exposure risk from the groundwater and that chemistry data confirms (sic) that no chemicals of concern are presently leaving the site."

As addressed earlier, the major risks from ground water exposure are present and future potential risks. Chemistry data do confirm that chemicals of concern are leaving the site. There are PCBs in marsh sediments, lead exceeds AWQC in the marsh surface waters, and a seepage sample also showed PCB contamination.

- b. "Jordan has failed to follow the procedures outlined in the Superfund Public Health Evaluation Manual (PHEM) and has improperly assessed present and future risk in accordance with EPA policy and guidance."

U.S. EPA and MDNR believe that the risk assessment is valid and properly shows the potential risks to receptors of chemicals from the Rose Site.

Specific comments follow:

- c. "No evidence is provided that establishes a direct connection between the aquifer beneath the Site and the aquifer from which local residents obtain their drinking water."

The PRP emphasis on a lack of direct evidence on the connection between domestic wells (nearest receptors) and the contaminated site aquifer(s) is misplaced. Anyone would be "hard pressed" to state there is no connection, simply based on the geologic nature and complexity of this site. Circumstantial evidence alone suggests a connection: over the entire site there is a hydraulic connection between the shallowest and deepest aquifers. The vast majority of domestic wells in the area are finished above the deep clay till (if it is present beyond the site).

- d. "Even if one accepts the unsubstantiated assumption that there is a connection between the aquifers, there still is virtually no risk because a conservative (e.g. over-estimation) prediction of groundwater movement

indicates that at a minimum, it would take over 250 years for any chemical of concern to reach the nearest drinking water well."

The ground water flow velocity in the report was understated: in the northern portion of the site, vinyl chloride is present in significant concentrations and the groundwater in this contaminated area is moving at a rate between 200 and 500 ft/yr. In only a few years, this contamination is likely to move to many receptors. And, according to Michigan law, the ground water is contaminated and it must be remediated, regardless of the proximity of present receptors.

- e. "Jordan did not compare the risk of implementing the selected remedy with the present risk of the Site."

The present risk of the Site has been shown to be very great for a long period of time. The risk of implementing the proposed plan should be minimized by standard engineering and safety practices. Possible extra short-term risks posed by implementation of the remedy are balanced by permanent remediation of the site.

- f. "Jordan's selected remedy did not address the potential risks related to the release of volatiles during soil excavation or adequately assess air emissions during incineration and the reliability/implementability of thermal destruction."

EPA recognizes that some volatiles will be lost when soil is excavated, which may pose an inhalation risk to the workers and the surrounding community. However, these risks are expected to be minimized through the use of safety procedures during remedial action. Note that the ground water degradation source will be removed, thereby reducing considerably the long-term risks due to ingestion of contaminated water.

- g. "Jordan's exposure scenario utilizes assumptions that are not reasonable. For instance, contrary to guidance in the PHEM, Jordan has chosen a drinking water exposure point that is within the center of the on-Site groundwater plume. Jordan's soil exposure scenario assumes that local hikers will choose an abandoned industrial waste Site as a picturesque locale for a hike and while on Site eat enough soil to incur a significant health risk."

Selection of a well in the center of a plume as a reasonable worst-case scenario is, in U.S. EPA's and MDNR's opinion, not inappropriate for this site. As discussed in a recent RD/RA negotiation meeting with the PRPs (September 3, 1987), Jordan's soil exposure scenario used a hunter as the most likely adult exposure, and soil ingestion was not used as a likely exposure scenario.

- h. "Some of Jordan's scenario's are not only unreasonable but impractical. Jordan assumes as a potential soil receptor the hypothetical snowmobiler, even though it would be expected that this person would be riding during the winter months while snow covers the frozen ground, when Jordan had stated that no soil contact is expected. Additionally, it is hard to understand how someone wearing winter clothes, including gloves, would be susceptible to dermal contact from frozen soil."

Snowmobiling was not used as an exposure scenario. It is only an example of present site use. This, too, was discussed with the PRPs on September 3, 1987.

- i. "Jordan has selected cleanup standards that are contrary to EPA Policy. See J. Winston Porter Memorandum (July 9, 1987) concerning guidance on selection of ARARs, and Lee M. Thomas, letter to the Honorable James J. Florio (May 21, 1987). [Specifically, the document feels MCLs, rather than MCLG's, are ARARs.]

The RI/FS utilized health-based risk calculations to formulate cleanup levels where no MCLs exist. The only exception is vinyl chloride, since the MCL shows an unacceptable risk to potential receptors. However, the TCL calculated (15 ppt) for vinyl chloride is way below detection limits for the chemical, such that the final TCL will approximate the MCL (2.0 ppb) as a result. MCLGs for carcinogens are zero, which is impractical to clean up to.

- j. "Jordan failed to adequately compare the risks, benefits and costs of the Remedial Alternatives."

See the RI/FS for the discussion of comparison of risks, benefits, and costs of the remedial alternatives. U.S. EPA and MDNR feel that it is adequate in its scope.

- k. "Target Cleanup Levels (TCL) are incorrect or overly conservative for some chemicals based upon particulate/water partition coefficient (Koc) values and/or a risk level of 10^{-6} , and not an appropriate cleanup standard. In the case of vinyl chloride, a TCL was calculated starting with an unnecessarily conservative groundwater cleanup standard (TCL of 0.015 ug/l, vs. EPA MCL of 2 ug/l). Jordan initially chose a soil TCL goal for arsenic of 0.828 ppm when the Agency for Toxic Substances and Disease Registry (ATSDR) of the Center for Disease Control has determined that a level of 100 ppm is a safe level based on the risk from the direct ingestion of contaminated soil by a child (Fed. Reg. Nov. 20, 1985, p. 47923)."

Vinyl chloride was discussed above. As discussed in the ROD, a cleanup level of 14 ppm for arsenic has been set based on background levels in the soils and health-based risk calculations using current available data.

- l. "Jordan's TCL for arsenic in soil (10 ppm) is below the top range of background levels of arsenic found on Site (Table 8-2). It is clearly unreasonable to present a cleanup level that would remove soil that would in some cases be below background levels.

U.S. EPA agrees that it would be unreasonable to cleanup below background levels in the case of arsenic. As stated above, the TCL for arsenic in soils has been set at 14 ppm, which is the highest recorded background level at the site.

- m. "Jordan has used an inappropriate groundwater contaminant model to predict future concentrations of chemicals. The model assumes a single input of chemicals into the environment; this is incorrect based upon known disposal facts and Jordan's own assessment of Site conditions (pg 3 - Final Report RI/FS June 1987).

Hart's criticisms of the chemical transport are basically acknowledged by Jordan in the text of the RI/FS. The Agencies believe that this is a reasonable simplified modelling effort. As more data become available for the complex geology at the site and for the chemicals of concern, more extensive modelling can be performed. Nothing in the FS provided by Hart suggests anything else which could resolve their own criticisms.

- n. "Jordan's choice of monitoring well RW-7 for the groundwater receptor point required that the initial input concentrations of groundwater into the model be obtained from RW-7. RW-7 was not properly constructed nor was it sampled according to EPA protocol. These factors result in inaccurate (excessive) input concentrations, and may have led to an over-estimation of receptor concentrations at the nearest domestic well as predicted by their model."

Use of monitor well RW-7 is appropriate for this site. Hart's concern about the construction of RW-7 is insignificant. The well log indicates the presence of odors and a greenish color in the aquifer (also there were red coloring of clays above, which strongly suggests contamination). Typical well construction for this phase of the study included letting the formation collapse around the well screen. If any drill cuttings were used as backfill material, it would have been from the sediments in or above the aquifer. Also, it is likely that it would have been the low permeable overlying clays. Further, these cuttings would have been placed above the bentonite seal. Thus, this location suggests that concentrated contaminants existed before the well was placed here, and the chemical results show contamination is still present in high levels. If it is accurate (which is doubtful) that this well was not properly evacuated before sampling, then the volatile chemical levels present would likely be lower than those actually in the aquifer.

- o. "The model assumes no attenuation of chemicals due to dilution, adsorption, volatilization or biodegradation, in direct contrast to the methods of an expert in the field that Jordan has often retained, Dr. James Dragun. Dr. Dragun has noted that these processes are important to quantify in order to properly assess the health hazards associated with chemical concentrations in groundwater."

As stated earlier, Jordan has acknowledged the limitations of their ground water transport model. See response to comment m, above.

- p. "Jordan has also used estimated concentrations in calculating exposure to indicator chemicals. This is not authorized by the PHEM and is contrary to accepted scientific methodology."

According to our interpretation of the RI tables in Chapter 7, it is true that some estimated values were used for evaluating chemicals as the average concentrations in the respective plumes. The worst-case concentrations, i.e., the highest concentrations found, were not estimated values. A likely reason that some of these average concentrations are denoted with a "J" qualifier is that the average values determined may have been noted as approximate values. Also, they may be below the CLP detection limit, but above the analytical detection limits of the procedure used. According to our interpretation, nowhere in the PHEM is this practice forbidden, nor do we believe it is contrary to accepted methodology. It is a mechanism

which allows some quantitative analysis of potential risk, particularly when taking average values, since these would automatically be an extrapolation of some hypothetical mean value.

- q. "Contrary to EPA guidance, Jordan has not used a quantitative method of selecting the chemical of "highest concern". Because of this, and the fact that a confusing selection rationale was used, reviewers cannot properly evaluate the conclusions drawn by Jordan's Baseline Risk Assessment presented in the RI/FS."

and,

"Some of the indicator chemicals Jordan has chosen were detected with such low frequencies and magnitudes that the resultant analysis is of virtually no significance. Additionally, some laboratory detections are estimated concentrations which are not accurate."

While it is true that Jordan did not utilize the worksheets provided in the Superfund Public Health Evaluation Manual (PHEM) to quantitatively "score" the indicator chemicals, professional judgement, based on knowledge of the chemicals' physical/chemical characteristics, relative toxicities, concentrations detected in various media, and representation of various approximate mobility categorizations were used to identify the indicator chemicals. The selection process for indicator chemicals as outlined in the PHEM is a general guideline which considers these same general characteristics and allows one to take a "cookbook" approach to assign a quantitative score to the chemicals found at a particular site. The process used by Jordan may have selected several chemicals as chemicals of concern that may not have been necessary, (e.g., 2-butanone and isophorone), but when the quantitative risk assessment was conducted these chemicals dropped out of the process and no target concentration levels were developed to drive the cleanup. Having unnecessary indicator chemicals is not critical, it only provides additional work for the risk assessor when establishing the quantitative risk assessment. A problem could arise if, in the indicator chemical selection process, a chemical of concern were missed, and because of some unusual physical/chemical properties or extreme toxicity, would not be adequately addressed by the selected remedial action for the site. However, this was not the case for this site.

- r. "Many typographical errors exist. Numerous inconsistencies in criteria values are presented for Tables 6-3 (pg. 69) and Table 7-2 (pg. 81) (e.g. Chlorobenzene - 250 ug/l vs. 19,500 ug/l (AWOC); Methylene Chloride - 1500 ug/l vs. N/A (Health Advisory); Methylene Chloride - 193,000 ug/l vs. 0 (Freshwater Acute))."

The errors have been corrected in the tables noted above.

- s. "Soil incineration proposed by Jordan may in fact increase the levels of inorganics in the soil/ash and may result in a soil/ash waste product that must still be disposed of as a hazardous waste. Jordan has not adequately addressed the potential disposal problem."

This will be addressed during the design treatability testing. If found to be significant, U.S. EPA will reconsider the proposed plan.

- t. "In identifying and screening remedial alternatives, Jordan has failed to adequately consider how the combinations and distributions of the various chemicals on-site will complicate the selection of appropriate technologies. Technology used to remediate a chemical specific group may cause the release and distribution of pollutants."

This, too, will be addressed during the design-phase. The proposed plan is intended to permanently address all aspects of chemical pollution through destruction (or immobilization in the case of metals).

- u. "The remedial alternatives recommended could lead to an increase in exposure of workers, the public and the environment to the chemicals of concern on site."

Standard safety engineering practices should minimize this short-term risk. However, the greater benefits of long-term risk reduction more than compensate.

- v. "The remedy recommended in the FS cannot ensure that the chemicals of concern in groundwater and soil will be destroyed or rendered harmless. Even Jordan has stated this in their evaluation of the remedies."

The design phase testing will shed more light on the reliability of the proposed plan.

- w. "The inconsistencies found within the report along with the generally poor presentation of data makes it difficult to evaluate the findings. The report does not describe the technical rationale for all conclusions and does not indicate when professional judgment was relied upon or identify whose judgment was used."

The report indicates that remedial action needs to be taken at this site. The Administrative Record contains all of the information relied upon in the selection of the remedy.

- x. "Jordan has failed to consider the inherent risks to workers and the general public inherent in the excavation, incineration and possible movement of soils off-site. In view of the very low risks from the site, the inherent risks of this type of remediation may substantially exceed the risks at the site."

The present and potential risks at the site are not "very low," but are rather substantial. Risks of implementing the remedy are considered in the description of the alternative in the FS.

- y. "Only the lack of time prevents this review from criticizing other specific problems, errors and inconsistencies in the Jordan RI/FS."

Comment noted, but it is irrelevant.

- z. [The PRPs Risk Assessment and Feasibility Study provided with the previous documents (addressed in Parts 1 and 2) is the basis for the PRP comments already discussed. The PRP Risk Assessment claims there is little or no present or future risk on-site, and bases their preference for in situ containment remedies or No-Action remedies on this assumption.]

The reasoning is flawed. There is a present risk, a present potential risk, and a future potential risk due to the chemicals of concern onsite. SARA mandates a preference for permanent treatment remedies to address hazardous waste site remediation.

C. Other Agency Comments

1. U.S. Department of the Interior

- a. "There is a potential for direct and indirect injury to migratory birds in the immediate vicinity of the site, until the contamination is removed or contained. Accordingly, we are not prepared to grant a release from claims for damages to resources under our trusteeship at this time. We would be willing to reconsider this position if the containment and/or cleanup at the site is implemented in a manner that renders these release innocuous to our resources." [See attached letter.]

As suggested in the DoI letter, U.S. EPA has consulted with the U.S. Fish and Wildlife Service in East Lansing, Michigan during public review of the RI/FS. Their comments are below:

- b. While the TCL for PCBs is a legitimate consideration of human health risk and of economics, "it is the opinion of the U.S. Fish and Wildlife Service that the TCL for PCBs is too high and if implemented will lead to direct and adverse impacts to resident and migratory wildlife at the Site." In consideration of bioaccumulation by invertebrates (earthworms) and other organisms on up the food chain, the TCL should be set at 0.1 ppm PCBs in soils. "To provide for a margin of safety we recommend that this value be halved to 0.05 mg PCB/kg soil dry weight." [See also attached letter.]

While U.S. EPA appreciates the spirit in which this recommendation is given, we must unfortunately keep the TCL as is. The extra volume of soils that would need to be excavated would render the remedy impractical to implement.

2. Michigan Department of Natural Resources.

- a. From Robert Hayes, Project Geologist, MDNR:

"The ground water flow velocity in the report was understated: in the northern portion of the site... ground water is moving at a rate between 200 and 500 ft/yr. (See attached flow velocity data.) In only a few years, ... contamination is likely to move to many receptors."

U.S. EPA is placing the ground water velocity calculations into the Administrative Record. (See attached memorandum.)

List of Attachments

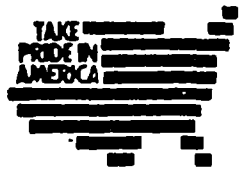
1. Department of the Interior - letter to U.S. EPA
2. Fish and Wildlife Service - letter to MDNR
3. MDNR - interoffice memorandum

ROUSE TOWNSHIP



United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW
175 WEST JACKSON BOULEVARD
CHICAGO, ILLINOIS 60604



May 15, 1987

RECEIVED

MAY 17 1987

MEMORANDUM

TO: Basil G. Constantelos, Director
Waste Management Division, U.S. EPA

FROM: Sheila M. Huff, Regional Environmental Officer, DOI

Subject: Preliminary Natural Resource Surveys, Region V

U.S. EPA, REGION V
WASTE MANAGEMENT DIVISION
OFFICE OF THE DIRECTOR

For your information, I have enclosed copies of Interior's comments on (4) Preliminary Natural Resource Surveys. These represent sites where the Department has expressed concern about impacts to Trustee Resources.

These are being provided to your office so that proper consultation with the U. S. Fish & Wildlife Service can take place, as expressed in the letters. For further information, I may be contacted at 353-6612.

Thank you for your assistance.

Sheila M. Huff

Enclosures

RECEIVED

JUL 07 1987

SITE MANAGEMENT SECTION

RECEIVED
MAY 18 1987
U.S. EPA REGION V
WASTE MANAGEMENT DIVISION
OFFICE OF THE DIRECTOR

REO/C1



United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW
WASHINGTON, D.C. 20240



ER86/956

MAR 24 1987

Memorandum

Mr. Gene Lucero, Director
Office of Waste Programs Enforcement
U.S. Environmental Protection Agency
401 M Street, SW (Room S364N) WH 527
Washington, DC 20460

7-6-87
S.M. Section

Dear Mr. Lucero:

Pursuant to our Memorandum of Understanding, the Department of the Interior has completed a Preliminary Natural Resources Survey of the Rose Township Dump Site, Oakland County, Michigan. Our survey indicates that no lands, minerals, anadromous fish, Indian resources, or endangered species under the trusteeship of the Department are being or have been affected by the site.

However, there is a potential for direct and indirect injury to migratory birds in the immediate vicinity of the site, until the contamination is removed or contained. Resources under our trust in the site vicinity include wood ducks, mallards, and redwing blackbirds.

Heavy metals and PCBs have been found to be the principle contaminants of the surface and sub-surface soils. Volatile and semi-volatile organic compounds are located in sub-surface soils, and in the groundwater as well. PCBs have also been detected in the groundwater plume. Although undocumented, these contaminants do pose a threat to migratory birds, their habitat, and food chain.

Accordingly, we are not prepared to grant a release from claims for damages to resources under our trusteeship at this time. We would be willing to reconsider this position if the containment and/or cleanup at the site is implemented in a manner that renders these releases innocuous to our resources. We suggest that the U.S. Fish & Wildlife Service be consulted during the development of the Remedial Investigation/Feasibility Study. Our Departmental contact for this site is Sheila Huff, Regional Environmental Officer, Chicago, IL (FTS 353-6612).

Sincerely,

Bruce Blanchard
Director

bcc: Director, Waste Mgmt Div, USEPA ✓
T. J. Miller, FWS, Twin Cities
Field Supv, FWS, E. Lansing

cc:
Steve Klein/EPA

Eleder EFA Chicago

U.S. Fish and Wildlife Service
East Lansing Field Office (ES)
1405 S. Harrison Rd., Rm. 301
East Lansing, Michigan 48825

August 12, 1987

RECEIVED
U.S. FISH AND WILDLIFE SERVICE
EAST LANSING FIELD OFFICE
AUG 12 1987

Mr. Steve Luzkow
Remedial Action Section
Groundwater Quality Division
Michigan Department of Natural Resources
P.O. Box 30028
Lansing, MI 48909

Dear Mr. Luzkow:

This letter is a follow-up to your August 5, 1987 telephone conversation with Dave Best of my staff concerning the Rose Township-Demede Road Dump site (CERCLA) in Oakland County, Michigan. This letter provides our written comments on the Remedial Investigation/Feasibility Study of June 1987, prepared by private consultants for the Michigan Department of Natural Resources. Additional information was obtained from Ms. Bonnie Eleder, U.S. Environmental Protection Agency on August 3, 1987. We appreciate the deadline extension for comments to August 12, 1987.

The document adequately describes the high quality terrestrial and wetland habitats surrounding the dump site, and lists numerous wildlife species known or expected to inhabit this area. The U.S. Fish and Wildlife Service concurs with this wildlife evaluation for the site. In November 1986, this office performed a Preliminary Natural Resources Survey of this site at the request of the U.S. Environmental Protection Agency and concluded that trustee resources, including migratory birds and waterfowl, are attracted to the site and adjacent areas, and may be impacted.

Our principle concern with the document is with the discussion regarding the degree of impact of PCB-contaminated soils onsite and offsite, as well as the selected final PCB target cleanup level (TCL). We have learned that the final TCL for PCBs of 10 mg PCB/kg soil dry weight involved two considerations. First, this TCL was based on a human cancer risk assessment (10^{-6} risk) for physical exposure/contact and ingestion of soils at the site.

In addition, there appears to be an economically driven cleanup consideration for this TCL, since the TCL will determine the amount (areal as well as depth) and hence cost, of contaminated soil/sediment that will require excavation for thermal treatment and backfilling, or disposal at a licensed landfill. Both are legitimate considerations and we have no reason to doubt the findings of the PCB human health risk assessment. However, a quantitative wildlife health risk assessment was not performed as part of the setting of the TCL.

It is the opinion of the U.S. Fish and Wildlife Service that the TCL for PCBs is too high and if implemented will lead to direct and adverse impacts to resident and migratory wildlife at the site. We offer a method and suggestions for establishing a final TCL for PCBs in soils which will adequately protect wildlife resources. We feel that our recommended TCL can be further modified to reflect the depth at which the sediment/soil samples are to be taken in preparation for removal, or are to be disposed as part of backfilling at the site after thermal treatment.

Our cause for concern about the designated TCL for PCBs is the known bioaccumulation of PCBs by organisms within a food chain. In general, there is a 10-fold increase in whole organism PCB body burdens between each step up the food chain. The initial step in the food chain at this site is, and will be after site cleanup, the processing of soil materials and accumulation of contaminants by soil invertebrates. The bulk of the soil invertebrates in terrestrial and vegetated wetland situations are earthworms (*Oligochaeta*). We have attached to this letter a table we developed for another project which surveys the expected bioaccumulation potentials (expressed as a storage ratio) for earthworms in various PCB and heavy metal soil situations. The storage ratios for PCBs by earthworms from the surveyed literature conforms quite well with the 10-fold increase between trophic levels.

There is little doubt about the ability of soil invertebrates, earthworms in particular, to accumulate PCBs to levels well in excess of soil concentrations. This known accumulation is the avenue by which impacts to the more visible and economically important wildlife species will occur at the site. There are numerous wildlife species (avian, mammalian, reptilian and amphibian) which prey wholly, or in part, on earthworms and other soil invertebrates (reference attached). The impacts of feeding on earthworms having various PCB burdens have not been directly studied. However, the U.S. Fish and Wildlife Service has recently published a synoptic review of hazards to fish, wildlife and invertebrates by way of PCB exposure in their diets and media, or in selected tissues and organs (reference attached). For birds, it is reported that concentrations of PCBs in excess of 3 mg PCB/kg fresh weight in a diet are associated with an increased likelihood of death from PCB poisoning. For the mink, one of the most susceptible small mammals, a diet as low as 0.1 mg PCB/kg fresh weight is reported to cause death and reproductive toxicity.

Based on our visit to the Rose Township dump site in October 1986, this office believes that mink are permanent residents at and adjacent to the dump site. The preferred habitat would be the vegetated wetlands and fringing upland areas which surround the site. However, mink are quite mobile and could easily use the dump site presently and upon completion of cleanup. Obviously, numerous avian species use the dump site and surrounding areas for feeding, migratory and breeding areas.

Although mink have not been documented from gut content studies to be direct predators of earthworms, they are opportunistic predators which are known to feed on a variety of vertebrate and invertebrate species. Many of these vertebrate species are known predators of earthworms. The existence of these intermediate worm predators only exacerbates the potential PCB threat to mink through the food chain.

Utilizing the mean storage ratios and PCB soil concentrations from our attached table, we have attempted to calculate the approximate PCB body burdens in earthworms which one would expect from various soil PCB concentrations. These calculated body burdens can then be compared to PCB hazards in wildlife diets, as reported above. The results are as follows:

<u>PCBs in soil</u> <u>(mg/kg, dry weight)</u>	<u>PCB in worms</u> <u>(mg/kg, fresh weight)</u>
110.3	608.9
9.7	13.0
0.73	0.92
0.13	0.09

These values are approximations only, as mean values were used in the calculations and the original tests were run with different soil types, experimental designs and exposure periods. However, please note that the fresh wet PCB concentration in earthworms does not approach the health hazard level for mink diets until the PCB concentration in the soils approach the level of 0.1 mg PCB/kg soil dry weight. Therefore, we believe that the final TCL for PCBs in soils/sediment should be set at a maximum of 0.1 mg PCB/kg soil dry weight. To provide for a margin of safety we recommend that this value be halved to 0.05 mg PCB/kg soil dry weight.

This value appears to be well within the potential cleanup range for the thermal treatment process proposed for preliminary testing on contaminated soils at this site, under the Environmental Protection Agency Superfund Innovative Technology Evaluation Program. This process has been reported to be 99.9999% efficient for PCB destruction at the design temperatures of 1350-2300°F. Using this efficiency and the maximum PCB soil concentration reported for the entire site (260 mg PCB/kg soil dry weight), the maximum expected PCB concentration in the resultant ash will be 0.026 mg PCB/kg soil dry weight, which is below our recommended final TCL. Therefore our recommended final TCL is a reasonable value in terms of cleanup technology potential.

Our recommended final TCL does have important implications for degree of excavation and cleanup of soils at the site. This will likely increase the areal extent of the cleanup area, but may not dramatically change the extent of excavation and cleanup in a vertical direction. We believe that our recommended final TCL for PCBs in soils need not apply necessarily to the entire soil depth profile. Since earthworms generally confine their feeding, burrowing and overwintering activities to the top 4-5 feet of a normal soil profile, our recommended final TCL would only need to apply for this upper soil stratum. This upper soil stratum would not only be present at the southwest dump site, but would also be applicable to the west facing drainage slope below the southwest site and the single wetland sediment site where PCBs above our recommended final TCL were detected. A higher final TCL value may be appropriate for excavation or backfilling criteria for PCB contaminated soil and ash below the five-foot depth contour. Groundwater extraction and treatment will help protect/control the environmental impact of these higher PCB concentrations in the lower soil strata.

Our final TCL for soil PCBs may also be modified if sufficient capping of the backfilled thermal treatment ash occurs. At this time, there is no information as to whether capping will occur. It is only known that the ash resulting from thermally treated soils excavated from the site will have to pass EP toxicity tests, as being a non-hazardous waste, in order to be backfilled onto the site. If backfilling and capping of the site does occur, a 4 to 5 foot topsoil layer should be considered for installation above the protective cap. This topsoil layer will permit soil invertebrate activity to occur without jeopardizing the integrity and function of the cap.

Special consideration should be given to better documentation of sediment/soil concentrations of PCBs offsite. PCB concentrations on the drainage slope below the dump site and the one wetland site with detectable PCBs, were all above our recommended final TCL at which we consider impacts to wildlife will occur. We suggest that additional soil/sediment samples be taken in these two areas, particularly in the wetland area, to better determine the presence and levels of PCBs. Additional soil/sediment sampling in other areas of the wetland west of the dump site is also suggested. Should PCBs indeed be present at these sites above our recommended final TCL, then our next recommended step would be to collect soil invertebrates at these sites for PCB residue analyses. If significant bioaccumulation of PCBs is indicated, then additional collection and testing of predator organisms, such as mink and waterfowl may be warranted. All of these bioassays may be preliminary to actual soil/sediment removal and cleanup at these sites. These bioassays may also be useful after cleanup of the southwest dump site to determine the appropriateness of the final selected TCL and the success of the cleanup in preventing impacts to the environment. This office would be willing to assist in the design of these bioassay techniques.

It was not clear in the document if actual cleanup is proposed for areas with PCB-contaminated soil outside and adjacent to the southwest dumpsite. This previously mentioned site is located on the upper drainage slope to the wetland and does contain good forested habitat. However, the appearance of good habitat at any site should not factor into the decision for possible cleanup. If PCBs in the soils are indeed above our recommended final TCL, then bioassays and/or cleanup of the soil should occur.

Information is also apparently not available as to the probable uses or processes with which the PCBs were employed, prior to disposal at the site. Thermally employed uses of PCBs can lead to the pyrolytic formation of dioxins/furans. Although the Michigan Department of Natural Resources does not expect dioxins and furans at this site due to the absence of these compounds at a nearby CERCLA site which received similar wastes, we suggest that a selected few soil samples from the southwest dump site undergo dioxin/furan analyses or an extract assay for dioxin equivalence. Since capping of a site is the only available clean-up methodology that we are aware of for dioxins/furans, it may well be worth the expense to document their absence or presence early on in this study. Since the thermal treatment method is proposed to be tested on a small scale at this site, we suggest that the dioxin/furan analyses, or an extract assay for dioxin equivalence, be conducted on a few of the resultant ash samples.

This office is willing to further discuss the above topics and aid, where possible, in the design and documentation of any wildlife health bioassays necessary for this site. Please direct your questions to either Dave Best or Tim Kubiak at (517) 337-6650. Thank you for this opportunity to comment on the Remedial Investigation/Feasibility Study document for the Rose Township dump site.

Sincerely yours,

/s/ Robert D. Pacific

Robert D. Pacific
Field Supervisor

✓ cc: Bonnie Eleder, U.S. EPA, Chicago, IL (5HE-12)

September 16, 1987

TO: Steve Luzkow, Project Mgr., Demode Rd., SMU
FROM: Robert Hayes, Project Geologist, Demode Rd., SMU
SUBJECT: Demode Road - Supplemental Evaluation

Some information and evaluations that I presented to E. C. Jordan for the Final RI/FS were not included in that report. The purpose of this memo is to bring several important points to light regarding contamination flow rates, nature of vinyl chloride plume, connection of north and south plumes, and remedy selection that must be considered in evaluating this site for remediation.

Using the information contained in the RI/FS, I calculate groundwater flow rates that are significantly different than those presented in Jordan's report (see attached calculations). Groundwater velocity in the northern groundwater contamination (i.e. vinyl chloride) plume ranges from approximately 200 - 500 feet/year. Jordan's suggested flow ranged from approximately 21 feet/year up to a possible 200 feet/year. This was based on overall site averages, rather than location specific (i.e. north plume area) data that I used. This is a significant difference, and one that suggests vinyl chloride (a carcinogen) will spread on and off site at a much faster rate than previously indicated. I believe this adds a new sense of urgency to the remediation of this site.

When considering the hydrogeology of the entire site, it is apparent that there is a groundwater recharge area in the same location as the known contaminant source area (i.e., the southwest portion of the site's upland area). Contaminants apparently are either retarded from moving vertically by the surficial clay deposits or they may be directed horizontally to more granular recharge areas. Once they move downward they encounter an unconfined shallow aquifer. In this mounded (most of the year) recharge zone contaminants initially move vertically and radiate to southwest, west, northwest and north directions away from the source area. As contaminants reach the lower portions of the aquifer, the regional groundwater flow system directs them generally northward toward Demode Road.

Groundwater in the southern portion of the site moves much slower than groundwater in the northern portion (previously discussed). (Attached are calculated groundwater velocities and additional groundwater flow contour maps.) When the entire site is considered, groundwater in the south moves on the order of 20-30 feet/year, toward the central portion of the site it gradually increases to approximately 50-75 feet/year, and continues to increase as it moves northward. When it reaches the north portion (e.g. vicinity of DNR-7) it begins to move considerably faster -

greater than 200 feet/year. For some of these flow rates I used assumed values for hydraulic conductivity and porosity--generally resulting in lower flow rates than I would expect for this type of aquifer. Additional slug tests/pump tests would be necessary to get more accurate data. (These flow rates could easily be much greater than presented here--by assuming greater values.)

Although the exact location of the vinyl chloride is unknown several physical and chemical conditions make its presence in the north part of the site a serious concern. Considering the different groundwater velocities, the location of known source areas, and the fact that vinyl chloride occurs as a result of chemical degradation and moves quite rapidly in the groundwater, chemicals apparently have moved a significant distance from the south or at least south central portion of the site. A major concern should be preventing contaminants from reaching the high groundwater velocity area in the north part of the site. Indeed, we should emphasize that the chemicals in the groundwater in the south portion of the site should be removed before they continue to transform into chemicals of even greater health concern (e.g., vinyl chloride) and move northward and rapidly away from the site.

The Jordan report treats the north and south plumes as separate concerns. I do not believe this is the case. Indeed, I believe there is ample evidence (flow directions, flow rates, stratigraphy, etc.) in the report that indicates the "north" and the "south" plumes are related and in fact connected. Additional intermediate depth wells in the vicinity of RW14 and MW103 (both shallow wells) should confirm this interpretation.

I conclude that at present there is enough data to select a remedy that would remediate this site appropriately. Further, I suggest that there should be some sense of urgency associated with remediation (for reasons described above) of this site. Finally, I recommend that at least the number of additional monitor wells suggested in Jordan's report be installed and pump tests completed prior to (or at least during) the Remedial Design phase of this project. The information gained from these additional monitor wells will be indispensable to a realistic remedial design and may even suggest the need for more and/or better located monitor wells for the final remedial action.

cc: ✓ Mr. Kevin Adler, EPA
Mr. R. Willson/Mr. J. Linton

GROUNDWATER VELOCITY SUMMARY

<u>DIRECTION/LOCATION</u>	<u>AVERAGE VELOCITY</u>
<u>North Plume Area:</u>	
DNR-6 to DNR-4	400 ft/yr
DNR-5 downgradient (toward Demode Rd.)	220 ft/yr
<u>Central Site Area:</u>	
DNR-3 to MW102D	50 ft/yr
<u>South Plume Area:</u>	
Shallow Aquifer	
RW7 to RW9	35 ft/yr
RW6 to Wetland	19 ft/yr
Deep Aquifer	
DNR-1 to MW106D	15 ft/yr

DEMODE ROAD SITE

Groundwater Flow Velocity

Formula: Velocity (v) = $\frac{K_{\text{hydraulic}} \times I \text{ gradient}}{\text{porosity} \times \text{cond}}$

NORTH PLUME: Flow from DNR6 to DNR 4 on 4/8/87

$$v = \frac{K_{\text{DNR6}} \times I_{\text{DNR 6 4}}}{n \text{ (assumed)}}$$

$$v_{\text{DNR-6}} = \frac{47.89 \text{ ft/d (.007)}}{0.25} = 1.34 \text{ ft/d}$$

$$1.34 \text{ ft/d} = 489 \text{ ft/yr}$$

$$v_{\text{DNR5}} = \frac{K_{\text{DNR-5}} \times I}{n} = \frac{27.09 \text{ ft/d (.0067)}}{0.25} = 0.7 \text{ ft/d}$$

$$v_{\text{DNR5}} = 0.7 \text{ ft/d} = 265 \text{ ft/yr}$$

If assume n = 0.3 then

$$v_{\text{DNR6}} = 407 \text{ ft/yr and } v_{\text{DNR5}} = 220 \text{ ft/yr}$$

SOUTH PLUME:
Shallow Aquifer:
 RW-7 to RW-9
 Distance approx. 450'

Average Groundwater velocity
 Data: 4/8/87 k (estimated)
 Water elev. 1007.54' (RW7)
 - 996.56' (RW9)
10.98'

$$I = \frac{10.98}{450} = 0.024$$

$$v = \frac{KI}{n} = \frac{1.0 \text{ ft/day (assumed)} \times 0.024}{0.25} \text{ approx. .1 ft/day}$$

approx. 35.0 ft/year

RW-6 to wetland (approx. elev. 999')

$$v = \frac{KI}{n} = \frac{1.0 \text{ ft/day} \times 0.013}{0.25} \text{ approx. 0.05 ft/day}$$

0.05 ft/day approx. 19.0 ft/yr

DNR1 to MW106D

Data 4/8/87

$$\frac{8.27}{-7.38} \quad I = \frac{.89}{1350} = 0.00066 \text{ approx. .0007}$$

$$0.89$$

$$v = \frac{KI}{n} = \frac{15 \text{ ft/day} \times 0.0007}{.25} = 0.043 \text{ ft/day}$$

$$= 15.3 \text{ ft/year}$$

CENTRAL SITE AREA
Groundwater Velocity

DNR-3 to MW-102D

elev. 1007.42 DNR-3
 -1005.97 MW-102D
 1.45

$$I = \frac{1.45}{1300} = .001$$

$$v = \frac{KI}{n} = \frac{30 \text{ ft/day} \times .001}{.25} \text{ approx. } 0.14 \text{ ft/day}$$

$$\text{approx. } 50 \text{ ft/year}$$

TABLE I
ROUND 1

ANALYSES OF MONITORING WELL WATER SAMPLES

ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION SAMPLE DATE	RW-1 8-16-84	RW-1D 8-16-84	RW-2 8-16-84	RW-2D 8-16-84	RW-3 8-15-84	RW-4 8-17-84	RW-5 8-16-84	RW-5D 9-25-84	RW-6 8-14-84	RW-6D 8-14-84	RW-7 8-15-84	RW-8 8-15-84	RW-8D 8-15-84
<u>Parameters</u>													
<u>Metals, Total (µg/l)</u>													
Aluminum	--	--	--	--	--	--	--	--	--	--	461	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	11	--	--
Barium	--	--	--	--	116	--	273	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron	--	--	--	55	76	--	574	138	7320	312	10000	60	453
Lead	--	8.3	15	11	7.6	6.9	6.5	--	--	--	94	--	13
Cyanide	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	22	145	94	104	60	124	612	605	1320	27	47	14	35
Mercury	--	--	0.24	0.38	--	--	--	--	0.45	--	0.40	0.46	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--
Tin	28	--	--	--	106	--	--	--	--	--	--	23	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	140	152	3930	4410	2810	2840	209	86	1280	1330	23800	272	312

TABLE 8 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES

ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION SAMPLE DATE	KW-9 8-14-84	KW-10 8-16-84	KW-10 9-26-84	KW-11 9-25-84	KW-12 8-15-84	KW-13 8-15-84	KW-13 9-26-84	KW-14 9-24-84	KW-15 8-16-84	KW-16 8-14-84	KW-17 8-17-84	KW-17D 8-17-84	KW-18 8-22-84
Parameters													
Metals, Total (µg/l)													
Aluminum	--	NS	--	--	--	NS	--	--	--	--	--	NS	--
Antimony	--	NS	--	--	--	NS	--	--	--	--	--	NS	--
Arsenic	--	NS	--	--	--	NS	--	--	--	--	--	NS	--
Barium	--	NS	--	--	--	NS	--	--	--	106	--	NS	--
Beryllium	--	NS	--	--	--	NS	--	--	--	--	--	NS	--
Cadmium	--	NS	--	--	1.5	NS	--	--	--	--	--	NS	--
Chromium	--	NS	--	--	--	NS	--	--	--	--	--	NS	--
Cobalt	--	NS	--	--	--	NS	--	--	--	--	--	NS	--
Copper	--	NS	--	--	--	NS	--	--	--	--	--	NS	--
Iron	65	NS	--	--	91	NS	--	--	--	--	486	NS	187
Lead	--	NS	--	16	14	NS	8.6	6.2	9.9	39	5.0	NS	--
Cyanide	--	NS	--	--	--	NS	--	--	--	--	--	NS	--
Manganese	967	NS	522	24	134	NS	102	149	11	67	45	NS	42
Mercury	0.40	NS	--	--	--	NS	--	--	--	0.35	--	NS	--
Nickel	--	NS	--	--	--	NS	--	--	--	--	--	NS	--
Selenium	--	NS	--	--	--	NS	--	--	--	--	--	NS	--
Silver	14	NS	--	--	--	NS	--	--	--	--	--	NS	--
Thallium	--	NS	--	--	--	NS	--	--	--	--	--	NS	--
Tin	26	NS	--	--	--	NS	--	--	--	--	--	NS	75
Vanadium	--	NS	--	--	--	NS	--	--	--	--	--	NS	--
Zinc	65	NS	4330	4020	4920	NS	11600	1300	342	766	587	NS	2080

TABLE 1 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES

ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION	MW-1011	MW-1010	MW-1021	MW-1021 Dup(MW-101A)	MW-101	MW-101 Dup(DP 10)	MW-104S	MW-104I	MW-105S	MW-105S Dup	MW-105 Dup	MW-105I	MW-105D	MW-106D
SAMPLE DATE	10-30-84	9-26-84	9-25-84	9-25-84	1-9-85	1-9-85	9-24-84	9-24-84	8-18-84	8-18-84	8-18-84	8-18-84	8-22-84	8-17-84
Parameters														
<u>Metals, Total (µg/l)</u>														
Aluminum	--	250	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	88	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron	125	377	--	--	--	--	--	--	--	--	--	--	--	205
Lead	--	--	68	19	--	--	--	--	--	--	--	16	5.2	--
Cyanide	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	27.2	24	21	20	--	--	172	62	13	--	--	58	22	41
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tin	--	--	--	--	--	--	--	--	23	--	--	--	58	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	1448	1820	1770	1260	--	--	389	313	148	--	--	1110	1010	2970
Total Dissolved Solids	310	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 1 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION	MW-106D	MW-106D	MW-1071	MW-107D	MW-1081	MW-108D	MW-109D	MW-110S	MW-110S	MW-1101	MW-110D	DP-20	MW-1111
SAMPLE DATE	Dup 8-17-84	Dup 8-17-84	10-30-84	10-30-84	10-30-84	9-25-84	10-29-84	10-29-84	Dup (MW-30) 10-29-84	10-29-84	1-8-85	Blank 1-9-85	10-29-84
<i>Parameters</i>													
Metals, Total (µg/l)													
Aluminum	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	--
Boron	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	98.3	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	43	--	--	--	--	--	--	--
Iron	--	--	697	885	--	226	125	114	190	133	--	--	103
Lead	--	--	--	--	--	54	--	--	--	--	--	--	--
Cyanide	--	--	--	--	--	14	--	--	--	--	--	--	--
Manganese	--	--	20.8	26.7	127	105	36.6	38.6	34.1	86.5	--	--	59.1
Mercury	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	59.2	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--
Tin	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	398	116	908	404	1,650	892	888	870	--	--	28.2
Total Dissolved Solids	NA	NA	340	360	280	NA	320	NA	290	300	NA	NA	180

TABLE 1 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION	TRIP BLANK #1 ^a	MW-28 DISTILLED WATER BLANK	MW-32 DISTILLED WATER BLANK	TRIP BLANK #2	FILTER BLANK #1	FILTER BLANK #2
SAMPLE DATE	8-14-84	10-30-84	11-01-84	8-20-84	8-16-84	8-16-84
Parameters						
<u>Metals, Total (µg/l)</u>						
Aluminum	--	202	--	--	--	--
Antimony	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--
Barium	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--
Chromium	--	--	--	--	--	--
Cobalt	--	--	--	--	--	--
Copper	--	--	--	--	--	--
Iron	--	--	--	--	--	--
Lead	--	--	--	--	5.6	--
Cyanide	--	--	--	--	--	--
Manganese	--	--	--	--	--	--
Mercury	--	--	--	--	0.38	0.2
Nickel	--	--	--	--	--	--
Selenium	--	--	--	--	--	--
Silver	--	--	--	--	--	--
Thallium	--	--	--	--	--	--
Tin	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--
Zinc	--	--	--	--	--	28
Total Dissolved Solids	NA	K20	NA	NA		

TABLE I

ANALYSIS OF MONITORING WELL SAMPLES
(MW-102 STUDY AREA)
ROSE TOWNSHIP - DENNIS ROAD SITE

Sample Location	MW-1	MW-14	MW-18	MW-1011	MW-101D	MW-1021	MW-51 (DUP MW-1021)	MW-102D	MW-103	MW-50 (Blank)
Sample Date	4-25-85	4-25-85	4-25-85	4-24-85	4-24-85	4-25-85	4-25-85	4-25-85	4-25-85	4-24-85
Parameters										
Metals - Total (µg/l)										
Aluminum	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	--
Barium	--	--	--	--	--	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--
Calcium	57270	42220	51810	71840	78010	54470	57320	60810	45780	--
Chromium	11	10	--	--	--	15	--	13	--	--
Cobalt	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	113	--	132	--	48	--	--
Iron	300	--	153	--	166	326	--	169	--	--
Lead	7.0	13	--	5.4	--	20	--	23	5.2	--
Magnesium	22480	18110	17690	21170	25800	21580	21790	20800	17900	--
Manganese	148	72	17	29	22	32	19	41	17	--
Mercury	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--
Silver	--	15	--	--	--	--	--	--	--	--
Sodium	--	--	--	--	5507	6954	5464	8289	5432	--
Thallium	--	--	--	--	--	--	--	--	--	--
Tin	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--
Zinc	751	869	962	276	--	271	90	2669	1267	--
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

-- - Not detected or below contract detection limit.

NA - Not analyzed.

DUP - Duplicate sample.

TABLE 2

ANALYSES OF MONITORING WELL WATER SAMPLES
 ROUND 11
 ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION SAMPLE DATE	RW-1 9-30-86	RW-10 9-30-86	RW-2 9-29-86	RW-3 9-30-86	RW-4 9-30-86	RW-5 10-1-86	RW-5D 10-1-86	RW-6 10-1-86	RW-6D 10-1-86	RW-7 10-2-86	RW-8 9-30-86	RW-8D 10-1-86	RW-8D Dup 10-1-86
<u>Parameters</u>													
<u>Metals, Total (µg/l)</u>													
Aluminum	48	51	55	65	86	46	45	66	61	2560	60	96	73
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--	14	--	--	--
Barium	103	31	78	139	114	106	196	30	91	320	100	103	104
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	7.3	--	--	--
Chromium	4	4.1	--	--	--	--	--	--	--	113	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--	12	--	--	--
Copper	5.4	--	4.8	4.6	--	7.6	8.6	6.4	4.8	138	3.3	4.8	5.9
Iron	935	238	482	1250	967	1310	965	7020	588	34400	1080	1080	1060
Lead	--	--	--	--	--	--	--	--	--	150	--	--	--
Cyanide	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	24	181	121	54	257	37	481	1300	19	209	26	18	15
Mercury	--	--	--	--	--	--	--	0.2	--	--	--	--	--
Nickel	--	--	--	--	--	--	16	--	--	47	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--
Tin	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	22	--	--	--
Zinc	99	98	151	45	1100	180	115	178	155	73000	104	187	168

TABLE 2 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES
 ROUND 11
 ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION SAMPLE DATE	RW-9 10-2-86	RW-10 9-29-86	RW-11 9-29-86	RW-12 9-30-86	RW-14 9-24-86	RW-15 9-29-86	RW-16 10-2-86	RW-17 10-2-86	RW-18 9-25-86
<u>Parameters</u>									
<u>Metals, Total (µg/l)</u>									
Aluminum	54	76	59	56	--	66	61	61	--
Antimony	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--
Barium	68	10	24	23	25	34	96	31	85
Beryllium	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	6.5	--	--	--
Cobalt	--	--	--	--	--	--	--	--	--
Copper	3.9	--	3.3	7.5	--	--	6.2	4.1	--
Iron	80	73	74	40	--	289	79	276	36
Lead	--	--	6.9	--	--	6.2	--	--	--
Cyanide	--	--	--	--	--	--	--	--	--
Manganese	173	360	30	35	10	41	33	54	17
Mercury	--	--	--	--	--	--	--	--	--
Nickel	11	--	--	--	--	10	--	--	40
Selenium	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--
Tin	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--
Zinc	235	4760	2800	1240	1740	3510	131	287	266

TABLE 2 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES
 ROUND 11
 ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION SAMPLE DATE	NW-1011	NW-101D	NW-102I	NW-102D	NW-102D Dup	NW-103S	NW-104S	NW-104I	NW-105S	NW-105I	NW-105D	NW-106D	NW-106D Dup
	9-25-86	9-25-86	9-23-86	9-24-86	9-24-86	9-24-86	9-24-86	9-24-86	9-29-86	9-29-86	9-29-86	9-30-86	9-30-86
<u>Parameters</u>													
<u>Metals (µg/l)</u>													
aluminum	34	41	--	--	--	--	--	--	44	60	53	110	70
antimony	--	--	--	--	--	--	--	--	--	--	--	--	--
arsenic	--	27	--	--	--	--	--	--	11	--	--	124	124
barium	118	151	67	145	145	100	36	38	87	36	158	--	--
beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--
cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--
chromium	--	--	--	--	--	--	--	--	--	--	4.4	--	--
cobalt	--	--	--	--	--	--	--	--	--	--	--	--	--
copper	--	--	3.5	--	--	--	4.5	--	--	4.5	--	--	4
iron	447	443	237	408	708	--	--	--	87	96	164	1320	1080
lead	--	--	--	--	--	--	--	--	--	--	--	26	--
cyanide	--	--	--	--	--	--	--	--	--	--	--	--	--
manganese	25	15	14	25	24	10	203	--	17	--	14	20	21
mercury	--	--	--	--	--	--	--	--	--	--	--	--	--
nickel	--	--	--	--	--	--	15	--	38	20	--	--	--
selenium	--	--	--	--	--	--	--	--	--	--	--	--	--
silver	--	--	--	--	--	--	--	--	--	--	--	--	--
thallium	--	--	--	--	--	--	--	--	--	--	--	--	--
tin	--	--	--	--	--	--	--	--	--	--	--	--	--
vanadium	--	--	--	--	--	--	--	--	--	--	--	--	--
zinc	378	32	609	1420	1390	27	1180	23	131	45	46	63	68

TABLE 2 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES
ROUND 11
ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION	MW-1071	MW-107D	MW-1081	MW-108D	MW-108D Dup	MW-109D	MW-110S	MW-1101	MW-110D	MW-110D Dup	MW-111
SAMPLE DATE	9-22-86	9-22-86	9-29-86	9-29-86	9-29-86	9-30-84	10-1-86	10-1-86	10-2-86	10-2-86	10-2-86
<u>Parameters</u>											
<u>Metals (ug/l)</u>											
aluminum	--	--	66	57	60	75	168	48	58	44	35
antimony	--	--	--	--	--	--	--	--	--	--	--
arsenic	--	--	--	--	--	--	--	--	--	--	--
barium	120	132	48	142	143	122	72	88	95	93	120
beryllium	--	--	--	--	--	--	--	--	--	--	--
cadmium	--	--	--	--	--	--	--	--	--	--	--
chromium	--	--	--	--	--	4.2	5	--	--	--	--
cobalt	--	--	--	--	--	--	--	--	--	--	--
copper	7.2	6.4	8.1	--	--	4.4	5.4	5.9	6.1	5.2	--
iron	1320	1060	160	1510	1560	884	177	1510	918	653	164
lead	--	--	--	--	30	--	--	--	--	--	--
cyanide	--	--	--	--	--	--	--	--	--	--	--
manganese	20	22	59	28	27	38	27	25	33	33	19
mercury	--	--	--	--	--	--	--	--	--	--	--
nickel	--	--	--	--	--	--	--	--	--	--	--
selenium	--	--	--	--	--	--	--	--	--	--	--
silver	--	--	--	--	--	--	--	--	--	--	--
thallium	--	--	--	--	--	--	--	--	--	--	--
tin	--	--	--	--	--	--	--	--	--	--	--
vanadium	--	--	--	--	--	--	--	--	--	--	--
zinc	229	445	68	128	148	109	322	165	120	182	57

TABLE 2 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES
 ROUND 11
 ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION	DNR 1	DNR 2	DNR 3	DNR 4	DNR 5	DNR 6	DNR 7
SAMPLE DATE	9-22-86	9-24-86	6-25-86	9-23-86	9-23-86	9-23-86	9-23-86

Parameters

Metals (ug/l)

aluminum	--	--	--	--	--	--	--
antimony	--	--	--	--	--	--	--
arsenic	--	--	--	--	--	--	--
barium	567	507	466	164	179	86	91
beryllium	--	--	--	--	--	--	--
cadmium	--	--	--	--	--	--	--
chromium	--	--	--	--	--	--	--
cobalt	--	--	--	--	--	--	--
copper	8.6	--	5.8	8	--	31	--
iron	1330	1520	843	1050	440	811	29
lead	--	--	--	--	--	--	--
cyanide	--	--	--	--	--	--	--
manganese	22	21	35	20	22	22	12
mercury	--	--	--	--	--	--	--
nickel	--	--	--	--	--	--	--
selenium	--	--	--	--	--	--	--
silver	--	--	--	--	--	--	--
thallium	--	--	--	--	--	--	--
tin	--	--	--	--	--	--	--
vanadium	--	--	--	--	--	--	--
zinc	251	152	210	380	109	48	153

TABLE 2 (cont.)

ROUND 11

ANALYSES OF MONITORING WELL WATER SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION	B05	MW-202	MW-205	MW-207	MW-209	MW-210
SAMPLE DATE	Blank	Blank	Blank	Blank	Blank	Blank
	9-22-86	9-25-86	9-30-86	10-1-86	10-2-86	10-2-86
Parameters						
<u>Metals, Total (µg/l)</u>						
Aluminum	--	--	--	42	47	43
Antimony	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--
Barium	--	--	--	4.2	--	--
Beryllium	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--
Chromium	--	--	--	--	--	4.2
Cobalt	--	--	--	--	--	--
Copper	--	79	103	48	64	82
Iron	76	27	--	57	57	57
Lead	--	--	--	--	--	--
Cyanide	--	--	--	--	--	--
Manganese	--	--	--	--	--	--
Mercury	--	--	--	--	--	--
Nickel	--	--	--	--	--	7.8
Selenium	--	--	--	--	--	--
Silver	--	--	--	--	--	--
Thallium	--	--	--	--	--	--
Tin	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--
Zinc	20	44	21	20	34	31
Total Dissolved Solids	NA	K20	NA	NA	--	--

TABLE 3

ANALYSES OF MONITORING WELL WATER SAMPLES

ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION SAMPLE DATE	RW-1 8-16-84	RW-1D 8-16-84	RW-2 8-16-84	RW-2D 8-16-84	RW-3 8-15-84	RW-4 8-17-84	RW-5 8-16-84	RW-5D 9-25-84	RW-6 8-14-84	RW-6D 8-14-84	RW-7 8-15-84	RW-8 8-15-84	RW-8D 8-15-84
Parameters													
Organics (µg/l)													
chlorobenzene	--	--	--	--	--	--	80/20	--	109	--	3500	--	--
methylphenol	--	--	--	--	--	--	--	--	--	--	46	--	--
ethylbenzene	--	--	--	--	--	--	--	--	75.2	--	7700	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--	--	4600	--	--
toluene	--	--	--	--	--	--	JK	--	--	--	52000	--	--
trichloroethylene	--	--	--	--	--	9	130	--	363	--	1100	--	--
PCBs	--	--	--	0.54**	0.35**	--	--	--	--	--	4800	10.0**	0.19**
naphthalene	--	--	--	--	--	--	--	--	--	--	210	--	--
xylene	--	--	--	--	--	--	--	--	59.3	--	7800	--	--
1,2-dichloroethane	--	--	--	--	--	--	12	--	18.3	--	--	--	--
1,1-dichloroethane	--	--	--	--	--	4K	560	7	14.4	--	--	--	5.9K
1,1,1-trichloroethane	--	--	--	--	--	JK	150	--	4.3	--	--	--	--
1,1,2-trichloroethane	--	--	--	--	--	--	--	--	34.0	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	5.2	--	--	--	3.4K
trans-1,2-dichloroethylene	--	.5CB	--	--	--	5	990	--	262	--	--	--	--
benzene	--	5	--	--	--	--	110	--	22.2	--	--	--	--
methylene chloride	--	25	--	3.1KB	--	500K	28	5JB	6.4C	3.1KB	--	1.0C	--
heptachlor	--	--	--	--	--	--	--	--	0.24**	--	--	--	--
1-fluoro-2,2,2-trichloroethane	--	--	--	--	--	--	--	--	18.2	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--	3.1	--	--	--	--
isophorone	--	--	--	--	--	--	27	20.1	43.8	--	--	--	3.3K
acetone	--	--	--	15KB	--	--	--	--	--	--	--	11.0C	--
dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	6.4	--
2-butanol	--	--	--	--	--	--	--	--	--	--	--	--	4.8KB
di-n-butylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	3.8K
dimethylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
cyclohexanone	--	--	--	--	--	--	--	--	--	--	--	--	--
2-chlorophenol	--	--	--	--	--	--	--	--	1.3K	--	--	--	--
bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
vinyl chloride	--	120	--	--	--	--	11	--	--	--	--	--	--
chloroethane	--	20	--	--	--	--	--	--	--	--	--	--	--
tetrahydrofuran	--	--	--	0.3	--	--	--	--	--	--	--	--	--
1,1-dichloroethylene	--	--	--	--	--	--	6	--	--	--	--	--	--
di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
(s,s)-DBP	--	--	--	--	--	--	--	--	--	--	--	--	--
acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--
n-nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 3. (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES

ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION SAMPLE DATE	KW-9 8-14-84	KW-10 8-16-84	KW-10 9-26-84	KW-11 9-25-84	KW-12 8-15-84	KW-13 8-15-84	KW-13 9-26-84	KW-14 9-24-84	KW-15 8-16-84	KW-16 8-14-84	KW-17 8-17-84	KW-17 8-17-84	KW-18 8-22-84
Parameters													
Organics (µg/l)													
chlorobenzene	--	--	NS	--	--	--	NS	--	--	--	--	--	--
methylphenol	--	--	NS	--	--	--	NS	--	--	--	--	--	--
ethylbenzene	--	--	NS	--	--	--	NS	--	--	--	--	--	--
tetrachloroethylene	--	--	NS	--	--	--	NS	--	--	--	--	--	--
toluene	--	--	NS	--	--	--	NS	--	--	--	--	--	--
trichloroethylene	--	--	NS	--	--	--	NS	--	--	--	--	--	--
PCBs	1.7±2	--	NS	--	--	--	NS	--	--	--	0.20±2	0.25±2	--
naphthalene	--	--	NS	--	--	--	NS	--	--	--	--	--	--
xylene	--	--	NS	--	--	--	NS	--	--	--	--	--	--
1,2-dichloroethane	--	--	NS	--	--	--	NS	--	--	--	--	--	--
1,1-dichloroethane	--	--	NS	--	--	--	NS	140	--	--	--	--	--
1,1,1-trichloroethane	--	--	NS	--	--	--	NS	780	--	--	--	--	--
1,1,2-trichloroethane	--	--	NS	--	--	--	NS	--	--	--	--	--	--
benzoic acid	--	--	NS	--	--	--	NS	--	--	--	--	--	--
trans-1,2-dichloroethylene	--	--	NS	--	--	--	NS	--	--	--	--	--	--
benzene	--	--	NS	--	--	--	NS	--	--	--	--	--	--
methylene chloride	1.1C	--	NS	500	3.1KM	--	NS	500	--	1.8C	11.0C	9.1C	--
heptachlor	--	--	NS	--	--	--	NS	--	--	--	--	--	--
fluorotrichloromethane	--	--	NS	--	--	--	NS	--	--	--	--	--	--
pentachlorophenol	--	--	NS	--	--	--	NS	--	--	--	--	--	--
isophorone	--	--	NS	--	--	--	NS	--	--	--	--	--	--
acetone	--	--	NS	--	--	--	NS	--	--	--	--	--	--
dichlorodifluoromethane	--	--	NS	--	--	--	NS	--	--	--	--	--	--
2-butanol	--	--	NS	--	--	--	NS	--	--	--	--	--	--
di-n-butylphthalate	--	--	NS	--	--	--	NS	20J	--	--	--	--	--
dimethyl phthalate	--	--	NS	--	--	--	NS	--	--	7.2	--	--	--
cyclohexanone	--	--	NS	--	--	--	NS	--	--	--	--	--	--
2-chlorophenol	--	--	NS	--	--	--	NS	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	--	--	NS	29	--	--	NS	79	--	--	--	--	--
vinyl chloride	--	--	--	--	--	--	--	--	--	--	--	--	--
chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrahydrofuran	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-dichloroethylene	--	--	NS	--	--	--	NS	70	--	--	--	--	--
di-n-octyl phthalate	--	--	--	--	--	--	--	20J	--	--	--	--	--
(4,4') DDT	--	--	--	--	--	--	--	--	--	--	--	--	--
phenol	--	--	--	--	--	--	--	--	--	--	--	--	--
acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--
n-nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 3 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES

ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION	MW-1011	MW-1010	MW-1021	MW-1021 Dup(MW-101A)	MW-103	MW-103 Dup(DP 10)	MW-104S	MW-104I	MW-105S	MW-105S Dup	MW-105 Dup	MW-105I	MW-105D	MW-106D
SAMPLE DATE	10-30-84	9-26-84	9-25-84	9-25-84	1-9-85	1-9-85	9-24-84	9-24-84	8-18-84	8-18-84	8-18-84	8-18-84	8-22-84	8-17-84
Parameters														
Organics (µg/l)														
chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	3K	4K	2K	--	--	10
toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PEBs	--	--	--	--	--	--	--	--	--	--	1.0	31	1.5	--
naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	7	9	5	--	--	--
1,1,2-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
methylene chloride	4A	5JB	--	5JB	2.4	6.4B	5JB	50B	13	20	11	--	--	20
heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--
fluorotrichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-butanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
di-n-butylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
dimethylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cyclohexanone	20J	--	--	--	--	--	--	--	--	--	--	--	--	--
2-chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	69	470	201	110	4.5KB	--	--	--	--	--	--	--	--	21
vinyl chloride	--	--	150	140	--	--	--	--	--	--	--	--	--	--
chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrahydrofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--
(4,4) DDT	--	--	--	--	--	--	--	--	--	--	0.2	--	--	--
phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
meta-rosaniline	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 3 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION	MW-106D Dup 8-17-84	MW-106D Dup 8-17-84	MW-107I 10-30-84	MW-107D 10-10-84	MW-108I 10-30-84	MW-108D 9-25-84	MW-109D 10-29-84	MW-110S 10-29-84	MW-110S Dup (MW-30) 10-29-84	MW-110I 10-29-84	MW-110D 1-8-85	DP-20 Blank 1-9-85	MW-111I 10-29-84
Parameters													
Organics (µg/l)													
chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
toluene	--	--	--	--	--	--	--	--	--	--	--	--	--
trichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs	--	--	--	--	--	--	--	--	--	--	--	--	--
naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--
xylene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
benzene	--	--	--	--	--	--	--	--	--	--	--	--	--
methylene chloride	14	9	5A	5A	6A	--	3A	3A	5	6A	--	12.7H	4A
heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1,2-tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--
acetone	--	--	--	--	--	--	--	--	--	--	--	--	--
dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--
2-butanone	--	--	--	--	--	--	--	--	--	--	--	--	--
di-n-butylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
dimethylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
cyclohexanone	--	--	--	--	--	--	--	--	--	10J	--	--	--
2-chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	--	--	--	--	4A	--	13A	39A	--	31A	--	--	--
vinyl chloride	--	--	--	--	--	--	--	--	--	--	--	--	--
chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrahydrofuran	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
(4,4) DDT	--	--	--	--	--	--	--	--	--	--	--	--	--
phenol	--	--	--	--	--	--	--	--	--	--	--	--	--
acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--
non-trosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	96

TABLE 3 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION	TRIP BLANK #1 8-14-84	NW-28 DISTILLED WATER BLANK 10-10-84	NW-12 DISTILLED WATER BLANK 11-01-84	TRIP BLANK #2 8-20-84	FILTER BLANK #1 8-16-84	FILTER BLANK #2 8-16-84
Parameters						
Organics (µg/l)						
chlorobenzene	--	--	--	--	--	--
methylphenol	--	--	--	--	--	--
ethylbenzene	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--
toluene	--	--	--	--	--	--
trichloroethylene	--	--	--	--	--	--
PCBs	--	--	--	--	--	--
naphthalene	--	--	--	--	--	--
xylene	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--
1,1,2-trichloroethane	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--
trans 1,2-dichloroethylene	--	--	--	--	--	--
benzene	--	--	--	--	--	--
methylene chloride	0.9	5	8	5	--	--
heptachlor	--	--	--	--	--	--
1-fluoro-2-chloroethane	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--
isophorone	--	--	--	--	--	--
acetone	--	--	--	--	--	--
dichlorodifluoromethane	--	--	--	--	--	--
2-butanone	--	--	--	--	--	--
di-n-butylphthalate	1.8K	--	--	--	--	--
dimethylphthalate	--	--	--	--	--	--
cyclohexanone	--	--	--	--	--	--
2-chlorophenol	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	--	--	4	--	--	--
vinyl chloride	--	--	--	--	--	--
chloroethane	--	--	--	--	--	--
tetrahydrofuran	--	--	--	--	--	--
1,1-dichloroethylene	--	--	--	--	--	--
di-n-octyl phthalate	--	--	--	--	--	--
(4,4) DDT	--	--	--	--	--	--
phenol	--	--	--	--	--	--
acenaphthene	--	--	--	--	--	--
n-nitrosodiphenylamine	--	--	--	--	--	--

TABLE 3 (cont.)

ANALYSIS OF MONITORING WELL SAMPLES
(MW-102 STUDY AREA)
ROSE TOWNSHIP - DEERODE ROAD SITE

Sample Location	RW-1	RW-14	RW-18	MW-1011	MW-1010	MW-1021	MW-51 (DUP MW-1021)	MW-1020	MW-103	MW-50 (Blank)
Sample Date	4-25-85	4-25-85	4-25-85	4-24-85	4-24-85	4-25-85	4-25-85	4-25-85	4-25-85	4-24-85
Parameters										
Organics µg/l										
methylene chloride	5JB	25JB	5JB	5JB	5JB	10JB	10JB	5JB	5JB	5JB
acetone	10JB	50JB	10JB	--	10JB	25JB	20JB	10JB	10JB	10JB
toluene	5J	25JB	--	5J	--	10J	10J	--	5J	5J
chloroethane	10J	50J	--	--	--	--	--	--	--	--
1,1-dichloroethylene	--	3J	--	--	--	--	--	--	--	--
1,1-dichloroethane	7.3	190	--	--	--	--	--	--	--	--
trans-1,2-dichloroethylene	5J	25J	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	1100	--	--	--	--	--	--	--	--
2-butanone	14B	50JB	14B	10JB	10JB	20B	20JB	10JB	10JB	10B
chlorobenzene	--	--	--	5J	--	10J	--	--	--	--
vinyl chloride	25	--	--	--	--	390	370	10J	--	--
2-hexanone	--	--	--	--	--	20J	--	--	--	--
di-n-butylphthalate	10J	10J	10J	10J	10J	10J	10J	10J	10J	10J
bis(2-ethylhexyl)phthalate	--	--	--	--	--	10J	--	10J	10J	--
PCB (124B)	1.0	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	50J	50J	--	--	--
phenol	--	10J	--	--	--	10J	10J	10J	10J	10J

NOTES:

- J = estimated value
- B = also found in blank
- = undetected

TABLE

 ANALYSES OF MONITORING WELL WATER SAMPLES
 ROUND 11
 ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION	RW-1	RW-1D	RW-2	RW-3	RW-4	RW-5	RW-5D	RW-6	RW-6D	* RW-7	RW-8	RW-8D	RW-8D D11
SAMPLE DATE	9-30-86	9-30-86	9-29-86	9-30-86	9-30-86	10-1-86	10-1-86	10-1-86	10-1-86	10-2-86	9-30-86	10-1-86	10-1-86
<u>Parameters</u>													
<u>Organics (µg/l)</u>													
chlorobenzene	--	--	--	--	--	--	190	170	--	3300	--	--	--
methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
ethylbenzene	--	--	--	--	--	--	--	31	--	3100	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--	4400	--	--	--
toluene	--	--	--	1J	1J	1J	62B	2JB	--	5500B	2J	--	1JB
trichloroethylene	--	--	--	--	35	--	71	350	--	1200J	--	--	--
PCBs	--	--	--	--	--	--	--	--	--	--	--	--	--
naphthalene	--	--	--	--	--	--	--	--	--	200	--	--	--
xylene	--	--	--	--	--	--	72	--	--	2500B	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	10	--	--	--	--	--
1,1-dichloroethane	--	6	--	--	8	7	490	19	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	15	--	48	7J	--	--	--	--	--
1,1,2-trichloroethane	--	--	--	--	--	--	--	31	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	--	--	--	--	--
trans 1,2-dichloroethylene	--	2J	--	--	19	2J	710	450	--	--	--	--	--
benzene	--	9	--	--	--	2J	170	26	--	--	--	--	--
methylene chloride	--	--	2J	--	--	1J	6J	3J	--	--	--	--	--
heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--
fluorotrichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	3J	13	28	--	--	--	--	--
acetone	5JB	4JB	10B	5JB	4JB	4JB	61B	19JB	6JB	8300B	5JB	31B	5JB
dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--
2-butanone	18B	18B	21B	15B	15B	19B	83B	30B	21B	13000B	15B	18B	10B
di-n-butylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
dimethylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
cyclohexanone	--	--	--	--	--	--	--	--	--	--	--	--	--
2-chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	3B	5B	--	5B	3B	4JB	3JB	6JB	8JB	15JB	3JB	5JB	5JB
vinyl chloride	--	65	--	--	--	86	1400	--	--	--	--	--	--
chloroethane	--	9J	--	--	--	3J	5J	--	--	--	--	--	--
tetrahydrofuran	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-dichloroethylene	--	--	--	--	--	--	6J	--	--	--	--	--	--
di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
(4,4')-DDT	--	--	--	--	--	--	--	--	--	--	--	--	--
acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--
n-nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-dimethylphenol	--	--	--	--	--	--	--	2J	--	--	--	--	--
carbon tetrachloride	--	--	--	--	--	--	8J	--	--	--	--	--	--
2-methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--
2-hexanone	--	--	--	--	--	--	--	--	--	--	--	--	JJB

TABLE 4 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES
 ROUND 11
 ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION SAMPLE DATE	MW-1011 9-25-86	MW-101D 9-25-86	MW-1021 9-23-86	MW-102D		MW-103S 9-24-86	MW-104S 9-24-86	MW-104I 9-24-86	MW-105S 9-29-86	MW-105I 9-29-86	MW-105D 9-29-86	MW-106D 9-30-86	MW-106D Dup 9-30-86
				MW-102D 9-24-86	Dup 9-24-86								
Parameters													
Organics (ug/l)													
bromodichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	1J
chloroform	--	--	--	--	--	--	--	--	--	--	--	--	2J
2-hexanone	--	--	9J	--	--	--	--	--	--	--	--	--	--
chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
toluene	--	--	--	2J	1J	--	--	--	--	--	--	2J	2J
trichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs	--	--	--	--	--	--	--	--	--	--	--	--	--
naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--
xylene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
benzene	--	--	--	--	--	--	--	--	--	--	--	--	--
methylene chloride	17B	9B	7JB	2JB	2JB	7B	3JB	2JB	--	1J	--	--	1J
heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--
fluorotrichloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--
acetone	5JB	--	--	--	--	--	--	--	16B	19B	10B	5JB	7JB
dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--
2-butanone	--	--	--	--	--	--	--	--	20B	19B	18B	20B	16B
di-n-butylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
dimethyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
cyclohexanone	--	--	--	--	--	--	--	--	--	--	--	--	--
2-chlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	--	--	--	5J	--	--	8J	--	3BJ	3BJ	2BJ	5BJ	5BJ
vinyl chloride	--	--	27D	--	--	2J	--	--	--	--	--	--	--
chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrahydrofuran	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
di-n-octyl phthalate	7BB	8JB	--	--	--	--	--	--	--	--	--	--	--
(5,4) DBP	--	--	--	--	--	--	--	--	--	--	--	--	--
phenol	--	--	--	--	--	--	--	--	--	3J	--	--	--
acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--
meta-ortho-phenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 4 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES
ROUND 1)
ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION	MW-107I	MW-107D	MW-108I	MW-108D	MW-108D Dup	MW-109D	MW-110S	MW-110I	MW-110D	MW-110D Dup	MW-110D
SAMPLE DATE	9-22-86	9-22-86	9-29-86	9-29-86	9-29-86	9-30-86	10-1-86	10-1-86	10-2-86	10-2-86	10-2-86
<u>Parameters</u>											
<u>Organics (ug/l)</u>											
2 hexanone	--	--	--	--	--	--	--	5JB	--	--	--
chlorobenzene	--	--	--	--	--	--	--	--	--	--	--
methylphenol	--	--	--	--	--	--	--	--	--	--	--
ethylbenzene	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--	--	--
toluene	--	--	--	--	--	2J	--	1J	1J	--	--
trichloroethylene	--	--	--	--	--	--	--	--	--	--	--
PCBs	--	--	--	--	--	--	--	--	--	--	--
naphthalene	--	--	--	--	--	--	--	--	--	--	--
xylenes	--	--	--	--	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--
1,1,2-trichloroethane	--	--	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	--	--	--
trans 1,2-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--
benzene	--	--	--	--	--	--	--	--	--	--	--
methylene chloride	4JB	7B	2J	1J	--	--	--	--	--	--	--
heptachlor	--	--	--	--	--	--	--	--	--	--	--
fluorotrichloromethane	--	--	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	--	--	--	--	--	--
acetone	3JB	2JB	14B	16B	7JB	4JB	5JB	5JB	6JB	12B	15B
dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--
2-butanone	--	--	12B	13B	16B	17B	27B	16B	29B	12B	16B
di-n-butylphthalate	3JB	2JB	--	--	--	--	--	--	--	--	--
dimethyl phthalate	--	--	--	--	--	--	--	--	--	--	--
cyclohexanone	--	--	--	--	--	--	--	--	--	--	--
2-chlorophenol	--	--	--	--	--	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	4J	--	5JB	7JB	4JB	7JB	6JB	7JB	3JB	3JB	3JB
vinyl chloride	--	--	--	--	--	--	--	--	--	--	--
chloroethane	--	--	--	--	--	--	--	--	--	--	--
tetrahydrofuran	--	--	--	--	--	--	--	--	--	--	--
1,1-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--
di-n-octyl phthalate	16JB	19JB	--	--	--	--	--	--	--	--	--
(4,4) DDT	--	--	--	--	--	--	--	--	--	--	--
phenol	--	--	--	--	--	--	--	--	--	--	--
acenaphthene	--	--	--	--	--	--	--	--	--	--	--
tert-butylphenylamine	--	1J	--	--	--	--	--	--	--	--	--

TABLE 4 (Cont.)

ANALYSES OF MONITORING WELL WATER SAMPLES
 ROUND 11
 ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION	DNR 1	DNR 2	DNR 3	DNR 4	DNR 5	DNR 6	DNR 7
SAMPLE DATE	9-22-86	9-24-86	9-23-86	9-23-86	9-23-86	9-23-86	9-23-86
<u>Parameters</u>							
<u>Organics (ug/l)</u>							
diethylphthalate	--	--	--	--	--	--	--
chlorobenzene	--	--	--	--	--	--	--
methylphenol	--	--	--	--	--	--	--
ethylbenzene	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--
toluene	--	--	--	--	--	--	--
trichloroethylene	--	--	--	--	--	--	--
PCBs	--	--	--	--	--	--	--
naphthalene	--	--	--	--	--	--	--
xylene	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--
1,1,2-trichloroethane	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--
trans 1,2-dichloroethylene	--	--	--	--	--	--	--
benzene	--	--	--	--	--	--	--
methylene chloride	6B	4JB	3JB	2JB	2JB	4JB	2JB
heptachlor	--	--	--	--	--	--	--
fluorotrichloromethane	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	--	--
acetone	--	--	--	--	--	--	--
dichlorodifluoromethane	--	--	--	--	--	--	--
2-butanone	--	--	--	--	--	--	--
di-n-butylphthalate	--	3JB	--	--	--	--	--
dimethyl phthalate	--	--	--	--	--	--	--
cyclohexanone	--	--	--	--	--	--	--
2-chlorophenol	--	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--
vinyl chloride	--	--	--	--	--	--	190
chloroethane	--	--	--	--	--	--	--
tetrahydrofuran	--	--	--	--	--	--	--
1,1-dichloroethylene	--	--	--	--	--	--	--
di-n-octyl phthalate	--	17JB	--	--	--	--	--
(4,4) DDT	--	--	--	--	--	--	--
phenol	--	--	--	--	--	--	--
acenaphthene	--	--	--	--	--	--	--
o-nitrosodiphenylamine	4J	--	--	--	--	--	--

TABLE (Cont.)
 ROUND 11
 ANALYSES OF MONITORING WELL WATER SAMPLES
 ROSE TOWNSHIP SITE - MICHIGAN

SAMPLE LOCATION	B05	NW-202	NW-205	NW-207	NW-209	NW-210
SAMPLE DATE	Blank	Blank	Blank	Blank	Blank	Blank
	9-22-86	9-25-86	9-30-86	10-1-86	10-2-86	10-2-86
Parameters						
Organics (µg/l)						
chlorobenzene	--	--	--	--	--	--
methylphenol	--	--	--	--	--	--
ethylbenzene	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--
toluene	--	--	--	1	2	1
trichloroethylene	--	--	--	--	--	--
PCBs	--	--	--	--	--	--
naphthalene	--	--	--	--	--	--
xylene	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--
1,1,2-trichloroethane	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--
trans 1,2-dichloroethylene	--	--	--	--	--	--
benzene	--	--	--	--	--	--
methylene chloride	86	19	--	1	--	--
heptachlor	--	--	--	--	--	--
fluorotrichloromethane	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--
isophorone	--	--	--	--	--	--
acetone	--	--	5	8	10	24
dichlorodifluoromethane	--	--	--	--	--	--
2-butanone	--	--	15	16	12	11
di-n-butylphthalate	3	--	--	--	--	--
dimethylphthalate	--	--	--	--	--	--
cyclohexanone	--	--	--	--	--	--
2-chlorophenol	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	--	--	4	5	4	3
vinyl chloride	--	--	--	--	--	--
chloroethane	--	--	--	--	--	--
tetrahydrofuran	--	--	--	--	--	--
1,1 dichloroethylene	--	--	--	--	--	--
di-n-octyl phthalate	14	8	--	--	--	--
(4,4) DDT	--	--	--	--	--	--
phenol	--	--	--	--	--	--
acenaphthene	--	--	--	--	--	--
n-nitrosodiphenylamine	--	--	--	--	--	--
chloroform	--	3	--	3	3	3
bromodichloromethane	--	1	--	1	1	1

TABLE 6

ANALYSIS OF TEST PIT SOIL SAMPLES¹
ROSE TOWNSHIP - DENODE ROAD SITE

Sample Location	TP-1	TP-1	TP-1	TP-1	TP-1	TP-1	TP-1	TP-1	TP-1
Sample Number	37	38	39	31	32	33	34	35	36
Sample Depth	3'	1'	4'	1'	2'	1'	4'	4'	8"
Sample Date	3/21/85	3/21/85	3/21/85	3/21/85	3/21/85	3/21/85	3/21/85	3/21/85	3/21/85
Parameters									
Metals - Total µg/kg									
Aluminum	10800	12100	1760	4200	10500	18000	5250	6410	9350
Antimony	--	--	--	--	--	--	--	--	--
Arsenic	15	18	11	6.2	13	28	11	8.8	15
Barium	--	--	--	779	--	--	--	--	1050
Beryllium	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	3.8
Calcium	21400	--	15100	--	8560	--	83000	80100	--
Chromium	23	36	5.9	89	32	34	12	14	85
Cobalt	--	--	--	--	--	--	--	--	--
Copper	23	22	--	14	22	31	14	--	--
Iron	20800	21800	56300	1410	21300	32400	12700	13500	17000
Lead	8	92	7.2	314	39	14	6.6	5.5	530
Magnesium	13800	3840	4490	--	5930	5370	32700	21800	--
Manganese	505	263	75	305	384	463	289	252	238
Mercury	--	--	--	--	--	--	--	--	0.19
Nickel	24	25	--	--	24	106	--	--	--
Potassium	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--
Tin	--	--	--	--	--	--	--	--	--
Vanadium	29	--	--	--	30	41	--	--	--
Zinc	45	53	14	214	48	60	32	30	261
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA

TP = test pit

NA = not analyzed

¹ Each sample listed represents the results of a sample collected from a distinct area of the test pit at a distinct depth interval. If more than one sample at a specific depth is listed for a given pit, then more than one area of the pit was sampled at that depth. See Appendix E-6B for soil descriptions and sample locations.

TABLE 6

ANALYSIS OF TEST PIT SOIL SAMPLES
ROSE TOWNSHIP - DEROOE ROAD SITE

Sample Location	TP-1	TP-1	TP-1	TP-1	TP-1	TP-1	TP-1	TP-1	TP-1
Sample Number	37	38	39	31	32	33	34	35	36
Sample Depth	1'	1'	4'	1'	2'	1'	4'	4'	8"
Sample Date	3/21/85	3/21/85	3/21/85	3/21/85	3/21/85	3/21/85	3/21/85	3/21/85	3/21/85
Parameters									
Organics µg/kg									
acetone	--	--	--	--	--	81B	--	--	--
toluene	3300B	--	2700B	13000B	65000B	--	3300B	1300JB	6700B
ethylbenzene	17000	--	9100	33000	270000	--	6700	11000	--
chlorobenzene	2500J	--	--	4400	4900	--	--	--	--
xylenes	800000	5J	56000	300000	1100000	5J	38000	76000	28000
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--
trichloroethylene	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--
naphthalene	37000	--	37000	81000	14000	--	4200	3200	8000
2-methylnaphthalene	3700	--	5200	16000	1700J	--	460	340	--
phenanthrene	1700J	--	--	2800	1700J	--	330J	330J	--
acenaphthene	--	--	--	1700J	--	--	--	--	--
fluorene	--	--	--	--	--	--	--	--	--
fluoranthene	--	--	--	2400	--	--	--	--	--
pyrene	--	--	--	1700	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--	--
4-methyl-2-pentanone	--	--	--	--	--	--	--	--	--
di-n-butylphthalate	--	330JB	--	4200B	1700JB	330JB	--	330JB	6700
butylbenzylphthalate	--	330JB	--	1700JB	1700JB	330JB	690B	330JB	6600J
bis(2-ethylhexyl)phthalate	1700JB	960B	1700JB	17000B	3300B	330JB	3800B	4000B	29000
di-n-octylphthalate	--	--	--	--	--	--	--	--	--
PCB's	680	720C	--	14000C	1000	--	--	--	74000
4,4'-DDE	--	--	20	--	--	15	--	--	--
styrene	--	--	--	--	--	--	--	--	--
anthracene	--	--	--	6500	--	--	--	--	--
isophorone	--	--	--	--	--	--	--	480	--
1,2-dichlorobenzene	--	--	--	--	--	--	--	--	--
phenol	--	--	--	--	--	--	--	--	--
aniline	--	--	--	--	--	--	--	--	--
dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--	--

TP = test pit

J = estimated value

B = also found in blank

C = confirmed by GC-MS

-- = not detected

TABLE 6 (cont.)

ANALYSIS OF TEST PIT SOIL SAMPLES
ROSE TOWNSHIP - DEMODE ROAD SITE

Sample Location	TP-2	TP-2	TP-2	TP-2	TP-2	TP-2	TP-3	TP-3	TP-3
Sample Number	10	11	12	13	14	15	21	20	22
Sample Depth	2.5'	3.5'	1.5'	2.5'	2.5'	4.5'	3½'	8"	2½-3'
Sample Date	3/19/85	3/19/85	3/19/85	3/19/85	3/19/85	3/19/85	3/20/85	3/20/85	3/20/85
Parameters									
Metals - Total mg/kg									
Aluminum	4300	5070	4630	4620	4380	7400	6260	5170	5530
Antimony	36	--	--	--	--	--	--	--	--
Arsenic	--	--	11	18	--	8.4	9.3	6.1	--
Barium	288	289	309	324	--	--	--	623	160
Beryllium	--	--	--	--	--	--	--	--	--
Cadmium	6.7	--	3.8	4.1	--	--	--	4.2	--
Calcium	7950	27800	15000	4280	--	--	33800	14600	27900
Chromium	45	50	40	48	20	15	36	107	44
Cobalt	--	--	--	--	--	--	--	--	--
Copper	--	14	--	21	--	14	26	32	21
Iron	9490	12400	11000	13600	9590	16300	13200	12200	12400
Lead	314	165	227	383	104	8.4	145	594	260
Magnesium	2990	8840	3880	--	--	--	10700	5090	7260
Manganese	168	235	251	656	173	313	261	215	251
Mercury	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--
Tin	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--
Zinc	246	380	474	7630	380	30	372	636	309
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA

TP = test pit
NA = not analyzed

TABLE 6 (cont.)

ANALYSIS OF TEST PIT SOIL SAMPLES
ROSE TOWNSHIP - DEMODE ROAD SITE

Sample Location	TP-2	TP-2	TP-2	TP-2	TP-2	TP-2	TP-1	TP-1	TP-1
Sample Number	10	11	12	13	14	15	21	20	22
Sample Depth	2.5'	3.5'	1.5'	2.5'	2.5'	4.5'	3.5'	8"	2.5-3'
Sample Date	3/19/85	3/19/85	3/19/85	3/19/85	3/19/85	3/19/85	3/20/85	3/20/85	3/20/85
Parameters									
Organics (pg/kg)									
acetone	58B	--	--	--	--	--	--	--	--
toluene	--	370B	--	--	--	--	83000B	86000B	470000
ethylbenzene	--	--	--	--	500J	--	280000	300000	430000
chlorobenzene	--	--	--	--	--	--	11000	11000	54000
xylenes	--	78000	6.4	9200	9900	5J	980000	1000000	1400000
1,1,2-Trichloroethane	--	--	--	--	--	--	--	--	--
trichloroethylene	--	--	--	--	--	--	--	--	--
tetrachloroethylene	24	1600	5J	--	--	--	4100	4500	5000
naphthalene	330J	16000	330J	6600J	330J	--	16000	22000	7000
2-methylnaphthalene	330J	7600	330J	--	330J	--	6600	9100	1900
phenanthrene	330J	6600J	330J	--	330J	--	--	6600J	1700J
acenaphthene	--	--	130J	--	--	--	--	--	--
fluorene	--	--	--	--	--	330J	--	--	--
fluoranthene	--	--	--	--	--	--	--	--	--
pyrene	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	32000J	--	--
4-methyl-2-pentanone	--	--	--	--	--	--	--	--	10000J
di-n-butylphthalate	330J	8200	--	6600J	330JB	330JB	6600J	6600J	1700JB
butylbenzylphthalate	960B	6600J	1600B	--	360JB	960JB	11000	13000	1700B
bis(2-ethylhexyl)phthalate	10000B	76000	5800B	29000	3800B	--	19000	30000	3700B
di-n-octylphthalate	--	--	--	--	--	--	--	--	--
PCBs	11000C	26000C	26000C	20000	14000C	--	5100	27000C	1900
4,4'-DDE	--	--	--	--	--	--	--	--	--
styrene	--	--	--	--	--	--	--	--	--
anthracene	--	--	--	--	--	--	--	--	--
isophorone	330J	--	330J	--	330J	--	--	--	--
1,2-dichlorobenzene	--	--	--	--	--	--	--	--	--
phenol	--	--	--	--	--	--	--	--	--
aniline	--	--	--	--	--	--	--	--	--
dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--	--

TP - test pit

J = estimated value

B = also found in blank

C = confirmed by GC-MS

-- = not detected

TABLE 6 (cont.)

ANALYSIS OF TEST PIT SOIL SAMPLES
ROSE TOWNSHIP - DEMODE ROAD SITE

Sample Location	TP-3	TP-3	TP-3	TP-3	TP-4	TP-4	TP-4	TP-4	TP-4
Sample Number	25	26	24	23	5	6	7	8	9
Sample Depth	2'	2'	6'	2'	2'	6'	2'	5'	5'
Sample Date	3/20/85	3/20/85	3/20/85	3/20/85	3/19/85	3/19/85	3/19/85	3/19/85	3/19/85
Parameters									
Metals - Total mg/kg									
Aluminum	1560	1910	2260	6480	3000	3730	6460	2960	4010
Antimony	--	--	--	39	--	--	--	--	--
Arsenic	--	--	6.7	9.2	--	--	9	--	--
Barium	--	--	--	396	177	--	165	--	--
Beryllium	--	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--
Calcium	--	--	82000	8610	--	--	10300	--	--
Chromium	5.3	--	16	64	12	7.6	15	--	7.6
Cobalt	--	--	--	--	--	--	--	--	--
Copper	--	13	--	35	--	--	--	--	--
Iron	5070	5810	8280	13500	8420	7780	15800	6540	8110
Lead	--	--	18	1300	34	2.6	17	--	3.0
Magnesium	--	--	15700	3810	--	--	--	--	--
Manganese	91	135	227	230	186	335	468	375	481
Mercury	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--
Tin	--	--	--	32	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--
Zinc	39	49	44	851	55	21	56	18	23
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA

TP = test pit
NA = not analyzed

TABLE 6 (cont.)

ANALYSIS OF TEST PIT SOIL SAMPLES
ROSE TOWNSHIP - DEMODE ROAD SITE

Sample Location	TP-3	TP-3	TP-3	TP-3	TP-4	TP-4	TP-4	TP-4	TP-4
Sample Number	25	26	24	23	5	6	7	8	9
Sample Depth	2'	2'	6'	2'	2'	6'	2'	5'	5'
Sample Date	3/20/85	3/20/85	3/20/85	3/20/85	3/19/85	3/19/85	3/19/85	3/19/85	3/19/85
Parameters									
Organics µg/kg									
acetone	--	--	--	--	--	--	--	74B	--
toluene	5.1	5.1	13000B	37000B	--	--	--	15	--
ethylbenzene	--	5.1	220000	62000	--	--	--	8.3	--
chlorobenzene	9.6	9.9	39000	4000	--	--	--	6.0	--
xylene	130	52	710000	140000	--	--	--	31	--
1,1,2-trichloroethane	--	--	--	--	--	--	--	--	--
trichloroethylene	--	--	1300	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--
naphthalene	1400	910	6800	40000	--	--	--	--	--
2-methylnaphthalene	1500	1100	6600J	20000	--	--	--	--	--
phenanthrene	5100	3300	6600J	4000	--	--	--	--	--
acenaphthene	--	--	--	--	--	--	--	--	--
fluorene	800	630	--	--	--	--	--	--	--
fluoranthene	--	--	--	--	--	--	--	--	--
pyrene	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--	--
4-methyl-2-pentanone	10.1	10.1	5000J	5000J	--	--	--	--	--
di-n-butylphthalate	--	330J	--	--	--	--	330JB	330JB	--
butylbenzylphthalate	660JB	330J	--	3000	--	--	--	--	--
bis(2-ethylhexyl)phthalate	960B	880B	6600J	16000	--	--	--	--	--
di-n-octylphthalate	--	110J	--	--	--	--	--	--	--
PCBs	10000C	65000C	53000C	1400	--	--	170	--	--
4,4'-DDT	--	--	--	--	--	--	--	--	--
styrene	--	--	--	--	--	--	--	--	--
anthracene	--	130J	--	--	--	--	--	--	--
isophotone	--	--	6600J	--	--	--	--	--	--
1,2-dichlorobenzene	--	--	--	--	--	--	--	--	--
phenol	780	410	--	--	--	--	--	--	--
aniline	--	--	--	--	--	--	--	--	--
dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--	--

TP = test pit

J = estimated value

B = also found in blank

C = confirmed by GC-MS

-- = not detected

TABLE 6 (cont.)

ANALYSIS OF TEST PIT SOIL SAMPLES
ROSE TOWNSHIP - DEMODE ROAD SITE

Sample Location	TP-5	TP-5	TP-5	TP-5	TP-6	TP-6	TP-6	Backhoe ¹
Sample Number	27	28	29	30	42	41	40	43
Sample Depth	1½'	5'	2½'	5½'	5'	3'	6-8"	
Sample Date	3/20/85	3/20/85	3/20/85	3/20/85	3/21/85	3/21/85	3/21/85	3/21/85
Parameters								
Metals - Total µg/kg								
Aluminum	8970	7920	8820	5230	7960	4880	4400	5880
Antimony	46	--	--	--	--	--	--	--
Arsenic	14	9.3	9.4	6.6	8.3	9.2	6.7	11
Barium	435	439	1010	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--
Cadmium	4.5	--	8.2	--	--	--	--	--
Calcium	14400	51600	30700	69500	--	27700	21100	136000
Chromium	73	32	81	12	16	15	9.5	16
Cobalt	--	--	--	--	--	--	--	--
Copper	109	38	38	19	15	15	--	39
Iron	29400	16900	17100	11800	15500	12100	8590	14600
Lead	1050	288	346	43	5.1	8.7	15	16
Magnesium	7010	15100	11800	26200	--	6820	4360	74100
Manganese	344	378	261	260	195	273	254	493
Mercury	0.45	0.15	0.29	--	--	--	--	--
Nickel	33	26	--	--	--	25	--	--
Potassium	--	--	--	--	--	--	--	--
Selenium	6.5	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--	5000
Thallium	--	--	--	--	--	--	--	--
Tin	35	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--
Zinc	438	354	530	53	36	45	53	63
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA

TP = test pit
NA = not analyzed

¹ A sample of fibrous, splintery material, perhaps fiberglass, that was collected from the backhoe bucket from Test Pit 6 at a depth of 3-4 feet.

TABLE 6 (cont.)

ANALYSIS OF TEST PIT SOIL SAMPLES
ROSE TOWNSHIP - DEMODE ROAD SITE

Sample Location	TP-5	TP-5	TP-5	TP-5	TP-6	TP-6	TP-6	Back-Hoe
Sample Number	27	28	29	30	42	41	40	43
Sample Depth	1½'	5'	2½'	5½'	5'	3'	6-8"	
Sample Date	3/20/85	3/20/85	3/20/85	3/20/85	3/21/85	3/21/85	3/21/85	3/21/85
Parameters								
Organics µg/kg								
acetone	--	--	--	--	--	--	900	--
toluene	--	26000B	11000	9800B	5J	--	--	160
ethylbenzene	--	29000	28000	5100	5J	--	--	420
chlorobenzene	--	13000	--	--	--	--	--	110
xylene	6.9	130000	130000	26000	15	5J	5J	6500
1,1,2 trichloroethane	--	--	--	--	--	--	14	26
trichloroethylene	--	--	--	--	--	--	--	9.3
tetrachloroethylene	5J	--	--	--	--	--	--	31
naphthalene	330J	15000	2500	1400	--	--	--	4800
2-methylnaphthalene	--	2200	550	540	--	--	--	1700
phenanthrene	--	1700J	330J	--	--	--	--	860
acenaphthene	--	--	--	--	--	--	--	660J
fluorene	--	--	--	--	--	--	--	660J
fluoranthene	--	--	--	--	--	--	--	660J
pyrene	330J	--	--	--	--	--	--	660J
pentachlorophenol	--	--	--	--	--	--	1600	--
4-methyl-2-pentanone	--	13000	2500J	800	--	--	--	--
di-n-butylphthalate	--	--	--	330JB	--	330JB	330JB	1400B
butylbenzylphthalate	490B	--	330JB	330JB	330JB	330JB	330JB	1700B
bis(2-ethylhexyl)phthalate	1200B	29000B	7000B	14000B	330JB	330JB	330JB	7700B
di-n-octylphthalate	1200	1700J	--	--	--	--	--	--
PCB's	7000C	74000C	3500C	280	--	4800C	--	24000C
4,4'-DDT	--	--	--	--	--	--	29	--
styrene	--	--	--	--	--	--	--	--
anthracene	--	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	--	--	--
1,2-dichlorobenzene	--	--	--	--	--	--	--	--
phenol	--	--	--	--	--	--	--	--
aniline	--	--	--	--	--	--	2600	--
dibenzo(a,h)anthracene	--	--	--	--	--	--	330J	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--

TP = test pit

J = estimated value

B = also found in blank

C = confirmed by GC-MS

-- = not detected

6.85.45
0003.2.0

TABLE 6 (cont.)

ANALYSIS OF TEST PIT SOIL SAMPLES
ROSE TOWNSHIP - DEMODE ROAD SITE

Sample Location	TP-7	TP-7	TP-7	TP-7	TP-8	TP-8	TP-8	TP-8
Sample Number	17	16	18	19 Dup 18	1	2	3	4
Sample Depth	2½'	1'	2½'	2½'	3'	6'	3'	3'
Sample Date	3/20/85	3/20/85	3/20/85	3/20/85	3/19/85	3/19/85	3/19/85	3/19/85

ParametersMetals - Total mg/kg

Aluminum	4660	6530	5010	5390	8100	8620	12400	9180
Antimony	--	--	--	--	--	--	--	--
Arsenic	--	8.1	--	--	16	8.1	15	11
Barium	864	1240	667	--	--	--	--	--
Beryllium	--	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	4.1	--
Calcium	--	12200	3200	--	9820	--	--	--
Chromium	62	105	52	14	16	79	21	26
Cobalt	--	--	--	--	--	--	--	--
Copper	--	22	15	24	16	22	25	24
Iron	9130	13700	8330	7340	18100	19300	27000	23900
Lead	226	185	70	36	7.0	127	11	7
Magnesium	--	6130	--	--	7130	--	--	--
Manganese	262	227	264	265	353	333	332	274
Mercury	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--
Potassium	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--
Tin	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--
Zinc	75	936	385	99	37	43	50	48
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA

TP = test pit
NA = not analyzed

TABLE 6

ANALYSIS OF TEST PIT SOIL SAMPLES
ROSE TOWNSHIP - DEBRIDE ROAD SITE

Sample Location	TP-7	TP-7	TP-7	TP-7	TP-8	TP-8	TP-8	TP-8
Sample Number	17	16	18	19 Dup 18	1	2	3	4
Sample Depth	2½'	1'	2½'	2½'	3'	6'	3'	3'
Sample Date	3/20/85	3/20/85	3/20/85	3/20/85	3/19/85	3/19/85	3/19/85	3/19/85
Parameters								
Organics µg/kg								
acetone	--	--	--	--	51B	100B	45B	--
toluene	78000B	36	7.2	--	--	--	--	--
ethylbenzene	190000	6.0	5.3	5J	--	--	--	--
chlorobenzene	570000	71	36	28	--	--	--	--
xylene	780000	56	8.3	11	--	--	--	--
1,1,2 trichloroethane	2500J	16	--	--	--	--	--	--
trichloroethylene	10000	71	--	--	--	--	--	--
tetrachloroethylene	2500J	11	--	--	--	--	--	--
naphthalene	67000	--	460	330J	--	--	--	--
2-methylnaphthalene	48000	--	330J	330J	--	--	--	--
phenanthrene	1700J	--	--	--	--	--	--	--
acenaphthene	1700J	--	--	--	--	--	--	--
fluorene	1700J	--	--	--	--	--	--	--
fluoranthene	--	--	--	--	--	--	--	--
pyrene	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--
4-methyl-2-pentanone	5000J	--	--	--	--	--	--	--
di-n-butylphthalate	2600B	6600J	330JB	330JB	--	--	--	--
butylbenzylphthalate	1700JB	--	330JB	330JB	--	--	--	--
bis(2-ethylhexyl)phthalate	9300B	24000	1600B	330JB	--	--	--	--
di-n-octylphthalate	--	--	--	--	--	--	--	--
PCBs	24000	7900	16000	6600	6400	--	--	2600
4,4'-DDT	--	--	--	--	--	--	--	--
styrene	--	--	--	--	--	--	--	--
anthracene	--	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	--	--	--
1,2-dichlorobenzene	--	--	--	--	--	--	--	--
phenol	--	--	330J	--	--	--	--	--
aniline	--	--	--	--	--	--	--	--
dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--
trans-1,2-dichloroethylene	--	5.6	--	--	--	--	--	--

TP - test pit

J = estimated value

B = also found in blank

C = confirmed by GC-MS

-- = not detected

TABLE 7
ANALYSES OF SURFACE SOIL GRAB SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location Sample Date	SEDA-1 8-23-84	SEDA-2 8-23-84	SEDA-3 8-24-85	SEDA-4 8-24-84	SEDA-4 8-24-84	SEDA-5 8-24-84	SEDA-6 8-24-84	SEDA-6 8-24-84	SEDA-7 8-24-84	SEDA-7 8-24-84	SEDA-8 8-24-84	SEDA-8 8-24-84	SEDA-9 8-27-84
Parameters													
Metals, Total (mg/kg)													
Aluminum	6100	4206	5345	5860	7865	7495	5885	NA	9030	NA	9675	NA	1511
Antimony	--	--	--	--	--	--	--	NA	--	NA	--	NA	--
Arsenic	2.5	2	3.5	4.0	4.5	5.5	2.5	NA	4.5	NA	5.0	NA	8.0
Barium	34.5	28	39	45	559	102	52	NA	110	NA	99	NA	29
Beryllium	0.5	--	1.1	0.45	0.7	--	0.4	NA	0.7	NA	0.8	NA	0.8
Cadmium	0.13	0.15	--	0.2	7.5	0.6	0.16	NA	0.12	NA	0.2	NA	--
Chromium	10	6.5	11.5	17	109	21	9	NA	14	NA	16	NA	4
Cobalt	3.5	4.5	5.5	5	10	8.5	4	NA	8	NA	6	NA	--
Copper	11.0	7.0	124	16.5	32.5	15.5	42	NA	174	NA	11.5	NA	24
Iron	7700	5080	8080	8990	13810	12565	7175	NA	11455	NA	13715	NA	5590
Lead	10.5	14	96	68	425	47	14	NA	33	NA	23.5	NA	6.0
Cyanide	0.3	--	--	--	3.275	1.6	--	NA	--	NA	--	NA	--
Manganese	184	175	150	193	250	132	887	NA	1532	NA	1211	NA	525
Mercury	--	--	--	--	0.17	0.13	--	NA	0.11	NA	--	NA	--
Nickel	10	5.0	10	12	31	14	7	NA	12.5	NA	13	NA	2
Selenium	0.3	0.25	0.1	--	1.2	0.1	0.1	NA	0.2	NA	0.2	NA	0.1
Silver	--	--	0.6	--	--	--	--	NA	--	NA	--	NA	--
Thallium	--	--	--	--	--	--	--	NA	--	NA	--	NA	--
Tin	--	--	--	--	6.0	--	--	NA	2.5	NA	--	NA	--
Vanadium	14	--	13	14	20	17.5	12.5	NA	18.5	NA	23.5	NA	--
Zinc	23	22	17	34	328	54	30	NA	59	NA	43	NA	21

TABLE 7 (Cont.)

ANALYSES OF SURFACE SOIL GRAB SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location Sample Date	SEDA-1 8-21-84	SEDA-2 8-23-84	SEDA-3 8-24-84	SEDB-1 8-24-84	SEDA-4 8-24-84	SEDA-5 8-24-84	SEDA-6 8-24-84	SEDB-6 8-24-84	SEDA-7 8-24-84	SEDB-7 8-24-84	SEDA-8 8-24-84	SEDB-8 8-24-84	SEDA-9 8-27-84
Parameters													
Organics (µg/kg)													
4-methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
toluene	--	--	--	--	--	--	--	--	--	--	--	--	--
trichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs	--	--	260000	490000	180000	590	100	92	--	26	300	110	--
xylenes	--	--	--	--	--	3.7	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	--	--	--	--	--
trans 1,2-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
methylene chloride	380	3.9	340	37	42	18	52	15	21	6.8	3.9	14	1.6
fluorotrichloroethane	--	--	--	5.1	--	5.4	--	12	19	--	--	5.9	6.3
pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--
acetone	--	--	--	--	--	--	--	--	--	--	--	--	--
phthalates (total)	--	490	3600	1900	618700	2810	--	--	--	530	960	--	--
phenol	--	--	--	--	550	--	--	--	--	--	--	--	--
pyrene	--	--	--	--	--	--	--	--	--	860	--	--	--
benzyl alcohol	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 7 (Cont.)

ANALYSES OF SURFACE SOIL GRAB SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location Sample Date	SEDA-10 8-27-84	SEDA-11 8-27-84	SEDA-12 8-27-85	SEDA-13 8-27-84	SEDA-14 8-27-84	SEDA-15 8-27-84	SEDA-16 8-27-84	SEDA-17 8-27-84	SEDA-18 8-27-84	SEDA-18 8-27-84	SEDA-19 8-28-84	SEDA-20 8-28-84	SEDA-20 8-28-84
Parameters													
Metals, Total (mg/kg)													
Aluminum	1916	2703	2210	5375	5520	3424	2647	2542	5035	4315	2678	4171	3695
Antimony	--	--	--	--	--	--	--	--	6	4.2	--	--	--
Arsenic	5.0	14	9.5	4	13.5	3.0	2.5	4.5	3.5	2.0	3.5	1	5
Barium	24	53	17	31	83	29	21	28.5	344	365	18	18	18
Beryllium	0.45	0.3	--	1.0	0.6	0.8	--	0.3	0.3	--	0.4	--	0.6
Cadmium	--	0.16	0.07	0.12	0.11	0.16	0.1	0.4	8.3	8.2	--	--	0.06
Chromium	4	5.5	5	11	9.0	5.5	5.5	10	18	33	6	7	7.5
Cobalt	3	3.0	--	5	5.5	3.0	--	2.5	3	--	3.5	3.5	3.5
Copper	5	197	41.5	27.5	9	40	6.5	99	19580	27045	11	10	9
Iron	4255	10275	7585	8410	13265	5110	4107	19950	6610	6620	4961	6440	6250
Lead	4	33	8	13	11	15	10	24	2157	3200	15.5	5.5	5
Cyanide	--	--	--	--	--	--	--	--	0.475	0.425	--	--	--
Manganese	261	1010	107	220	402	201	200	144	73	63	167	186	214
Mercury	--	0.18	0.19	0.1	--	--	--	--	0.13	0.11	--	--	--
Nickel	--	5	4.5	9	7.5	5	4.5	9.0	12	17.5	5	7.0	6.5
Selenium	--	--	--	0.15	0.1	--	--	0.1	0.1	--	0.1	--	--
Silver	--	--	--	--	--	--	--	--	1.4	1.4	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--
Tin	--	--	--	4.5	3.0	--	6.0	--	23	62	--	--	--
Vanadium	--	--	--	14	13	--	--	--	--	--	--	10.5	--
Zinc	12.5	88	29	29	18	31.5	18	84	2251	1969	28	19	17

TABLE 7 (Cont.)

ANALYSES OF SURFACE SOIL GRAB SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location Sample Date	SEDA-10 8-27-84	SEDA-11 8-27-84	SEDA-12 8-27-85	SEDA-13 8-27-84	SEDA-14 8-27-84	SEDA-15 8-27-84	SEDA-16 8-27-84	SEDA-17 8-27-84	SEDA-18 8-27-84	SEDA-18 8-27-84	SEDA-19 8-28-84	SEDA-20 8-28-84	SEDA-20 8-28-84
Parameters													
Organics (µg/kg)													
4-methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
toluene	--	--	--	--	--	--	--	--	--	--	--	--	--
trichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs	--	--	--	--	--	--	--	100	1410	1310	--	--	--
xylenes	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
methylene chloride	18	58	24	24	--	100	--	44	31	48	1.4	84	12
fluorotrichloroethane	7.1	5.2	3.9	--	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--
acetone	--	--	--	--	--	--	--	--	--	--	--	--	--
phthalates (total)	--	--	970	--	--	--	1480	1100	2480	--	590	--	--
phenol	--	--	--	--	--	--	--	--	--	--	--	--	--
pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--
benzyl alcohol	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 7 (Cont.)

ANALYSES OF SURFACE SOIL GRAB SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location	SEDA-21	SEDA-22	SEDA-23	SEDA-24	SEDA-25	SEDA-26	SEDA-27	SEDA-28	SEDA-29	SEDA-30	SEDA-31	SEDA-32	
Sample Date	8-28-84	8-28-84	8-28-84	8-28-84	8-28-85	8-28-84	8-28-84	8-28-84	8-28-84	8-28-84	8-28-84	8-29-84	
Parameters													
Metals, Total (mg/kg)													
Aluminum	3103	1972	2960	172	2882	4502	4705	5255	5710	4738	3075	1895	2846
Antimony	--	--	--	--	--	--	--	--	--	--	1.1	--	--
Arsenic	2.0	1.0	3.0	3.5	6.8	3.5	2.5	3.5	3	3.5	2.0	8	2.0
Boron	36	21	27	8	36	33.5	87	46	48	43	25	57	26
Beryllium	0.45	0.4	0.3	0.3	0.5	0.7	0.8	--	--	0.8	--	--	0.35
Cadmium	0.08	0.09	0.18	0.1	0.3	--	0.25	0.13	0.13	--	0.12	0.13	0.12
Chromium	6.5	5	4.5	--	5	6.5	9	9.5	10.5	9.5	5.5	4	4.5
Cobalt	4.5	2.5	--	--	2.5	3	5.5	6.0	6.0	5.5	5.0	--	--
Copper	7.5	4.5	8.5	7	7.5	7.5	10	10	9.5	8.5	7.5	3.5	4.0
Iron	6395	2854	4797	1622	7375	5490	7010	7970	8320	7385	5705	10020	4192
Lead	8	5.5	8	2.5	7.5	8	14	10	10	11.5	7.5	5.5	6.3
Cyanide	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	270	151	110	88	135	52	1179	505	518	455	313	1404	161
Mercury	--	--	--	--	--	--	0.1	--	--	--	0.1	--	--
Nickel	5.5	2.8	3.6	--	3	5.5	10	9	9	7.5	5	3.0	2.3
Selenium	--	0.1	--	--	--	--	0.15	0.1	0.15	--	--	--	--
Silver	--	0.7	--	--	--	--	--	--	--	0.7	--	--	--
Thallium	--	--	--	--	--	--	--	--	1	--	--	--	--
Tin	--	--	--	2.5	3.0	2.3	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	10.5	13	13.5	11.6	--	--	--
Zinc	22	14	28	10	24.5	25	35	30	33	32	22.5	34	18

TABLE 7 (Cont.)
ANALYSES OF SURFACE SOIL GRAB SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location Sample Date	SEDA-21 8-28-84	SEDA-22 8-28-84	SEDA-23 8-28-84	SEDA-24 8-28-84	SEDA-25 8-28-85	SEDA-26 8-28-84	SEDA-27 8-28-84	SEDA-28 8-28-84	SEDA-28 8-28-84	SEDA-29 8-28-84	SEDA-30 8-28-84	SEDA-11 8-28-84	SEDA-12 8-29-84
Parameters													
Organics (µg/kg)													
4-methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
toluene	--	--	--	--	--	--	--	--	--	--	--	--	--
trichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
PCHs	--	--	--	--	--	--	--	--	--	--	--	--	--
xylene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
methylene chloride	92	290	580	1100	300	360	67	190	18	5.8	8.3	14	13
fluorotrichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	2200	--	--	--	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--
acetone	--	--	--	--	--	--	--	--	--	--	--	--	--
phthalates (total)	--	--	--	--	--	--	9000	--	--	--	--	4400	--
phenol	--	--	--	--	--	--	--	--	--	--	--	--	--
pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--
benzyl alcohol	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 7 (Cont.)
 ANALYSES OF SURFACE SOIL GRAB SAMPLES
 ROSE TOWNSHIP SITE - MICHIGAN

Sample Location Sample Date	SEDB-13 8-28-84	SEDA-34 8-29-84	SEDA-15 8-29-84	SEDB-15 8-29-84	SEDA-16 8-29-84	SEDB-16 8-29-85	SEDA-17 8-29-84	SEDB-17 8-29-84	SEDA-18 8-29-84	SEDB-18 8-29-84	SEDA-19 8-29-84	SEDB-40 8-29-84	SEDB-41 8-29-84
Parameters													
Metals, Total (mg/kg)													
Aluminum	5825	9765	2204	NA	3856	4448	2992	4780	4045	NA	6425	7455	5055
Antimony	--	--	--	NA	--	1.5	--	--	--	NA	--	--	--
Arsenic	1.3	3.8	83	NA	2.0	3.0	1.6	2.4	2.6	NA	2.3	1.2	1.0
Barium	60	180	318	NA	966	966	25	40	18.5	NA	83	48	46
Beryllium	0.45	0.35	--	NA	--	--	0.3	0.4	0.4	NA	0.4	0.5	0.4
Cadmium	0.09	1.3	0.16	NA	0.56	1.6	0.18	0.28	0.18	NA	0.34	0.43	0.2
Chromium	11.5	31	6.0	NA	76	158	6.5	10	7.5	NA	9	10	8.5
Cobalt	4	8.3	--	NA	6.0	8	--	5.0	3.0	NA	5	--	4.5
Copper	10.5	19	4.0	NA	1.7	17	6.0	9.5	7.0	NA	7	15.5	7.5
Iron	10670	15240	23480	NA	6125	7360	4887	8320	6285	NA	9535	4137	7200
Lead	6.8	118	14.5	NA	302	679	12	20	9.7	NA	14.3	8.5	13
Cyanide	--	0.96	--	NA	1.225	0.475	--	--	--	NA	--	--	--
Manganese	96	233	154	NA	332	377	152	313	145	NA	1190	21.5	504
Mercury	--	--	--	NA	--	--	--	--	--	NA	--	--	--
Nickel	13	21	6.0	NA	13	18	5.0	8	6	NA	7.5	10	7.5
Selenium	--	--	--	NA	--	--	--	--	0.1	NA	--	0.35	0.1
Silver	--	--	--	NA	--	--	--	--	--	NA	22	--	--
Thallium	--	--	--	NA	--	--	--	--	--	NA	--	--	--
Tin	--	--	--	NA	2.5	--	--	--	--	NA	--	--	--
Vanadium	16	20	--	NA	--	10	--	13	10	NA	11	16.5	10.5
Zinc	25	186	33	NA	161	295	34	55	23	NA	39	27	29

TABLE 7 (Cont.)

ANALYSES OF SURFACE SOIL GRAB SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample location Sample date	SEDB-33 8-28-84	SEDA-34 8-29-84	SEDA-35 8-29-84	SEDB-35 8-29-84	SEDA-36 8-29-84	SEDB-36 8-29-85	SEDA-37 8-29-84	SEDB-37 8-29-84	SEDA-38 8-29-84	SEDB-38 8-29-84	SEDA-39 8-29-84	SEDB-40 8-29-84	SEDB-41 8-29-84
Parameters													
Organics (µg/kg)													
4-methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
toluene	--	--	--	--	--	--	--	--	--	--	--	--	--
trichloroethylene	--	10	--	--	--	--	--	--	--	--	--	--	--
PCBs	--	4300	199	350	2100	4000	74	37	--	--	--	200	110
xylene	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	4.7	--	--	--	--	--	--	--	--	--	--
1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	3.4	--	--	--	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--
methylene chloride	110	61	72	320	1300	57	34	14	14	57	7.8	120	26
fluorotrichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	--	--	--	--	--	--	--	--
acetone	--	--	--	--	--	--	--	--	--	--	--	--	--
phthalates (total)	3.4	--	--	2200	13000	13000	780	--	--	650	1500	--	--
phenol	--	--	--	--	--	--	--	--	--	--	--	--	--
pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--
benzyl alcohol	--	11000	2500	--	--	--	--	--	--	--	--	--	--

TABLE 7 (Cont.)

ANALYSES OF SURFACE SOIL GRAB SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location	SEDA-42	SEDB-43	SEDA-44	SEDA-45	SEDA-46	SEDA-47	SEDA-48	SEDA-49	SEDA-50
Sample Date	8-29-84	8-28-84	8-29-84	8-29-84	8-29-84	8-29-84	8-29-85	8-29-84	8-29-84
Parameters									
Metals, Total (mg/kg)									
Aluminum	4956	3840	6180	4145	3837	3095	4578	2161	7165
Antimony	--	--	--	--	--	--	--	--	--
Arsenic	1.8	1.2	3.0	1.6	1.0	1.3	2.3	1.2	3.0
Barium	52	53	68	50	41	18	24	15	58
Beryllium	0.15	0.3	0.5	0.5	0.3	0.45	0.45	--	0.5
Cadmium	0.26	0.32	0.42	0.2	0.2	0.07	0.16	0.09	0.32
Chromium	8	6.0	9.5	7.0	6.5	6.5	9	4.5	12
Cobalt	3	2.7	4.0	3.5	3.5	3.0	5.5	3.0	4.0
Copper	7	5.5	6.0	6.5	4.0	5.0	6.5	3.0	10
Iron	6395	4823	8100	6145	5220	5185	7780	3873	7140
Lead	21	17	29.5	11.0	12	6.3	7.5	4.0	18.5
Cyanide	--	--	--	--	--	--	--	--	--
Manganese	785	561	858	540	839	212	307	225	120
Mercury	--	--	--	--	--	--	--	--	--
Nickel	6	10	8.5	5.8	5	5.0	8.5	4.0	10
Selenium	--	--	0.15	--	--	--	--	--	--
Silver	--	--	--	3.5	--	--	--	0.6	--
Thallium	--	--	--	--	--	--	--	--	--
Tin	--	--	--	--	--	--	--	--	--
Vanadium	--	--	12	--	--	--	14	--	15.5
Zinc	34	36	53	29	29	16	21	12	43

TABLE 7 (Cont.)
 ANALYSES OF SURFACE SOIL GRAB SAMPLES
 ROSE TOWNSHIP SITE - MICHIGAN

Sample Location	SEDA-42	SEDA-43	SEDA-44	SEDA-45	SEDA-46	SEDA-47	SEDA-48	SEDA-49	SEDA-50
Sample Date	8-29-84	8-28-84	8-29-84	8-29-84	8-29-84	8-29-84	8-29-85	8-29-84	8-29-84
Parameters									
Organics (µg/kg)									
4-methylphenol	--	--	--	--	--	--	--	--	--
2,4-dimethylphenol	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--
toluene	--	--	--	--	--	--	--	--	--
trichloroethylene	--	--	--	--	--	--	--	--	--
PCBs	--	--	--	--	--	--	--	--	--
xylenes	--	--	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	--	--
1,1-trichloroethane	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--	--
methylene chloride	--	--	--	--	--	--	--	--	1200
fluorotrichloroethane	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	--	--	--	--
acetone	--	--	--	--	--	--	--	--	--
phthalates (total)	--	--	--	670	1300	--	--	--	2700
phenol	--	--	--	--	--	--	--	--	--
pyrene	--	--	--	--	--	--	--	--	--
benzyl alcohol	--	--	--	--	--	--	5200	--	--

TABLE 7
ANALYSES OF SURFACE SOIL - GRID SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location Sample Date	7S-OE 8-22-84	7S-OW 8-22-84	7S-IW 8-22-85	6S-OE 8-22-84	6S-OW 8-22-84	6S-IW 8-22-84	5S-OE 8-22-84	5S-OW 8-22-84	5S-IW 8-22-84	4S-OE 8-22-84	4S-OW 8-22-84	4S-IW 8-22-84	3S-OE 8-21-84	3S-OW 8-21-84
<u>Parameters</u>														
<u>Metals, Total (mg/kg)</u>														
Aluminum	2566	5260	3730	4176	3143	7170	3794	3810	5035	3881	4675	5025	3265	4613
Antimony	--	--	--	--	--	--	--	1.2	--	--	1.8	--	--	--
Arsenic	2.5	4	3	3	2.5	4	3.0	3.5	3.5	2.5	5.5	3.5	2.5	4.5
Barium	16	365	326	236	22	611	35	420	262	53	180	120	37	87
Beryllium	0.3	0.7	--	0.5	0.4	0.35	--	--	0.4	0.3	0.6	0.3	--	--
Cadmium	0.07	6.0	0.6	0.25	0.08	2.3	0.11	0.85	0.6	0.18	3.0	0.5	0.13	0.15
Chromium	5	30	26	15	7.0	70	6	50	48	9.0	32.5	26	8.0	15
Cobalt	--	3.5	3.5	4.0	4.0	7	3.5	3.5	6.0	4.2	3.7	4	4.3	4.5
Copper	5.0	8.5	8.0	6.5	18.5	25.5	5	12.5	14.5	5.5	10	16	5.0	9.5
Iron	4848	8215	6570	6465	5870	11095	5845	6055	8115	6050	7930	8820	5055	7185
Lead	7.5	125	143	132	9	1480	8.5	345	216	87	599	104	13	41
Cyanide	--	--	0.5	--	--	--	0.575	0.85	--	0.55	0.65	0.625	--	--
Manganese	137	240	175	192	244	225	389	162	182	282	205	210	304	209
Mercury	--	--	0.18	--	--	0.14	--	0.13	0.12	0.15	--	0.11	--	0.17
Nickel	3.5	8.0	7.0	7.5	6	31	5.5	10	13	6.0	9.5	10.5	5.0	8.5
Selenium	--	1.9	0.15	0.15	--	0.45	--	0.15	0.2	0.1	0.5	0.2	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tin	--	2.5	--	--	3.5	46	--	--	--	--	6.0	2.5	--	--
Vanadium	--	14	10	11	--	19	--	--	13	--	12	13	--	12
Zinc	17	93	226	93	20	312	22	302	337	38	158	131	26	100

TABLE 7 (Cont.)

ANALYSES OF SURFACE SOIL - GRID SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location	7S-OE	7S-OW	7S-IW	6S-OE	6S-OW	6S-IW	5S-OE	5S-OW	5S-IW	4S-OE	4S-OW	4S-IW	3S-OE	3S-OW
Sample Date	8-22-84	8-22-84	8-22-85	8-22-84	8-22-84	8-22-84	8-22-84	8-22-84	8-22-84	8-22-84	8-22-84	8-22-84	8-21-84	8-21-84
<u>Parameters</u>														
<u>Organics (µg/kg)</u>														
4-methylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-4 dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	5.2	--	--	--	--	--	--	--	--
trichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs	--	23000	1600	--	3200	980000	--	24000	42000	64000	80900	840	390	8000
xylenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	--	--	--	--	--	--
methylene chloride	17	14	23	86	19	300	29	24	20	18	17	6.1	120	150
fluorotrichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	8200	--	--	--	--	--	--	--	--
acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
phthalates (Total)	--	--	3000	760	1200	21000	--	1000	1920	--	4570	2600	--	1600
phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-4 dimethyl phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
benzyl alcohol	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 7 (Cont.)

ANALYSES OF SURFACE SOIL - GRID SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location Sample Date	3S-IW 8-21-84	2S-OE 8-21-84	2S-OW 8-21-84	2S-IW 8-21-84	1S-OE 8-21-84	1S-OW 8-21-84	1S-IW 8-21-84	OS-OE 8-21-84	OS-OW 8-20-84	OS-IW 8-21-84	ON-OE 8-20-84	ON-OW 8-22-84	ON-IW 8-21-84	BASE-OE 8-23-84
<u>Parameters</u>														
<u>Metals, Total (ng/kg)</u>														
Aluminum	5535	3235	5080	5845	3497	4967	3763	5865	4975	4840	3443	4073	3385	2864
Antimony	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	4	2.3	5.0	4.0	2.5	4.5	4.5	5.0	3.5	3.2	5	2.3	3.8	2.0
Barium	390	41	146	164	31	86.5	225	40.5	3010	105	314	95	35	21
Beryllium	--	0.4	--	0.5	--	--	--	--	--	--	--	--	--	--
Cadmium	0.2	0.1	0.3	0.38	0.11	0.3	0.4	0.74	0.26	0.09	3.8	0.2	0.11	--
Chromium	36.5	6.8	24	22	7.5	23	29	12	510	43	11.0	13.5	10	5.5
Cobalt	6.0	4.5	6.0	5	4.25	148	6.0	6.0	4.0	6.2	5.5	4.0	5.0	--
Copper	13.5	5.0	12.5	13	5.0	19	8.5	11.0	11.5	9.0	8.5	9.0	8.0	5.0
Iron	9305	5130	8800	10530	5260	8265	7240	9945	8125	8255	5925	6620	7510	5335
Lead	201	22	98	38.3	13.5	80	170	23.5	34	67	36	54	20	7.0
Cyanide	0.28	--	--	--	--	0.35	--	--	--	--	0.35	0.28	0.55	--
Manganese	233	378	256	293	172	173	189	284	144	215	195	205	262	206
Mercury	--	--	--	--	--	0.1	--	--	0.11	--	0.15	0.1	0.1	--
Nickel	14	4.5	12	12	5.5	12	8.5	11.5	9.5	9.0	6.5	7	5.25	4.5
Selenium	0.15	--	0.1	--	--	--	--	0.35	--	0.15	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tin	--	--	--	--	--	2.5	--	--	--	2.2	--	--	--	--
Vanadium	14	--	14	15	--	12.5	--	15.5	14	14	--	11	12	--
Zinc	334	30	142	158	33	76	135	40	2323	145	52	62	34	20.5

TABLE 7 (Cont.)

ANALYSES OF SURFACE SOIL - GRID SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location	3S-IW	2S-OE	2S-OW	2S-IW	1S-OE	1S-OW	1S-IW	OS-OE	OS-OW	OS-IW	OW-OE	OW-OW	OW-IW	BASE-OE
Sample Date	8-21-84	8-21-84	8-21-84	8-21-84	8-21-84	8-21-84	8-21-84	8-21-84	8-20-84	8-21-84	8-20-84	8-22-84	8-21-84	8-23-84
<u>Parameters</u>														
<u>Organics (µg/kg)</u>														
4-methylphenol	4700	--	--	--	--	--	--	850	--	--	--	--	--	--
2-4 dimethylphenol	710	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs	17000	460	10900	30000	24600	1300	7200	700	9400	28800	65	16000	2400	--
xylenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	5200	--	--	--	--	--
methylene chloride	--	180	190	34	55	100	180	230	110	--	300	840	48	8.2
fluorotrichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--
phthalates (total)	--	--	--	4700	--	840	2360	--	2080	540	--	750	--	--
phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-4 dimethyl phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
benzyl alcohol	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 7 (Cont.)

ANALYSES OF SURFACE SOIL - HIGH INTENSITY GRID SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location Sample Date	BASE-OW 8-23-84	1N-OE 8-22-84	1N-OEA ¹ 8-22-84	1N-OW 8-22-84	1N-OWH ¹ 8-22-84	2N-OE 8-23-84	2N-OEA ¹ 8-23-84	2N-OW 8-22-84	2N-OWA ¹ 8-22-84	3N-OE 8-23-84	3N-OW 8-23-84	4N-OE 8-23-84	4N-OW 8-23-84	5N-OE 8-23-84	5N-OW 8-23-84
<u>Parameters</u>															
<u>Metals, Total (mg/kg)</u>															
Aluminum	2910	4494	5535	3623	NA	5125	3798	3288	3478	3613	3500	3682	2929	3408	3510
Antimony	--	--	--	--	NA	--	--	--	--	--	--	--	6.5	--	--
Arsenic	4.5	3	4	2.5	NA	3.5	3.2	3.5	3.0	3.2	3.2	2.5	10	2.5	2
Barium	447	27	36	28	NA	42	44.5	73	62	31	29	31	201	21	29
Beryllium	0.7	0.25	--	0.8	NA	0.7	--	0.35	0.6	--	--	--	0.35	--	0
Cadmium	0.15	0.12	0.16	0.12	NA	0.14	--	0.16	0.18	0.2	0.15	0.15	0.32	0.08	0
Chromium	7.0	9.5	10	8.0	NA	9.5	7.5	6.5	7.5	9.0	6.0	8	10	6.5	7
Cobalt	3.0	4.0	5	4.0	NA	3.5	4.0	3.5	3.6	4.0	4.5	4	--	4.0	4
Copper	7.0	6.5	8	8.5	NA	7.5	65	12	11.0	7.0	7.0	5.5	11	6.5	7
Iron	6030	6750	7830	7030	NA	7830	6065	5735	5905	6050	5385	6425	5410	4905	5660
Lead	15	12	14	13	NA	13	10.5	29.5	25	10.5	11.5	10	1485	7	20
Cyanide	--	--	--	--	NA	--	--	--	--	--	--	--	--	--	--
Manganese	224	203	252	202	NA	346	273	250	286	301	262	357	182	208	180
Mercury	0.11	--	0.11	--	NA	--	--	--	--	--	--	--	0.1	--	--
Nickel	5	6.5	9.0	5.5	NA	7.0	5.0	5.5	6.0	6.5	5.5	7	6.0	5.5	5
Selenium	0.1	0.1	--	0.15	NA	--	--	--	--	0.15	--	0.1	0.1	--	--
Silver	--	--	--	--	NA	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	NA	0.9	--	0.8	--	--	--	--	--	--	--
Tin	--	3.0	2.5	--	NA	4.0	--	--	2.2	2.8	2.4	4.0	11	--	--
Vanadium	--	12	14	11.5	NA	13.5	--	--	10	--	--	12	--	--	--
Zinc	27.5	26.5	38	26	NA	33	31	33	31	25.5	25	21	166	19	69

¹ A and B suffixes denote duplicate samples.

TABLE 7 (Cont.)
 ANALYSES OF SURFACE SOIL - GRID SAMPLES
 ROSE TOWNSHIP SITE - MICHIGAN

Sample Location Sample Date	BASE-OW 8-23-84	1N-OE 8-22-84	1N-OEA 8-22-84	1N-OW 8-22-84	1N-OWB 8-22-84	2N-OE 8-23-84	2N-OEA 8-23-84	2N-OW 8-22-84	2N-OWA 8-22-84	3N-OE 8-23-84	3N-OW 8-23-84	4N-OE 8-23-84	4N-OW 8-23-84	5N-OE 8-23-84	5N-OW 8-23-84
<u>Parameters</u>															
<u>Organics (µg/kg)</u>															
4-methylphenol	--	--	--	--	4400	--	--	--	--	--	--	--	--	--	--
2-4 dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCBs	160	27	--	--	--	--	48	220	520	63	--	--	--	72	65
xylenes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
methylene chloride	12	4.9	11	41	23	43	58	20	30	39	32	17	43	8.6	3.9
fluorotrichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	270
phthalates (total)	520	--	--	850	900	--	--	--	--	--	1770	--	--	--	--
phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-4 dimethyl phenol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
benzyl alcohol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 7
ANALYSIS OF SUBSURFACE SOIL SAMPLES
ROSE TOWNSHIP - MICHIGAN

Sample Location	SB1 0-2	SB1 2-4	SB1 6-8	SB1 8-10	SB1A 8-10	SB1 10-12	SB2 6-8	SB2 12-14	SB2 18-20	SB1 2-4
Sample Date	1-9-85	1-9-85	1-9-85	1-9-85	1-9-85	1-9-85	1-13-85	1-14-85	1-14-85	1-10-85
Parameters										
Metals,										
Total (mg/kg)										
Aluminum	4330	3180	4070	5080	4850	4410	4040	4930	3120	6180
Antimony	---	---	---	---	---	---	---	---	---	---
Arsenic	---	---	---	---	---	8.6	---	---	---	---
Barium	---	---	---	---	---	---	---	---	---	---
Beryllium	---	---	---	---	---	---	---	---	---	---
Cadmium	---	---	---	---	---	---	---	---	---	---
Chromium	11	---	13	15	13	11	6.6	12	6.8	14
Cobalt	---	---	---	---	---	---	---	---	---	---
Copper	---	---	---	14	---	---	---	---	---	---
Iron	8830	11500	10200	12900	11700	13200	9400	10500	8940	13400
Lead	7.5	---	24	5.9	7.2	8.1	4.7	5.6	4.9	5.3
Cyanide	---	---	---	---	---	---	---	---	---	0.27
Manganese	135	317	253	300	251	247	150	335	295	165
Mercury	---	---	---	---	---	---	---	---	---	---
Nickel	---	---	---	---	---	---	---	---	---	---
Selenium	---	---	---	---	---	---	---	---	---	---
Silver	---	---	---	---	---	---	---	---	---	---
Thallium	---	---	---	---	---	---	---	---	---	---
Tin	---	---	---	---	---	---	---	---	---	---
Vanadium	---	---	---	---	---	---	---	---	---	---
Zinc	18	33	32	36	33	34	34	26	20	11

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TABLE 7
ANALYSIS OF SUBSURFACE SOIL SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location	SBI 0-2	SBI 2-4	SBI 6-8	SBI 8-10	SBI A 8-10	SBI 10-12	SB2 6-8	SB2 12-14	SB2 18-20	SB3 2-4	SB3 4-6
Sample Date	1-9-85	1-9-85	1-9-85	1-9-85	1-9-85	1-9-85	1-13-85	1-14-85	1-14-85	1-10-85	1-10-85
Parameters											
Organics (µg/kg)											
4-methylphenol	--	--	--	--	--	--	--	--	--	--	--
2,4-dimethylphenol	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	13	--	--	--	--	8	--
toluene	--	--	--	--	--	--	--	6J	--	--	--
trichloroethylene	--	--	--	--	--	--	--	--	--	--	--
PCBs	--	--	--	--	--	--	--	--	--	--	--
xylenes	--	--	--	--	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	20	--	--	--	--	9	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-tetrachloroethane	10	--	--	--	7	--	--	--	--	7	9
benzoic acid	--	--	--	--	--	--	1900J	--	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--
methylene chloride	45B	68.11B	74B	69B	54B	50B	7700	26	28B	64B	68B
pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--
acetone	24B	24.42B	17B	43B	55B	--	76000	77	220	21B	51B
phenol	--	--	--	--	--	--	--	--	--	--	--
2-butanone	--	--	--	--	--	--	66000	120	45	--	--
di-n-butylphthalate	--	1120	--	--	--	--	390JB	370JB	380JB	--	--
benzo(a)anthracene	--	--	--	--	--	--	390J	--	--	--	--
bis(2-ethylhexyl)phthalate	1000B	1650B	1200B	--	610B	980B	390JB	370JB	380JB	580B	--
chrysene	--	--	--	--	--	--	390J	--	--	--	--
benzo(b)fluoranthene	--	--	--	--	--	--	390J	--	--	--	--
benzo(a)pyrene	--	--	--	--	--	--	390J	--	--	--	--
naphthalene	--	--	--	--	--	--	--	--	380J	--	--
isophorone	--	--	--	--	--	--	--	--	--	--	--
chlorobenzene	--	--	--	--	--	--	--	--	--	--	--
ethylbenzene	--	--	--	--	--	--	--	--	--	--	--
styrene	--	--	--	--	--	--	--	--	--	--	--
2-methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--
butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--
di-n-octylphthalate	--	--	--	--	--	--	--	--	--	--	--
phenanthrene	--	--	--	--	--	--	--	--	--	--	--
carbon disulfide	--	--	--	--	--	--	--	--	--	--	--
pyrene	--	--	--	--	--	--	--	--	--	--	--
diethylphthalate	--	--	--	--	--	--	--	--	--	--	--
n-nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--
chloroform	--	13.32	--	--	--	--	--	--	--	--	--
2-hexanone	--	--	--	--	--	--	--	--	--	--	--
4-methyl-2-pentanone	--	--	--	--	--	--	--	--	--	--	--

TABLE 7 (continued)
ANALYSIS OF SUBSURFACE SOIL SAMPLES
ROSE TOWNSHIP - MICHIGAN

Sample Location	SB3 4-6	SB3 8-10	SB3 10-12	SB3 12-14	SB3A 12-14	SB3 14-16	SB4 2-4	SB4 6-8	SB4 10-12	SB5 2-4
Sample Date	1-10-85	1-10-85	1-10-85	1-10-85	1-10-85	1-10-85	1-13-85	1-13-85	1-13-85	1-16-85
Parameters										
Metals										
Total (mg/kg)										
Aluminum	5880	3610	1450	2030	1610	582	3330	3180	1660	9550
Antimony	---	---	---	---	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---	---	---	---	---
Barium	---	---	---	---	---	---	---	---	---	---
Beryllium	---	---	---	---	---	---	---	---	---	---
Cadmium	---	---	---	---	---	---	---	---	---	---
Chromium	11	16	16	9.0	6.6	---	10	6.4	---	20
Cobalt	---	---	---	---	---	---	---	---	---	---
Copper	---	---	---	---	---	---	---	---	---	15
Iron	13200	12800	14100	12900	9780	45000	6760	6640	4000	18200
Lead	8.1	5.8	5.8	---	1.0	---	6.6	6.0	---	12
Cyanide	---	---	---	---	---	---	---	---	---	---
Manganese	247	292	4.3	324	356	103	168	100	36	421
Mercury	---	---	---	---	---	---	---	---	---	---
Nickel	---	---	---	---	---	---	---	---	---	---
Selenium	---	---	---	---	---	---	---	---	---	---
Silver	---	---	---	---	---	---	---	---	---	---
Thallium	---	---	---	---	---	---	---	---	---	---
Tin	---	---	---	---	---	---	---	---	---	---
Uranium	---	---	---	---	---	---	---	---	---	---
Zinc	36	36	29	29	25	22	23	14	---	---

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TABLE 7 (Cont.)
ANALYSIS OF SUBSURFACE SOIL SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location	SB1 8-10	SB1 10-12	SB1 12-14	SB1A 12-14	SB1 14-16	SB4 2-4	SB4 6-8	SB4 10-12	SB5 2-4	SB5 8-10	SB5 20-22
Sample Date	1-10-85	1-10-85	1-10-85	1-10-85	1-10-85	1-11-85	1-11-85	1-11-85	1-16-85	1-16-85	1-16-85
Parameters											
Organics (pg/kg)											
4-methylphenol	--	--	--	--	--	--	--	--	--	--	--
2,4-dimethylphenol	--	--	--	--	--	--	--	--	--	--	--
tetrachloroethylene	7	--	--	--	--	--	--	--	--	--	--
toluene	--	--	2.58K	--	--	--	--	--	17000	190000	1800
trichloroethylene	--	--	2.15K	--	--	--	--	--	--	4600	--
PCBs	--	--	--	--	--	--	--	--	740	1550	--
xylenes	--	--	3.66K	--	--	--	--	--	91000	310000	2700
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	4.52K	--	--	--	--	--	--	--	--
1,1,2,2-tetrachloroethane	21	--	7.97	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	--	--	1900J	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--	--	--	--
methylene chloride	43B	36B	36.17B	53.53B	50B	7200B	38B	45B	570J	--	550J
pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--
acetone	148B	--	29.06B	63.14B	59B	41000	48	65	1100J	--	1100J
phenol	--	--	--	--	--	360J	--	--	--	--	--
2-butanone	--	--	--	--	--	100000	210	34	3500	--	14000
di-n-butylphthalate	--	--	786	859	--	360JB	360JB	390JB	370JB	360JB	360JB
benzo(a)anthracene	--	--	--	--	--	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	940B	--	257BK	--	1000B	360JB	360JB	390JB	2100B	3500B	360JB
chrysene	--	--	--	--	--	--	--	--	--	--	--
benzo(b)fluoranthene	--	--	--	--	--	--	--	--	--	--	--
benzo(a)pyrene	--	--	--	--	--	--	--	--	--	--	--
naphthalene	--	--	--	--	--	--	--	--	3800	8500	360J
isophotone	--	--	--	--	--	--	360J	--	--	--	--
chlorobenzene	--	--	--	--	--	--	--	--	2000	2300	--
ethylbenzene	--	--	2.05K	--	--	--	--	--	18000	66000	550J
styrene	--	--	3.55K	--	--	--	--	--	4200	25000	--
2-methylnaphthalene	--	--	--	--	--	--	--	--	1900	6900	660J
butylbenzylphthalate	--	--	--	--	--	--	--	--	2100	3300	--
di-n-octylphthalate	--	--	--	--	--	--	--	--	370J	--	--
phenanthrene	--	--	--	--	--	--	--	--	--	360J	--
carbon disulfide	--	--	--	--	--	--	--	--	--	--	550J
pyrene	--	--	--	--	--	--	--	--	--	--	--
diethylphthalate	--	--	--	--	--	--	--	--	--	--	--
n-nitrosodiphenylamine(1)	--	--	--	--	--	--	--	--	--	--	--
chloroform	--	--	7.32	9.94	--	--	--	--	--	--	--
2-hexanone	--	--	12.69	--	--	--	--	--	--	--	--
4-methyl-2-pentanone	--	--	14.75	--	--	--	--	--	--	--	--

TABLE 7 (continued)
ANALYSIS OF SUBSURFACE SOIL SAMPLES
ROSE TOWNSHIP - MICHIGAN

Sample Location	SB5 8-10	SB5 20-22	SB6 2-4	SB6 6-8	SB6 14-16	SB7 8-10	SB7A 8-10	SB7 12-14	SB7 22-24	SB8 6-8
Sample Date	1-16-85	1-16-85	1-13-85	1-13-85	1-13-85	1-12-85	1-12-85	1-12-85	1-12-85	1-12-85
Parameters										
Metals, Total (mg/kg)										
Aluminum	5650	1650	4540	1020	652	3630	3160	806	731	897
Antimony	---	---	---	---	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---	6.1	---	---	---
Barium	---	---	---	---	---	---	---	---	---	---
Beryllium	---	---	---	---	---	---	---	---	---	---
Cadmium	---	4.1	---	3.9	---	---	---	---	---	---
Chromium	14	6.1	---	---	---	8.0	8.4	---	---	---
Cobalt	---	---	---	---	---	---	---	---	---	---
Copper	---	---	---	---	---	---	---	1.6	---	---
Iron	11100	9540	9060	6030	3950	15100	8830	3090	2460	3120
Lead	10	---	5.7	4.6	---	4.6	5.4	3.7	---	---
Cyanide	---	---	---	---	---	---	---	---	---	---
Manganese	243	294	207	162	97	644	238	104	70	103
Mercury	---	---	---	---	---	---	---	---	---	---
Nickel	---	---	---	---	---	---	---	---	---	---
Selenium	---	---	---	---	---	---	---	---	---	---
Silver	---	---	---	---	---	---	---	---	---	---
Thallium	---	---	---	---	---	---	---	---	---	---
Tin	---	---	---	---	---	---	---	---	---	---
Uranium	---	---	---	---	---	---	---	---	---	---
Zinc	34	24	22	50	15	35	26	12	11	13

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TABLE 7 (Cont.)
ANALYSIS OF SUBSURFACE SOIL SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location	SB6 2-4	SB6 6-8	SB6 14-16	SB7 8-10	SB7A 8-10	SB7 12-14	SB7 22-24	SB8 6-8	SB8 14-16	SB8A 14-16
Sample Date	1-13-85	1-13-85	1-13-85	1-12-85	1-12-85	1-12-85	1-12-85	1-12-85	1-12-85	1-12-85
Parameters										
Organics (pg/kg)										
4-methylphenol	--	--	--	--	--	--	--	--	--	--
2,4-dimethylphenol	--	--	--	--	--	--	--	--	--	71
tetrachloroethylene	--	--	51	--	--	1100J	51	--	--	--
toluene	61	--	51	--	--	--	--	--	--	--
trichloroethylene	--	--	51	--	--	--	--	--	--	--
PCBs	--	--	--	--	--	--	--	--	--	--
xylenes	--	--	--	--	--	--	--	--	--	--
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--
1,1,2,2-tetrachloroethane	--	--	--	--	--	--	--	--	--	--
benzoic acid	--	--	--	--	--	1700J	1700J	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--	--	--	--	--
methylene chloride	22B	900B	22B	13	11000B	4400	15	43B	24B	45B
pentachlorophenol	--	--	--	--	--	1700J	--	--	--	--
acetone	89	810	360	74	57000	46000	140	84	58	210
phenol	--	--	--	370J	--	--	--	--	--	--
2-butanone	160	24000	190	33	43000	130000	71	70	31	130
di-n-butylphthalate	180JB	370JB	340JB	370JB	380JB	360JB	360JB	370JB	350JB	440JB
benzo(a)anthracene	--	--	--	--	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	380JB	370JB	340JB	370JB	380JB	--	360JB	370JB	350JB	440JB
chrysene	--	--	--	--	--	--	--	--	--	--
benzo(b)fluoranthene	--	--	--	--	--	--	--	--	--	--
benzo(a)pyrene	--	--	--	--	--	--	--	--	--	--
naphthalene	--	--	--	--	--	--	--	--	--	--
isophorone	--	--	--	--	--	--	--	--	--	--
chlorobenzene	--	--	--	--	--	--	--	--	--	--
ethylbenzene	--	--	--	--	--	--	--	--	--	--
styrene	--	--	--	--	--	--	--	--	--	--
2-methylnaphthalene	--	--	--	--	--	--	--	--	--	--
butylbenzylphthalate	--	--	--	--	--	160J	--	--	--	--
di-n-octylphthalate	--	--	--	--	--	--	--	--	--	--
phenanthrene	--	--	--	--	--	--	--	--	--	--
carbon disulfide	--	--	--	--	--	1100J	--	--	--	--
pyrene	--	--	--	--	--	360J	--	--	--	--
dichlphthalate	--	--	--	--	--	--	--	--	--	--
pentrosidiphenylamine(1)	--	--	--	--	--	--	--	--	--	--
chloroform	--	--	--	--	--	--	--	--	--	--
2-hexanone	--	--	--	--	--	--	--	--	--	--
4-methyl-2-pentanone	--	--	--	--	--	--	--	--	--	--

TABLE 7 (continued)
ANALYSIS OF SUBSURFACE SOIL SAMPLES
ROSE TOWNSHIP - MICHIGAN

Sample Location	SB8 14-16	SB8A 14-16	SB8 20-22	SB9 2-4	SB9 16-18	SB9 24-26	SB10 0-2	SB10 10-12
Sample Date	1-12-85	1-12-85	1-12-85	1-17-85	1-17-85	1-17-85	1-11-85	1-11-85
Parameters	-----							
Metals, Total (mg/kg)								
Aluminum	790	1140	1470	4300	6350	2350	10900	2870
Antimony	---	---	---	62	---	---	---	---
Arsenic	---	---	---	---	---	7.8	---	---
Barium	---	---	---	---	---	---	82	---
Beryllium	---	---	---	---	---	---	---	---
Cadmium	---	---	---	4.9	---	---	---	---
Chromium	---	---	---	17	12	6.1	26	9.7
Cobalt	---	---	---	---	7.8	---	---	6.0
Copper	---	---	14	---	---	---	17	---
Iron	2800	4580	7060	6930	12800	11100	19700	9300
Lead	---	---	4.2	4.1	7.3	6.6	71	6.3
Cyanide	0.23	---	---	---	---	---	0.99	---
Manganese	87	124	284	267	271	131	509	228
Mercury	---	---	---	---	---	---	---	---
Nickel	---	---	---	---	---	---	---	---
Selenium	---	---	---	---	---	---	---	---
Silver	---	---	---	8.2	---	---	---	---
Thallium	---	---	---	---	---	---	---	---
Tin	---	---	---	---	---	---	---	---
Tellurium	---	---	---	---	---	---	---	---
Zinc	---	18	23	22	30	44	64	26

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TABLE 7. (Cont.)
ANALYSIS OF SUBSURFACE SOIL SAMPLES
ROSE TOWNSHIP SITE - MICHIGAN

Sample Location	SB8 20-22	SB9 7-4	SB9 16-18	SB9 24-26	SB10 0-2	SB10 10-12
Sample Date	1-13-85	1-17-85	1-17-85	1-17-85	1-11-85	1-11-85
Parameters						
Organics (µg/kg)						
4-methylphenol	--	--	--	--	--	--
2,4-dimethylphenol	--	--	--	--	--	--
tetrachloroethylene	--	--	--	--	--	7
toluene	13	--	110J	400J	--	--
trichloroethylene	--	--	--	--	--	--
PCBs	--	300**	700	250**	2616	460
xylene	--	--	--	--	--	23
1,2-dichloroethane	--	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--	6
1,1,1-trichloroethane	--	--	--	--	--	--
1,1,2,2-tetrachloroethane	--	--	--	--	--	4J
benzoic acid	1600J	--	--	--	--	--
trans-1,2-dichloroethylene	--	--	--	--	--	--
methylene chloride	9.8	110	110	400JB	42B	52B
pentachlorophenol	--	--	--	--	--	--
acetone	70	230J	590	2000	--	58B
phenol	--	--	--	--	--	--
2-butanone	75	17000	23000	23000	--	--
di-n-butylphthalate	340JB	380JB	410B	400JB	1640	--
benzo(a)anthracene	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	340JB	380JB	910B	400JB	675B	660B
chrysene	--	--	--	--	--	--
benzo(b)fluoranthene	--	--	--	--	--	--
benzo(a)pyrene	--	--	--	--	--	--
naphthalene	--	--	710	--	--	--
isophorone	340J	--	--	--	--	--
chlorobenzene	--	--	--	--	--	--
ethylbenzene	--	--	--	--	--	--
styrene	--	--	--	--	--	--
2-methylnaphthalene	--	--	530	--	--	--
butylbenzylphthalate	--	--	--	--	361K	--
di-n-octylphthalate	340J	--	--	400J	--	--
phenanthrene	--	--	--	--	--	--
carbon disulfide	--	--	--	400J	--	--
pyrene	--	--	--	--	--	--
diethylphthalate	--	--	--	400J	--	--
n-nitrosodiphenylamine (1)	--	--	--	--	126K	--
chloroform	--	--	--	--	--	--
2-hexanone	--	--	--	--	--	--
4-methyl-2-pentanone	--	--	--	--	--	--

September 3, 1987

Discussion of U.S. EPA RI/FS

- Dave M. To select an adequate remedy, must factor in risk and identify receptor (nearest well off-site). EPA dropped the well pretty much in the middle of the site, not according to SARA guidance.
- Tech. As to a connection with the nearest domestic well it's not that we need a specific well log. We just want evidence of connection between wells, whatever you need as geologists to say this is the same aquifer.
- Bob Hays Groundwater flow is significantly faster than what Jordan has indicated. Groundwater moves relatively slower on SW side of the site, increases quite rapidly as you reach northern part - 100, 200 ft greater per year.
- Tech. I don't think they differentiate between north and south in RI/FS.
- Steve Bob's calculations bring plume to Demode next year. Indirect evidence for different rates is found in Appendix D.
- Tech. North plume should have been presented in report.
- Tech. Observed variant in flow gradients. It appears regional flow rate dictates how quickly it moves, as demonstrated by new wells.
- Bob Permeability data was calculated by Jordan. K values of 20-50 ft/day on north. Using gradients, K 25% porosity, came up with 365 ft/year or greater. On south side, K values, gradients much less.
- Tech. Permeability nos. and porosity values are in Appendix. Were other K values used in new calculation? Haven't heard any denials of south side calculations, doesn't it affect remedy?
- Steve No available models for such a complex site.

- Tech. We can't define mobility. We disagree on how fast these move, effects, etc. You're saying you have to implement remedy. Why not implement monitoring?
- Tech. Extenuating factors weren't addressed when discussing transport-flow rates, or the marsh as a hydraulic boundary.
- Tech. We'll go through pgs. 2-6. On 2, we're looking for qualifications of risk to workers and general public in excavation/thermal remedy. How do you compare with present risk to people?
- Steve We rely on the best applicable safety standards we can. RIFS discusses the risk measures that will be taken during implementation of incineration. Difficult looking at ARARs until you stage it at final design.
- Tech. Any risk assessment for workers/public?
- Steve We didn't do assessment. Didn't have to.
- Brad Jordan did not use ingestion of soil in risk assessment and did not use snowmobiler as a risk potential.
- MCLG's were promulgated for some of these when we did risk assessment. Decided to use 10-6 for those. Utilized cancer risk potency values when we calculated 10-6 values.
- Tech. There are MCLG's now-would you redo these calculations, or do you think they're appropriate?
- Kevin We're shooting for nondetection - 1 part/billion. 10-6 risk is appropriate.
- Brad Detection is 1 part/billion. Not practical to get to 15/trillion.
- Tech. Total risk is...?
- EPA ...additive risk of chemicals which went through and didn't fall out.
- Tech. Not all risks have been defined for all remedies? What are remedial objectives? What do we define public threat to be?

- Steve Again we did a cancer risk value targeted to 10⁻⁶. Modelling effort to work backward ..what concentration would prevent groundwater contamination...MCLG of 2 for municipal drinking water.
- Tech Do you disagree with drinking water people who say 2 microg/liter is OK?
- Brad Historically, when cancer risk is below detection, we'll shoot for nondetection. Cancer risk value for arsenic-TCL in soil less than 1 part/million, given back calculations - we choose 10 to approx background...didn't feel we had to clean beyond that.
- Tech. Some data I saw had figures greater than 10.
- Steve Background concentrations range from 8 to 13 or 14.
- Brad Jordan determined, and we concurred, on 10. 500 yards have been effected by arsenic.
- Tech. Background levels indicate some areas are greater than 10 in areas outside of site (according to Jordan data). Isn't there literature which suggests arsenic is noncarcinogenic?
- Arsenic has MCLG of 50 in water Approx background in soil. EPA decided to keep it at 50 because risk is uncertain.
- Tech. General construction documents mentioned hole was backfilled with something. Assume it's soil. Report of chemical odors from it. Material appeared to be there already.
- Bruce It's not EPA policy to backfill - since it was used as gravel pack.
- No, it was allowed to collapse.
- Tech. Essentially it was same material that was drilled out?
- Yes.
- Tech. Employees said that Jordan took a no. of bales of water out but due to high OVA's made a decision to sample at that time. Was told that there were different colors of water. Assume some of separate phase was getting into your samples.
- Steve We have wells that produce separate layers even when we purge them.

Steve Page 3 last item. Model choice based on available data. Difficult to ascertain how long drums were there. Difficult to continue flow model. Could not model as a continuous source due to lack of available information.

Tech. Did you use single sample data for concentrations?

Steve Last modelling was source of data, involves several samplings. If we used dispersion plumes, you'd have identical concentrations for dispersed and source areas.

Chemicals probably wouldn't make it through process if it was based on estimated concentrations.

Basically intent of public health process was followed. Didn't use worksheets. They had a couple of indicator chemicals not found throughout site. Indicator chemicals used to make process more manageable.

Tech. You selected chemicals on a number of criteria. Did you choose 1 or 2 from each of a number of groups?

Chemicals grouped together according to environmental characteristics, toxicity, volatility. They choose something from each group. Individual chems that are unnecessary don't make process incorrect because they fall out.

Steve Page 5, second item. We feel temps are high enough that chems on site won't create dioxins which were broken down on the incinerator's last job. They're using the system on two other sites, one of high metal concentrations.

Tech. Risks here have been defined as direct contact. May not be able to put material on soil if its leachable or not, if direct contact is at issue.

There would be clean filling on top.

Tech. Permeable cover isn't covered in cost.

Steve Backfilling costs are covered in Appendix Worksheets. They'll be a 20% reduction in volume.

Tech. Heterogenous/Homogenous Waste - any data?

Steve We're getting data from Florida, where they have PCB's and metals. We estimated 330/ton. They're peak is 225/ton.

Tech. Because of high hydrocarbon content it should burn on its own. Would be less expensive.

Tech. Site is saturated with hydrocarbons and oils. Is it going to work?

Steve They're putting fuel right into waste. We'll just need less since we already have hydrocarbons.

If Shirco doesn't work we'll use rotary kiln, which is more expensive.

Tech. You could miss pockets during excavation. Soil flushing might get by that since you're doing whole area - any incineration runs risk of missing area.

Steve Have found PCB's in marshland. PCB's are away from area. We want to know to what extent. There will be verification of areas to be treated. Have to look into wetland. Maybe 1000 cubic yards more.

Tech. There are only 10 yards in test to see if chemicals will be destroyed. Raises concerns that you couldn't get all groundwater concentrations to nondetection.

Air stripping is only treatment you can use for vinyl chloride. We have to meet state standards for discharge into water.

Tech. Waste may be moving from groundwater to surface water.

Steve We have to meet the intent of a permit.

Tech. We may not meet all parameters. Some inorganics will pass through. Remedy may be worse than problem.

There is treatment to remove metals.

Tech. The problem with the concentration of metals in the groundwater is that you'll dilute the metals but you won't change the mass that you'll be discharging. You must assess risks of remedy.

According to program Michigan deals with, allowable discharge has to meet concentration. Best technology available is also a requirement.

Rose Township Meeting

September 3, 1987

Sign In Sheet

<u>Name</u>	<u>Representing</u>	<u>Phone</u>
Connie Puchalski	EPA	886-6620
Mike Grice	Chrysler	(313) 956-2075
Keith Lerminiaux	Vandevveer/Chrysler	(313) 961-4880
Mark Edie	Ford	(313) 390-1874
Jeffrey Klein	GM/RPM (Dykeman, Gossett)	(313) 568-5442
David Maurer	TRW/Uniroyal (Pepper)	(313) 259-7110
Robert Jurczynszyn	Akzo Coatings America	(313) 589-3660
Bob Emmett	Reed Smith/Detrex	(202) 457-6144
Kevin Adler	EPA-V.	886-7078
Stanley Pross	Mich AG	(517) 373-7780
David Minc	Uniroyal Goodrich	(216) 374-2189
Brad Verman	MDNR	(517) 373-8751
Larry Elmleaf	MDNR	(517) 373-3503
Bob Hayes	MDNR	(517) 335-3389
Steve Luzkow	MDNR	(517) 335-3392
Bruce Mackie	Hart Environmental Mgnt.	(201) 647-8111
John Iannome	Hart Environmental Mgnt.	(212) 840-3990
Paul Bitter	US EPA, Cercla Enf. Sect.	886-4697

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September 15, 1987

Ms. Connie Puchalski
Assistant Regional Counsel
United States Environmental
Protection Agency, Region V
230 South Dearborn Street
Chicago, Illinois 60604

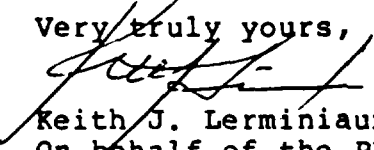
Re: Rose Township Site

Dear Ms. Puchalski:

Enclosed herewith kindly find our summary of the meeting held September 3, 1987. We would ask that the enclosed summary be made a part of the administrative record concerning the Rose Township Site.

Thank you for your attention and cooperation.

Very truly yours,


Keith J. Lermaniaux
On behalf of the PRP Group

KJL/lđ
Enclosure

SUMMARY OF MEETING 9/3/87
(A list of attendees is attached)

- * On September 3, 1987 commencing at approximately 10:30 a.m., a meeting was conducted regarding the Rose Township site at the EPA offices in Chicago, Illinois. The meeting was attended by representatives of the EPA, representatives of the Michigan Department of Natural Resources, representatives of the PRP Group, and representatives of Hart and Associates. A list of attendees is attached.

- * Keith Lerminiaux raised the subject of the outstanding FOIA requests submitted by the PRP's to the EPA. Connie Puchalski stated that she had been working with Dave Tripp on the FOIA requests. She stated that she had about 1 1/2 feet of documents available for copying. She also suggested that the PRPs might wish to send their experts to the MDNR to look at the MDNR analytical data.

- * Keith Lerminiaux then raised the subject of mixed funding for this site, and the EPA criteria for mixed funding;
 - Connie Puchalski suggested that the PRPs look to the EPA Interim Settlement Policy published in the Federal Register.
 - Connie Puchalski indicated that she would be willing to explore mixed funding further if there are other viable PRPs that are not participating in the PRP group.
 - Keith Lerminiaux and several other PRP representatives indicated that there are several viable PRPs that are not participating in the PRP group.
 - Keith Lerminiaux then suggested that the EPA consider mixed funding or cost sharing with respect to response costs already spent at the site. Connie Puchalski responded and suggested that she would consider this, and would be willing to recommend it if there were other viable PRPs around to pay for the past response costs.

- * Keith Lerminiaux on behalf of the PRPs then solicited the comments of the EPA/DNR on the Hart technical documents, which were submitted as a part of the PRP public comment materials.
 - The EPA/DNR representatives present gave their comment on pages 2 through 6 of the Hart document entitled "Review of the E.C. Jordan Final Report, Rose Township - Demode Road Site, Remedial Investigation/Feasibility Study Volumes I and II". Pages 2 through 6 of this document set forth a brief summary of Hart's critique of the Jordan RI/FS.

- The EPA/DNR representatives had the following comments on the Hart critique document;
- 1) the DNR believes that Jordan may have documentation to establish a direct connection between the aquifer beneath the site and the aquifer from which local residents obtain their drinking water. The DNR representative admitted that this information is not a part of the RI/FS, and that the information has not been supplied to the PRPs or made a part of the public record. In fact, the EPA/DNR representatives had not seen and do not have a copy of the data which purports to show a connection between the two aquifers. The PRP representatives and their experts stated that they are unaware of the existence of any such data, and that it was not included in the RI/FS submitted by Jordan.
 - 2) The EPA/DNR representatives also advised that the contaminated plume under the northern portion of this site will reach Demode Road in "the next year or so".
 - 3) The PRP group and their expert stated that this information was not set forth in the RI/FS, and that the PRPs did not interpret the RI/FS in the same way that the EPA/DNR representatives did.
 - 4) Mr. Hayes of the DNR stated that the flow rates for the ground water at the site are faster than the rate set forth in the Jordan RI/FS. He suggested that the ground water under the northern portion of the site may be moving in the range of 100 to 300 feet per year. Mr. Hayes expressed disagreement with the transport model utilized by Jordan in the Jordan RI/FS.
 - 5) The EPA/DNR stated that the Jordan transport model only applied to the plume on the south side of the site.
 - 6) In response to the PRP position that no contamination would reach the nearest receptor until 250 to 270 years in the future, Mr. Hayes and Connie Puchalski both made a statement to the effect that if there is contamination at the site, that it must be dealt with, and suggested it would be cheaper to deal with it now rather than later.

- 7) With respect to excavation at the site, the DNR representatives stated that the RI/FS sets forth what would be done to reduce risks during excavation. They did state that the RI/FS did not assess the risk of the excavation remedy, either to the public, or to the workers involved in the excavation. The DNR representatives suggested that this would be looked at further in the predesign phase.
- 8) DNR representatives indicated that they will forward information accumulated by the DNR regarding the incineration process in use at a site in Florida. Based upon the results of the incineration at the site in Florida, the DNR representatives stated that cost figures for the excavation/incineration remedy at this site may be as much as \$12,000,000.00 too high.
- 9) DNR representatives stated that soil ingestion was not used in risk assessment in the RI/FS, and that the soil risk were based upon dermal contact only.
- 10) The PRP experts questioned the use of MCLGs in the report. The DNR responded by indicating that the MCLs were not promulgated and EPA guidance on the subject was not available when the RI/FS was prepared in January and February of 1987.
- 11) The EPA/DNR stated that Jordan used cancer risk potency values when they calculated the 10^{-6} potency values.
- 12) An EPA representative stated that Region 5 guidance provided that 10^{-6} risk levels should be used where practicable.
- 13) The MDNR stated that it may increase the vinyl chloride TCL to 2 UG/L based on newly promulgated MCLs.
- 14) The PRP experts expressed their concern that the TCL for arsenic (10 PPM) was less than some background levels, and that arsenic is not considered carcinogenic by the EPA. The DNR didn't really make any response to the concern regarding background levels. The DNR stated that arsenic is considered carcinogenic at levels above 50 PPM. Dave Maurer referred the EPA/DNR to a Federal Register Cite, which indicates that the EPA has taken a position that there is not enough information to

classify arsenic as a carcinogen either by dermal contact or through ingestion.

- 15) Bruce Mackie questioned the placement and construction techniques of well RW-7. Bob Hayes of the DNR agreed that the construction diagrams or drawings for the well were vague, but stated that the well would have been backfilled with native soils left on the site. Bruce Mackie pointed out that the backfilling with native soils would not be a proper technique for constructing such a well.
- 16) Bruce Mackie also mentioned concern over well sampling techniques, i.e. insufficient baling, and pulling samples through an organics layer. Bob Hayes said that he would check this out.
- 17) In discussing sundry surface and ground water issues, Bob Hayes stated on several occasions that "dilution may be the solution".
- 18) The DNR stated that the transport modelling involved was based upon a series of sampling events. The MDNR was not aware of the use of any estimated values for chemicals which presented risks. The DNR agreed to check to determine whether estimated concentrations were used in assessing the vinyl chloride plume.
- 19) Bob Hayes of the DNR stated that "it didn't seem that unreasonable" to rely upon the samples obtained from well RW 7.
- 20) Bob Hayes also indicated that he did not have faith in the Jordan transport model and because he felt unsure of it, and the results of the model, he felt that a ground water remedy should be implemented. Mr. Jordan also stated that any model the PRPs could suggest would or could be just as valid as the Jordan transport model.
- 21) The MDNR indicated that worksheets were not used to select indicator chemicals at this site.
- 22) The DNR stated that when the incineration remedy is implemented, the ash resulting from the process will be backfilled and covered with a permeable soil cover, if determined not to be hazardous.

- 23) The DNR also indicated that any PCBs in the wet land surrounding the site must be investigated, and that they may need to excavate even more soil.
- 24) The DNR/EPA stated that risk from air emissions (resulting from excavation), and water emissions (resulting from point source discharge from the ground water treatment system) were not and will not be defined by Jordan.
- 25) The DNR stated that when the selected remedy is implemented, that air monitoring and stack monitoring will be utilized, and that the contractor will use "applicable safety standards".
- 26) DNR representatives stated that it was DNR policy of using a 10^{-6} cancer risk level for carcinogens in equations as a substitute for 0 potency values in the Public Health Evaluation Manual. The DNR didn't know if it would accept MCLs. The state utilized a total additive risk of 10^{-6} .
- 27) The state also indicated that Koc values were used for a "crude estimation" of determining the concentration for TCLs.
- 28) The DNR stated that because of the anticipated incineration temperatures involved in the incineration process, that the heterogeneous mix of any chemicals in the soils is not an issue. DNR also stated that the Shirco thermal destruction remedy will only be used if a test burn determines that it is feasible, and if it is not feasible, a rotary kiln may be substituted. The DNR stated that treated discharge from the ground water pump and treat program to surface water will comply with state criteria.

LEGAL DISCUSSION

- * Connie Puchalski stated that she felt that the PRPs have been given an adequate opportunity to comment on the proposed remedy. Mike Grice responded by saying that we don't feel that we have been given an adequate opportunity.
- * Dave Maurer stated that to facilitate discussion, the PRPs would not comment on Connie Puchalski's statement, but that our lack of comment was not to be construed as our agreement.

- * Connie Puchalski stated that in her view the EPA's actions in this matter have not been arbitrary or capricious. She also stated that she feels that the EPA has exhausted all remedies available to it to ascertain the PRPs at the site.
- * Dave Maurer asked whether the record would be closed on the 30th of September, and Connie Puchalski indicated that she didn't know, and would have to follow up for guidance. Connie agreed to follow up to determine when the record would close, and also agreed to call Keith Lerminiaux to schedule another meeting on September 14 or September 15, 1987.
- * Dave Maurer expressed a concern that the incineration/thermal destruction process is innovative technology (SITE program), and that the technology has not been fully evaluated for the record. Dave also suggested that we are being asked to commit to a remedy selection that is costly and untested. The EPA responded by indicating that thermal destruction remedy by Shirco is a preference at this time, to be tested, only because it is cheaper than the rotary kiln. The EPA representatives suggested that the rotary kiln is definitely workable at this site.
- * Mike Grice then expressed several concerns that the PRPs have. In particular, he expressed the concern that there is a whole body of knowledge not in the record that is apparently being relied upon by the EPA in the selection of a remedy. This body of knowledge would include the purported connection between the aquifers involved, and the statements by the DNR that the ground waters at the north portion of the site were moving at a rate of between 100 and 365 feet per year. Mike Grice suggested that the only appropriate thing to do would be to supplement the record and re-do the RI/FS and the Risk Assessment.
- * Mike Grice also indicated that the PRPs have been severely prejudiced because the PRPs have been looking at developing a remedy for the site, that the PRPs have begun putting together a remedial action plan. Our assumptions for our remedial action plan had been based upon the RI/FS and the Risk Assessment, whereas the information contained in those documents seems to be inconsistent with the information we were supplied with earlier in the meeting.
- * Mike stated that based upon the ground water receptor issues and the direct contact issues set forth in the RI/FS and Risk Assessment, the PRPs were looking at a permeable cap and additional well monitoring as a proposed remedy for the site. Mike reiterated his suggestion that the EPA should re-open the RI/FS and re-do the report.
- * The meeting was closed when Connie Puchalski agreed to contact Keith Lerminiaux to set up an additional meeting to discuss a potential remedy for the site either on September 14 or September 15.

Summary of Meeting 9/3/87

Re: Rose Township Site

Page 7

- * Connie Puchalski stated that caps were generally viewed as being unreliable. She also stated that the State of Michigan did not concur in an in situ vacuum extraction remedy for the site.

ROSE TOWNSHIP MEETING SEPTEMBER 3, 1987

SIGN IN SHEET

<u>NAME</u>	<u>REPRESENTING</u>	<u>PHONE</u>
Connie Puchalski	EPA	886-6620
Mike Grice	Chrysler	(313) 856-2075
Keith Lerminiaux	Vandever/Chrysler	(313) 961-4880
Mark Edie	Ford Motor	(313) 390-1874
Jeffrey Klein	GM/RPM (Dykema, Gossett)	(313) 568-5442
David Maurer	TRW/Uniroyal (Pepper)	(313) 259-7110
Robert Jurczynszyn	Akzo Coatings America	(313)-589-3660
Bob Emmett	Reed Smith/Detrex	(202) 457-6144
Kevin Adler	EPA - V	886-7078
Stanley Pruss	Mich A G	(517) 373-7780
David Minc	Uniroyal Goodrich	(216) 374-2189
Brad Venman	MDNR	(517) 373-8751
Larry Elmleaf	MDNR	(517) 373-3503
Bob Hayes	MDNR	
Steve Luzkow	MDNR	(517) 335-3392
Bruce Mackie	Hart Environmental Management	(201) 647-8111
John Iannone	Hart Environmental Mgt.	(212) 840-3990
Paul Bitter	USEPA, CERCLA Enf. Section	(312) 886-4697

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

MEMORANDUM

September 10, 1987

TO: Steve Luzkow, Remedial Action Section,
Environmental Response Division

FROM: Brad Venman, Land Application Unit, Waste
Management Division

SUBJECT: Review of Fred C. Hart Associates, Inc. comments
on Rose Township - Demode Road RI/FS

A primary focus of Hart's criticisms for Jordon's interpretation of the Risk Assessment was to attack the selection of the indicator chemicals. While it is true that Jordon did not utilize the worksheets provided in the "Superfund Public Health Evaluation Manual" (PHEM) to quantitatively "score" the indicator chemicals, professional judgement, based on knowledge of the chemicals' physical/chemical characteristics, relative toxicities, concentration detected in various media, and representation of various approximate mobility categorizations were used to identify the indicator chemicals. The selection process for indicator chemicals as outlined in the PHEM is a general guideline which considers these same general characteristics and allows one to take a "cookbook" approach to assign a quantitative score to the chemicals found at a particular site. The process used by Jordon may have selected several chemicals as chemicals of concern that may not have been necessary, (e.g., 2-butanone and isophorone), but when the quantitative risk assessment was conducted these chemicals dropped out of the process and no target concentration levels were developed to drive the cleanup. Having unnecessary indicator chemical is not critical, it only provides additional work for the risk assessor when establishing the quantitative risk assessment. A problem could arise if in the indicator chemical selection process a chemical of concern were missed, and because of some unusual physical/chemical properties or extreme toxicity, would not be adequately addressed by the selected remedial action for the site, this may be cause for concern. In my opinion, however, this was not the case for this site.

Hart's criticisms of the chemical transport model are basically acknowledged by Jordon in the text. As you know, we believe this is a reasonable simplified modeling effort,

as more data become available for the site and for the chemicals of concern, more extensive modeling can be attempted. Nothing in Hart's FS suggests anything else which could resolve their own criticisms.

We made a decision back in January to utilize the promulgated Maximum Contaminant Level Goals (MCLG) values for the baseline risk assessment and for development of target concentration levels (TCL's). For those chemicals with a value of zero for the MCLG, we utilized a one in one million cancer risk value for drinking water which was calculated from cancer potency values listed in the PHEM as a reasonable approximation of an acceptable risk. Since the risk assessment portion of the document was put together in January and February of 1987, the EPA guidance cited by Hart was not available, nor were the MCL's for VOC's promulgated. Utilization of the cancer risk values when formal standards were not available is appropriate and is consistent with past MDNR consent agreements for site cleanups. The comments that the shallow aquifer would need to be connected to the deeper aquifer in order for the drinking water standards to be applicable is inconsistent with past MDNR interpretations for usable aquifers. It is also not yet clear how the Department will utilize EPA's proposed ground water classification scheme. To my knowledge, it has not yet been finalized by EPA.

As I have discussed, utilization of the health based cancer risk value for vinyl chloride and for other carcinogens on the site is appropriate when characterizing the risk at the site. We recognize however, that the final TCL may need to be set at something approximating the MCL since the analytical level of detection is in the range of one part per billion.

The selection of a background concentration of 10 ppm for arsenic was proposed by Jordon as a reasonable approximation based on the limited background data available. The classification of arsenic as a human carcinogen is consistent with current EPA classification, International Agency for Research on Cancer, and the World Health Organization classifications. It was our judgement that cleanup to background concentrations would be most appropriate for naturally occurring carcinogenic substances, rather than the cancer risk based value for contact hazard in soils. Selection of the current MCL for arsenic in drinking water was judged appropriate given the uncertainties of the quantitative risk assessment and the judgement of the National Academy of Sciences, Safe Drinking Water Committee, and EPA's Office of Drinking Water.

Hart comments that the TCL for PCB's was inappropriately selected at 10 ppm. Yet according to our interpretation, the same cleanup advisory information cited, suggests that cleanup of contaminated soils in residential and commercial soils should target 10 ppm with 10

for other sites is consistent with the 10 ppm TCL.

The determination by Jordon that a soil TCL for total organics would be based on that calculated for TCE results from several assumptions which are outlined in appendix I-2. The extrapolation to total VOC's at this level is a conservative approach to estimate the volume of soil which will need to be removed. This was done to be reasonably assured that the VOC's remaining in soil after cleanup will not result in any VOC contaminants leaching into the ground water above some undesirable concentrations (since TCE was found in the highest concentrations and has also been found to be quite mobile in soils). Although Hart's comments that this process is not sufficiently accurate, they offer no alternatives.

It is my opinion that selection of a well in the center of a plume as a reasonable worst case scenario is not inappropriate for the site. It is not the policy for the MDNR to write off a usable aquifer, and the ultimate goal for site restoration would be to not require institutional controls for the site after remediation.

The fact that the RI/FS conducted by Jordon did not specifically detail the quantitative risk associated with excavation/remediation, it is not my understanding that this is necessary. Under OSHA regulations, appropriate worker protection equipment would be necessary, and site air monitoring would identify any concerns to surrounding populations during actual remediation. During remediation, engineering practices would attempt to minimize air emissions and transport of contaminated particulates.

Hart's contention that Jordon used a snowmobiler as the example exposure scenario is totally incorrect. The mention of snowmobilers and ATR vehicle use as well as hunting and hiking across the site were only mentioned as examples of persons having access to the site and having been seen using the site. Jordon used the exposures outlined on page 98 of the Remedial Investigation report for a hunter as the most likely adult exposure and children playing at the site to assess this population. Dermal exposures were used to assess their potential for chemical contact.

According to my interpretation of the RI tables in chapter 7, it is true that some estimated values were used for evaluating chemicals as the average concentrations in the respective plumes. The worst case concentrations, i.e., the highest concentrations found, were not estimated values. A likely reason that some of these average concentrations are denoted with a "J" qualifier is that the average values determined may have been noted as approximate values. Also, they may be below the CLP detection limit, but above the analytical detection limits of the procedure used. According to our interpretation, no where in the PHEM is this practice

forbidden, nor do we believe it is contrary to accepted methodology. It is a mechanism which allows some quantitative analysis of potential risk, particularly when taking average values, since these would automatically be an extrapolation of some hypothetical mean value.

I believe these comments address Hart's comments for the risk assessment portion of the RI/FS.

My general comments for Hart's FS are not extensive at this time. It was my impression that Hart's representatives may be altering this document to some extent based on our recent meeting. Much of the above discussion applies to their comments made in this document as well. The indicator chemicals identified by Hart are not significantly different than those used by Jordon, and as I have noted above, these do not alter the selection of the remedial alternative. We obviously do not agree with the conclusion reached that since no receptor wells are yet impacted, there is zero risk associated with the ground water contamination and that no remediation is necessary.

Bud Verner

U.S. EPA Meeting Notes
Rose Township Dump Site - September 15, 1987

Mike Grice introduced the PRP proposal. He said that there was a dilemma. They had a record of the E.C. Jordan report, which reaches a number of conclusions. At an earlier meeting, there was some discussion of data which is not in the record, and this data is not in the Jordan Report. He said that they had a proposal dealing with remedial action, which went beyond the problems at the site and that they had tried to address concerns as to groundwater.

Bruce Mackie then distributed the plan, entitled "Proposal for Rose Township-Demodé Road Site Remedial Action Plan." This plan was prepared by Fred C. Hart Associates, Inc. John Iannone discussed the proposal. He made certain admissions including the possibility that groundwater containing chemicals of concern might reach domestic wells and that there is a dermal contact threat from the soils. The direct contact threat would be eliminated by installing a fence and gate around the perimeter and placing a soil cover over those areas in the southwestern portion. A groundwater monitoring program and supplemental hydrogeologic work would also be implemented. Their proposal lays out the work in 2 phases: A description of the work and steps needed to implement it, at section 3. Work involved under the heading of construction includes fence and gate, a soil cover, diversion berms and a locked security gate to permit only authorized entrance. Steps implemented to install the soil cover include clearing the site, regrading it, installing a soil cover, filling in portions of soil, and revegetation with things which will thrive at such a site. Drainage will have to be done and diversion berms will be constructed to make sure that there is no erosion. They also have to make sure that the cover doesn't break. Monitoring wells will be installed. About 6 or more wells will be needed.

Operation and maintenance involves inspecting every six months and annually thereafter. Inspection would involve making sure that the fence is intact along with the barriers and the wells; and checking whether the cover is eroding and that the drainage is still working. If there is a problem, the system is set up for a yearly maintenance contractor to perform repairs. There will be monitoring of some sort and a report will be issued. As to maintenance, to maintain the site is why they designed the cover, fence, monitoring system and monitoring wells.

Bruce Mackie, discussing the permeable cover, discussed the validity of sampling results in the RI due to well construction and the link between nearby receptors and the site. The supple-

mental hydrogeological studies would involve a well abandonment program. They would survey wells to find out which might not be representative, identify which wells to abandon, abandon those and, if there are wells which are needed for long-term monitoring, replace them. They would implement an aquifer testing program. The pumping test will help to further define hydrogeological areas not properly defined by the Jordan Report.

Receptor analysis: The supplemental study would determine the actual zones of receptors and how many people there are down-gradient. They also need to determine if there are other aquifers which are or could be used. In addition, a piezometer study and a land survey will be performed. Once they have hydrogeological information, they will form a preliminary design, mapping out how the configuration of the work will be done. Once that is agreed to, they will form a final design. When that is agreed to, they will select a contractor, make bids, begin construction and hire a consultant to oversee and to provide third party verification.

If supplemental hydrogeological work resolves the question of whether groundwater is affected to unacceptable public health risk levels, if it is moving off the site, they will implement a vacuum extraction system in the southern portion of the site and ground water extraction for the northern and southern portions, or an impermeable cap on the southern portion and a groundwater extraction system over all of the site.

Connie Puchalski asked if they were suggesting fencing and groundwater monitoring as part of a hydrogeological study, a permeable soil cover in the southern portion and predesign investigations to determine if there are off-site groundwater problems. There are two alternatives presented: A vacuum extraction system on the south end plus pump and treat on the north and south end, or an impermeable cover for the south end plus pumping and treat for the north and south end. Vacuum extraction only treats VOCs. Thus, the PCBs would remain.

David Tripp responded that the PCBs, as DNR would agree, don't move, whereas there is mobile ability in VOCs. Purge and treat would resolve that question to the extent it is needed.

Bob Reichel asked what criteria were used to choose between the alternatives.

Bruce Mackie said that the supplemental hydrogeological study, part of the predesign investigation, would be implemented after the consent decree. As to the length of time it will take to do the hydrogeological study, that depends on the field work, which winter might delay. They need to design the study first, then agree to it. The field work will take one month; evaluation,

a few weeks; and, if it is necessary to run it through contract labs, a few months. If they run it through their labs, four to six weeks.

John Iannone said that it would take four to six months from planning to getting lab results and putting them together.

In response to the proposal, Connie began by stating our reaction to the permeable cap. It is not a permanent remedy as required by SARA. It leaves contamination: the PCBs are still there. Thus, the plan might not meet ARARs, at least for PCBs. The fence we want, and the groundwater monitoring; but the cap does not adequately protect health and the environment.

Bob Reichel said that the cap does not provide for treatment as SARA requires. In addition, there are State concerns. There is uncertainty as to the rate of outside migration and the time in which contamination can be dealt with. We are dealing with a risk to human health and environmental and public resources. Doing groundwater work only to the extent there is migration is not acceptable. A Michigan statute prohibits degradation of usable resources--which we already have at the site.

David Tripp noted that there are draft permit rules which recognize a site boundary concept of protection. He said he expects that the concept of boundary protection will also be a part of the clean-up rules, which are less demanding than the permit rules. With ongoing permit rules, DNR is now proposing rules with boundary site protection such that protection levels at the boundary are met.

Bob Reichel responded that current statutes control. Provisions which might be adopted in the part 22 rules, at least on their face, indicate that they are not intended to be operative as clean up factors. Whatever the drafts of regulations say, under existing state laws, we look at both present and potential degradation of environmental and protected resources.

David Tripp replied that section 6(a) protects the public health and welfare in uses of the water, and the uses of the water on the site preclude domestic use. Therefore, they don't think that they are endangering public health or the uses of this site.

Bob Reichel said that the statute deals not only with present, but also with potential uses. Under existing law, there has to be a restoration of the resources that have already been affected.

Steve Luzkow wanted the documents to provide for a permanent remedy for PCBs and VOCs and groundwater. If they have a suggestion for a permanent remedy which deals with thermal

destruction (of PCBs), removal of VOCs and contaminated groundwater, he said, we have a basis for discussion. As to PCB's we are looking for permanent destruction. We are looking for treatment of groundwater with extractions. With treatment of VOCs, if there is an alternative they can come up with we will look at it.

David Maurer said that the question is how far they are to go in the direction of a permanent remedy. This involves several factors, one of which is cost-effectiveness. If there is a way of achieving a permanent remedy and cost-effectiveness, they will be willing to hear it.

Mike Grice: This meeting has been a help to us. There are some fundamental areas where we see the issues differently. I was glad to hear that you suggested a cost-effective permanent remedy. But the cost-effective test is used to determine whether a permanent remedy is appropriate. I suggest we meet in the future. We are intrigued by a number of statements made. You identified areas of concern such as the treatment of PCBs and VOCs. It would be helpful to us if you could give us a little evaluation on what your thoughts in that area are.

Mike Grice: You are concerned about PCB contamination. Contamination at what level?

Bonnie Eleder: Do you mean a clean-up level?

Kevin Adler: 10 ppm is the clean-up level.

David Tripp: On the discussion of a permeable cap and enhanced volatilization when you combine purge and treat with those, were you suggesting both a permanent cap and enhanced volatilization?

Petitioners: No, we agree purge and treat is necessary as far as other contaminants in the soil. We're looking for you to address a permanent remedy in that area. We're not specifying a remedy.

David Maurer: Do you make a distinction between a permanent remedy for PCBs and volatiles?

Bonnie Eleder: The remedies could be the same or different as long as it reaches the objectives.

Bob Hayes: If it will work and be permanent and be equal to what we proposed within a reasonable time.

Bob Emmett: If you sign a ROD would you still consider our proposal?

Connie: If you come up with a proposal that contained a permanent remedy for VOCs and PCBs, we would consider it. Our deadline is October 6. I do not think a ROD would preclude consideration of a plan that offers a permanent solution for both PCBs and VOCs.

ROSE TOWNSHIP MEETING - September 15, 1987

Sign - In Sheet

<u>Name</u>	<u>Representing</u>	<u>Phone</u>
Connie Puchalski	U.S. EPA	886-6620
Maria E. Gonzalez	U.S. EPA	353-1129
David Maurer	TRW/Uniroyal (Pepper)	(313) 259-7110
Mark Edie	Ford	(313) 390-1874
Keith Lerminiaux	Chrysler/Vandever	(313) 961-4880
Mike Grice	Chrysler	(313) 956-2075
David Tripp	GMC, RPM (Dykema)	(313) 568-6748
Robert Jurczynsyn	Akzo Coatings America	(313) 589-3660
J.K. MacKendree Day	Akzo Coatings America	(312) 906-7543
John Phelps	Chrysler	(313) 493-3981
John Iannone	Hart Environ. Mgmt.	(212) 840-3990
Bruce Mackie	Hart Environ. Mgmt.	(201) 647-8111
Bob Emmett	Detrex/Reed Smith	(202) 457-6144
Paul Bitter	EPA (MI/WI CES Unit)	(312) 886-4697
Kevin Adler	EPA-V	(312) 886-7078
Bob Hayes	MDNR	(517) 335-3389
Bonnie Eleder	U.S. EPA	(312) 886-4885
Steve Luzkow	MDNR	(517) 335-3392
Bob Reichel	Mich. Dept. of Atty. General	(517) 373-7780
David Minc	Uniroyal	(216) 374-2189

SAMUEL A. GARZIA
RICHARD J. TONKIN
IVIN E. KERR
JOHN M. HEAPHY
RALPH S. MOORE
JOHN D. SILLS
RICHARD B. POLING
THOMAS P. ROCKWELL
JAMES A. SULLIVAN
EDMUND M. BRADY, JR.
JAMES E. PLASTOW, JR.
MICHAEL M. HATHAWAY
JOHN J. LYNCH
THOMAS M. PETERS
JAMES K. THOME
D. DOUGLAS MCGAW
RICHARD B. POLING, JR.
CECIL F. BOYLE, JR.
DENNIS B. COTTER
DAVID P. GRUNEWALD
JOSEPH W. O'BRIEN
GARY A. MILLER
KEITH J. LERMINIAUX
RANDALL J. GILLARY
WILLIAM E. STEWART
THOMAS R. CHARBONEAU, JR.
WILLIAM L. KIRIAZIS
CHARLES W. BROWNING
CYNTHIA E. MERRY
DANIEL P. STEELE
SHELLEY K. MILLER
RICHARD G. SZYMCAK
TERRANCE P. LYNCH
ROBERT D. BRIGNALL
GREGORY C. HAMILTON
BRUCE E. PEARCE
SUZANNE C. STANCZYK
DAVID M. NICHOLAS

VANDEVEER, GARZIA, TONKIN, KERR, HEAPHY,
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September 23, 1987

Ms. Connie Puchalski
Assistant Regional Counsel
UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY, Region V
230 South Dearborn Street
Chicago, Illinois 60604

Re: Rose Township

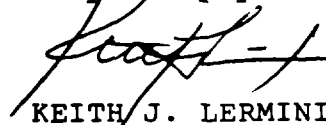
Dear Ms. Puchalski:

Enclosed please find a summary of the meeting held on
September 15, 1987. We are requesting that the enclosed summary
be made a part of the Administrative Record for the Rose Township
site.

If you have any questions, please feel free to contact me at
your convenience.

Thank you for your attention and cooperation.

Very truly yours,


KEITH J. LERMINIAUX

KJL/vn
Enclosure

SUMMARY OF MEETING 9/15/87
(A list of attendees is attached)

- * On September 3, 1987 commencing at approximately 10:30 a.m., a meeting was conducted regarding the Rose Township site at the EPA offices in Chicago, Illinois. The meeting was attended by representatives of the EPA, representatives of the Michigan Department of Natural Resources, representatives of the PRP Group, and representatives of Hart and Associates. A list of attendees is attached.
- * The meeting was opened by Mike Grice. He made some introductory comments concerning the proposal submitted to the EPA/DNR during the meeting. Mr. Grice suggested that the PRPs had hoped to see the Jordan data that was referred to during the meeting of September 3, 1987, but that the PRPs had not been afforded that opportunity. Mr. Grice stated that the PRP proposal submitted on September 15th goes beyond the demonstrated need at the site. He also noted that although the PRPs have not seen the E.C. Jordan data referred to in the meeting of September 3, 1987, that the PRPs have tried to address the data in the proposal submitted.
- * John Iannone summarized and presented the PRP proposal. He discussed the concerns at this site and also discussed how the PRP proposal would address those concerns.
- * The PRP proposal outlined by Mr. Iannone contained the following elements; fencing, monitoring, the construction of a permeable soil cover in the southern portion of the site, and supplemental hydrogeological work. The proposal presented also contained a provision for two alternate remedies, depending upon the outcome of the supplemental hydrogeological work. The two alternate remedies suggested by the PRP proposal are as follows;
 - (a) vacuum extraction for the southern portion of the site and a ground water pump and treatment program for the northern and southern portion of this site or;
 - (b) changing the permeable cap to an impermeable cap combined with a ground water pumping and treatment program for the northern and southern portions of this site.
- * Bruce Mackie then described the supplemental hydrogeo study contained in the PRP proposal. The supplemental hydrogeo study would include a well abandonment/survey program, additional aquifer testing, a receptor analysis, and other similar work.
- * After the proposal was presented by John Iannone and Bruce Mackie, the EPA and DNR then commented on the proposal. Connie Puchalski stated that the vacuum extraction technique only takes care of the VOCs. John Iannone agreed, but also stated that the vacuum extraction technique would take care of some of the non-volatiles.

- Dave Tripp stated that the PCBs in the soil were considered immobile, and that the purge and treat program would take care of the chemicals of concern at this site.
- Bob Reichel asked about the criteria that would be used to select amongst the alternate remedy suggested by the PRPs. Dave Tripp responded by indicating that this would be the subject of negotiation, but that the remedy selected would be the appropriate remedy based upon the further hydrogeological work contemplated in the PRP proposal.
- Bob Hayes asked when the hydrogeo study would be implemented, and Dave Tripp responded by saying that it would be implemented right after the consent decree was signed. John Iannone commented that he thought that it would take four to six months to implement the program.
- Steve Luzkow of the DNR then asked whether there would be a cap over the area where the vacuum extraction would be implemented. The PRPs responded by saying that there would not be a cap over those areas.

The EPA/DNR representatives also made the following comments:

- That a permeable cap was not a permanent remedy.
- That the PRP proposal didn't deal with the PCBs in the soils.
- That the proposal would not meet applicable ARAR's for possible PCBs.
- The EPA/DNR agreed that fencing and monitoring would be a good idea.
- They suggested that a cap does not adequately protect the health and environment.

* Bob Reichel then made several comments concerning the PRP proposal. He expressed the concern that the PRP proposal does not provide for the destruction of the chemicals in the soils. He also indicated that the State of Michigan's concern at this site was not limited to human health, and that the state was concerned about the environment and public resources. He suggested that the PRP proposal does not do anything with the contaminated ground water as it exists now, and suggested that the ground water underneath the site has been degraded. He stated that under Section 6A of the Water Resources Commission Act that there had been a degradation of usable resources, and that for that reason, the ground water had to be cleaned up under the site.

- Dave Tripp made some comments regarding the application of Section 6A of the Water Resources Commission Act, and he also discussed some new part 22 rules that are presently being promulgated.

* Steve Luzkow then expressed the DNR concern that the PRP proposal does not address permanent remedies. He suggested that the DNR would be willing to listen to any permanent remedy that

would address the soils, ground water, and VOCs. He went on to indicate that there must be some treatment of the PCBs, there has to be treatment of the ground water, and something has to be done with the VOCs.

- * Dave Maurer commented that any remedy at this site must be cost effective, and that cost effectiveness should be a factor in selecting a remedy. The DNR responded by saying that if we have a more cost effective remedy, that they would be willing to entertain it.
- * Mike Grice then commented that the meeting was helpful. He also commented that he had some questions as to whether or not a permanent remedy was appropriate at this site based on the risks present. He also indicated that he felt that there were some areas of agreement, and some areas of disagreement, but felt that a further meeting would be useful. He then asked the DNR to clarify some of the comments that the DNR made on the PRP proposal.
- * In response to Mr. Grice's request for a clarification, Mr. Hayes of the DNR suggested that a purge and treat program for the ground water was definitely necessary. The DNR is looking for a permanent remedy for the soils, although the DNR is "not suggesting anything in particular". He also indicated that there would have to be some permanent remedy for the PCBs and VOCs present at this site. He stated that if the PRPs could come up with a proposal as good or better than the one proposed by the EPA/DNR, that it would be seriously considered.
- * The meeting then came to a close when the respective parties agreed to attempt to meet on September 22 or September 24. It was also suggested that representatives of each side try to set an agenda by phone to make the meeting more meaningful. The parties will also attempt to exchange any documents they have available prior to the next meeting date.
- * At this point the EPA/DNR was asked again about the data mentioned during the meeting of September 3. Bob Hayes commented that he had received some data from E.C. Jordan, but that he was not certain that he had gotten all of the data, as the person involved was on vacation. He promised to check into this again, and also advised that he would supply the data involved to the PRP experts. He stated that he had received correspondence from Jordan indicating that some of the wells along Demode Road are 20 feet to 30 feet deep. He has not received any well logs.
- * At the close of the meeting, Keith Lerminiaux submitted to Connie Puchalski a summary of the meeting which was held on September 3, 1987.

LIST OF ATTENDEES

Rose Township Meeting - September 15, 1987

Sign in Sheet

<u>NAME</u>	<u>REPRESENTING</u>	<u>PHONE</u>
Connie Puchalski	U.S. EPA	313-886-6620
Maria E. Gonzalez	U.S. EPA	313-353-1129
David Maurer	TRW/Uniroyal (Pepper)	313-259-7110
Mark Edie	Ford	313-390-1874
Keith Lerminiaux	Chrysler/Vandever	313-961-4880
Mike Grice	Chrysler	313-956-2075
David Tripp	GMC, RPM (Dykema)	313-568-6748
Robert Jurczyszyn	AKZO Coatings American	313-589-3660
J.K. MacKendree Day	AKZO Coatings American	312-906-7543
John Phelps	Chrysler	313-493-3981
John Iannone	Hart Environ Mgt.	212-840-3990
Bruce Mackie	Hart Environ Mgt.	201-647-8111
Bob Emmett	Detrex/Reed Smith	202-457-6144
Paul Bitter	EPA	312-886-4697
Kevin Adler	EPA-V	312-886-7078
Bob Hayes	MDNR	517-335-3389
Bonnie Eleder	U.S. EPA	312-886-4885
Steve Luzkow	MDNR	517-335-3392
Bob Reichel	Michigan Dept. of Atty. Gen.	517-373-7780
David Minc	Uniroyal	216-374-2189

September 16, 1987

TO: Steve Luzkow, Project Manager, Demode Road Site,
Site Management Unit

FROM: Robert Hayes, Project Geologist, Demode Road Site,
Site Management Unit

SUBJECT: Comments on Fred C. Hart Associates Inc. Review of Demode Road
Final RI/FS

The PRP emphasis on a lack of direct evidence on the connection between domestic wells (nearest receptors) and the contaminated site aquifer(s) is misplaced. First, anyone would be "hard pressed" to state there is no connection, simply based on the geologic nature and complexity of this site. Circumstantial evidence alone suggests a connection: over the entire site there is hydraulic connection between the shallowest and deepest aquifers. The vast majority of domestic wells in the area are finished above the deep clay till (if it is present beyond the site). Second, the groundwater flow velocity in the report was understated: in the northern portion of the site, vinyl chloride is present in significant concentrations and the groundwater in this contaminated area is moving at a rate between 200 and 500 ft/yr. (See attached flow velocity data.) In only a few years, this contamination is likely to move to many receptors. Finally, according to Michigan law, the groundwater is contaminated and it must be remediated, regardless of the proximity of present receptors.

It should be pointed out that the Final RI contained some data that was not corrected:

The following elevations are the corrected elevations:

DNR4 Top of Casing	=	979.66'
MW102D Top of Casing	=	1013.61'
DNR 5 Top of Casing	=	999.16'

Groundwater elevations in the report should be corrected accordingly.

Groundwater modeling by any model is very likely to be misleading and of very limited value for this geologically complex site - especially using the relatively limited data compared to the amount of data necessary to model a site of this complexity.

Models are merely tools to help understand complex data. For the most part, models assume uniformity and consistency in geologic parameters which are extremely variable and inconsistent at this site. To generate a contaminant transport model for this site is of questionable value when considering that even a groundwater flow model (which is the basis for a contaminant transport model) is likely to be a complex task with questionable results for this site. The data necessary to generate and calibrate a contaminant transport model for this site would be excessively expensive and beyond the scope and need of this remedial investigation. The data thus far collected indicates that contamination is present and moving in a useable aquifer. The nature and extent of contamination is known sufficiently to select an appropriate remedy for this site. A computer is not necessary to reach this conclusion! As for predicting concentrations of contaminants at existing receptors, this is virtually impossible and not necessary considering the ARARs. The empirical evidence alone is sufficient to indicate a significant problem exists.

Use of monitor well RW-7 is appropriate for this site. Hart's concern about the construction of RW7 is insignificant. The well log indicates the presence of odors and a greenish color in the aquifer (also there were red coloring of clays above, which strongly suggests contamination). Typical well construction for this phase of the study included letting the formation collapse around the well screen. If any drill cuttings were used as backfill material, it would have been from the sediments in or above the aquifer. Also, it is likely that it would have been the low permeable overlying clays. Further, these cuttings would have been placed above the bentonite seal. Thus, this location suggests that concentrated contaminants existed before the well was placed here, and the chemical results show contamination is still present in high levels. If it is accurate (which I doubt) that this well was not properly evacuated before sampling, then the volatile chemical levels present would likely be lower than those actually in the aquifer.

Overall, Hart's comments do not have a significant influence on the RI/FS data and conclusions. However, the change in flow rates that I have noted do increase the urgency associated the remediation of this site.

cc: Kevin Adler, U.S. EPA
Willson/Linton, MDNR
Bruce Fowler, E. C. Jordan

GROUNDWATER VELOCITY SUMMARY

<u>DIRECTION/LOCATION</u>	<u>AVERAGE VELOCITY</u>
<u>North Plume Area:</u>	
DNR-6 to DNR-4	400 ft/yr
DNR-5 downgradient (toward Demode Rd.)	220 ft/yr
<u>Central Site Area:</u>	
DNR-3 to MW102D	50 ft/yr
<u>South Plume Area:</u>	
Shallow Aquifer	
RW7 to RW9	35 ft/yr
RW6 to Wetland	19 ft/yr
Deep Aquifer	
DNR-1 to MW106D	15 ft/yr

DEMODE ROAD SITE

Groundwater Flow Velocity

Formula: Velocity (v) = $\frac{K_{\text{hydraulic}} \times I \text{ gradient}}{\text{porosity} \text{ cond}}$

NORTH PLUME: Flow from DNR6 to DNR 4 on 4/8/87

$$v = \frac{K_{\text{DNR6}} \times I_{\text{DNR 6 4}}}{n \text{ (assumed)}}$$

$$v_{\text{DNR-6}} = \frac{47.89 \text{ ft/d (.007)}}{0.25} = 1.34 \text{ ft/d}$$

$$1.34 \text{ ft/d} = 489 \text{ ft/yr}$$

$$v_{\text{DNR5}} = \frac{K_{\text{DNR-5}} \times I}{n} = \frac{27.09 \text{ ft/d (.0067)}}{0.25} = 0.7 \text{ ft/d}$$

$$v_{\text{DNR5}} = 0.7 \text{ ft/d} = 265 \text{ ft/yr}$$

If assume n = 0.3 then

$$v_{\text{DNR6}} = 407 \text{ ft/yr and } v_{\text{DNR5}} = 220 \text{ ft/yr}$$

SOUTH PLUME:
Shallow Aquifer:
 RW-7 to RW-9
 Distance approx. 450'

Average Groundwater velocity
 Data: 4/8/87 k (estimated)
 Water elev. 1007.54' (RW7)
 - 996.56' (RW9)
10.98'

$$I = \frac{10.98}{450} = 0.024$$

$$v = \frac{KI}{n} = \frac{1.0 \text{ ft/day (assumed)} \times 0.024}{0.25} \text{ approx. .1 ft/day}$$

approx. 35.0 ft/year

RW-6 to wetland (approx. elev. 999')

$$v = \frac{KI}{n} = \frac{1.0 \text{ ft/day} \times 0.013}{0.25} \text{ approx. 0.05 ft/day}$$

0.05 ft/day approx. 19.0 ft/yr

DNR1 to MW106D

Data 4/8/87

$$\frac{8.27}{-7.38} \quad I = \frac{.89}{1350} = 0.00066 \text{ approx. .0007}$$

0.89

$$v = \frac{KI}{n} = \frac{15 \text{ ft/day} \times 0.0007}{.25} = 0.043 \text{ ft/day}$$

$$= 15.3 \text{ ft/year}$$

CENTRAL SITE AREA
Groundwater Velocity

DNR-3 to MW-102D

elev. 1007.42 DNR-3
-1005.97 MW-102D
1.45

$$I = \frac{1.45}{1300} = .001$$

$$v = \frac{KI}{n} = \frac{30 \text{ ft/day} \times .001}{.25} \text{ approx. } 0.14 \text{ ft/day}$$

$$\text{approx. } 50 \text{ ft/year}$$



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September 16, 1987

TO: Steve Luzkow, Project Mgr., Demode Rd., SMU

FROM: Robert Hayes, Project Geologist, Demode Rd., SMU

SUBJECT: Demode Road - Supplemental Evaluation

Some information and evaluations that I presented to E. C. Jordan for the Final RI/FS were not included in that report. The purpose of this memo is to bring several important points to light regarding contamination flow rates, nature of vinyl chloride plume, connection of north and south plumes, and remedy selection that must be considered in evaluating this site for remediation.

Using the information contained in the RI/FS, I calculate groundwater flow rates that are significantly different than those presented in Jordan's report (see attached calculations). Groundwater velocity in the northern groundwater contamination (i.e. vinyl chloride) plume ranges from approximately 200 - 500 feet/year. Jordan's suggested flow ranged from approximately 21 feet/year up to a possible 200 feet/year. This was based on overall site averages, rather than location specific (i.e. north plume area) data that I used. This is a significant difference, and one that suggests vinyl chloride (a carcinogen) will spread on and off site at a much faster rate than previously indicated. I believe this adds a new sense of urgency to the remediation of this site.

When considering the hydrogeology of the entire site, it is apparant that there is a groundwater recharge area in the same location as the known contaminant source area (i.e., the southwest portion of the site's upland area). Contaminants apparently are either retarded from moving vertically by the surficial clay deposits or they may be directed horizontally to more granular recharge areas. Once they move downward they encounter an unconfined shallow aquifer. In this mounded (most of the year) recharge zone contaminants initially move vertically and radiate to southwest, west, northwest and north directions away from the source area. As contaminants reach the lower portions of the aquifer, the regional groundwater flow system directs them generally northward toward Demode Road.

Groundwater in the southern portion of the site moves much slower than groundwater in the northern portion (previously discussed). (Attached are calculated groundwater velocities and additional groundwater flow contour maps.) When the entire site is considered, groundwater in the south moves on the order of 20-30 feet/year, toward the central portion of the site it gradually increases to approximately 50-75 feet/year, and continues to increase as it moves northward. When it reaches the north portion (e.g. vicinity of DNR-7) it begins to move considerably faster -

greater than 200 feet/year. For some of these flow rates I used assumed values for hydraulic conductivity and porosity--generally resulting in lower flow rates than I would expect for this type of aquifer. Additional slug tests/pump tests would be necessary to get more accurate data. (These flow rates could easily be much greater than presented here--by assuming greater values.)

Although the exact location of the vinyl chloride is unknown several physical and chemical conditions make its presence in the north part of the site a serious concern. Considering the different groundwater velocities, the location of known source areas, and the fact that vinyl chloride occurs as a result of chemical degradation and moves quite rapidly in the groundwater, chemicals apparently have moved a significant distance from the south or at least south central portion of the site. A major concern should be preventing contaminants from reaching the high groundwater velocity area in the north part of the site. Indeed, we should emphasize that the chemicals in the groundwater in the south portion of the site should be removed before they continue to transform into chemicals of even greater health concern (e.g., vinyl chloride) and move northward and rapidly away from the site.

The Jordan report treats the north and south plumes as separate concerns. I do not believe this is the case. Indeed, I believe there is ample evidence (flow directions, flow rates, stratigraphy, etc.) in the report that indicates the "north" and the "south" plumes are related and in fact connected. Additional intermediate depth wells in the vicinity of RW14 and MW103 (both shallow wells) should confirm this interpretation.

I conclude that at present there is enough data to select a remedy that would remediate this site appropriately. Further, I suggest that there should be some sense of urgency associated with remediation (for reasons described above) of this site. Finally, I recommend that at least the number of additional monitor wells suggested in Jordan's report be installed and pump tests completed prior to (or at least during) the Remedial Design phase of this project. The information gained from these additional monitor wells will be indispensable to a realistic remedial design and may even suggest the need for more and/or better located monitor wells for the final remedial action.

cc: Mr. Kevin Adler, EPA
Mr. R. Willson/Mr. J. Linton

GROUNDWATER VELOCITY SUMMARY

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<u>Central Site Area:</u>	
DNR-3 to MW102D	50 ft/yr
<u>South Plume Area:</u>	
Shallow Aquifer	
RW7 to RW9	35 ft/yr
RW6 to Wetland	19 ft/yr
Deep Aquifer	
DNR-1 to MW106D	15 ft/yr

DEMODE ROAD SITE

Groundwater Flow Velocity

Formula: Velocity (v) = $\frac{K_{\text{hydraulic cond}} \times I \text{ gradient}}{\text{porosity}}$

NORTH PLUME: Flow from DNR6 to DNR 4 on 4/8/87

$$v = \frac{K_{\text{DNR6}} \times I_{\text{DNR 6 4}}}{n \text{ (assumed)}}$$

$$v_{\text{DNR-6}} = \frac{47.89 \text{ ft/d (.007)}}{0.25} = 1.34 \text{ ft/d}$$

$$1.34 \text{ ft/d} = 489 \text{ ft/yr}$$

$$v_{\text{DNR5}} = \frac{K_{\text{DNR-5'}} \times I}{n} = \frac{27.09 \text{ ft/d (.0067)}}{0.25} = 0.7 \text{ ft/d}$$

$$v_{\text{DNR5}} = 0.7 \text{ ft/d} = 265 \text{ ft/yr}$$

If assume n = 0.3 then

$$v_{\text{DNR6}} = 407 \text{ ft/yr and } v_{\text{DNR5}} = 220 \text{ ft/yr}$$

SOUTH PLUME:
Shallow Aquifer:

RW-7 to RW-9
Distance approx. 450'

Average Groundwater velocity
Data: 4/8/87 k (estimated)
Water elev. 1007.54' (RW7)
- 996.56' (RW9)
10.98'

$$I = \frac{10.98}{450} = 0.024$$

$$v = \frac{KI}{n} = \frac{1.0 \text{ ft/day (assumed)} \times 0.024}{0.25} \text{ approx. .1 ft/day}$$

approx. 35.0 ft/year

RW-6 to wetland (approx. elev. 999')

$$v = \frac{KI}{n} = \frac{1.0 \text{ ft/day} \times 0.013}{0.25} \text{ approx. 0.05 ft/day}$$

0.05 ft/day approx. 19.0 ft/yr

DNR1 to MW106D

Data 4/8/87

$$\frac{8.27}{-7.38} \quad I = \frac{.89}{1350} = 0.00066 \text{ approx. .0007}$$

$$0.89$$

$$v = \frac{KI}{n} = \frac{15 \text{ ft/day} \times 0.0007}{.25} = 0.043 \text{ ft/day}$$

$$= 15.3 \text{ ft/year}$$

CENTRAL SITE AREA
Groundwater Velocity

DNR-3 to MW-102D

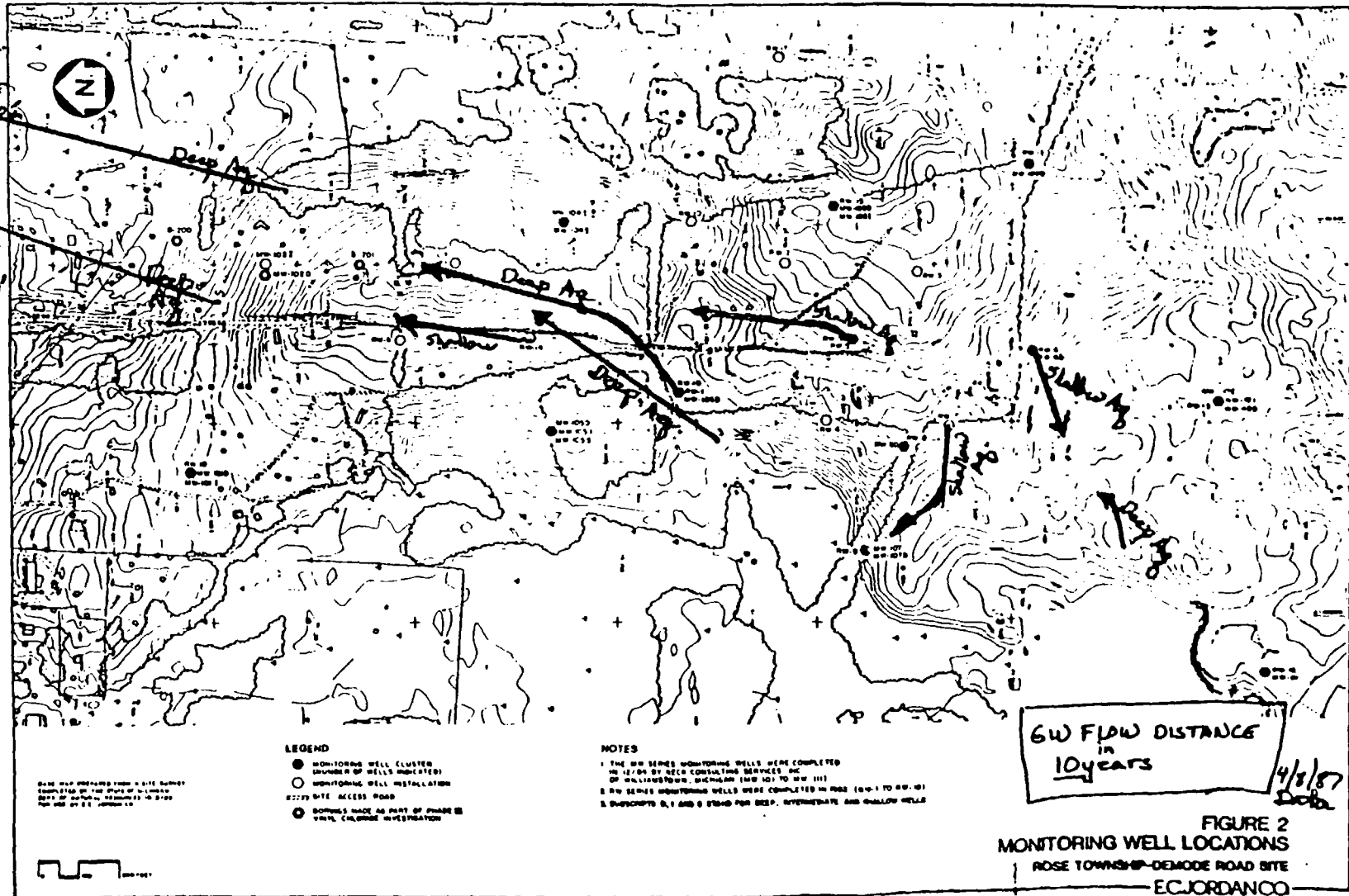
elev. 1007.42 DNR-3
 -1005.97 MW-102D
 1.45

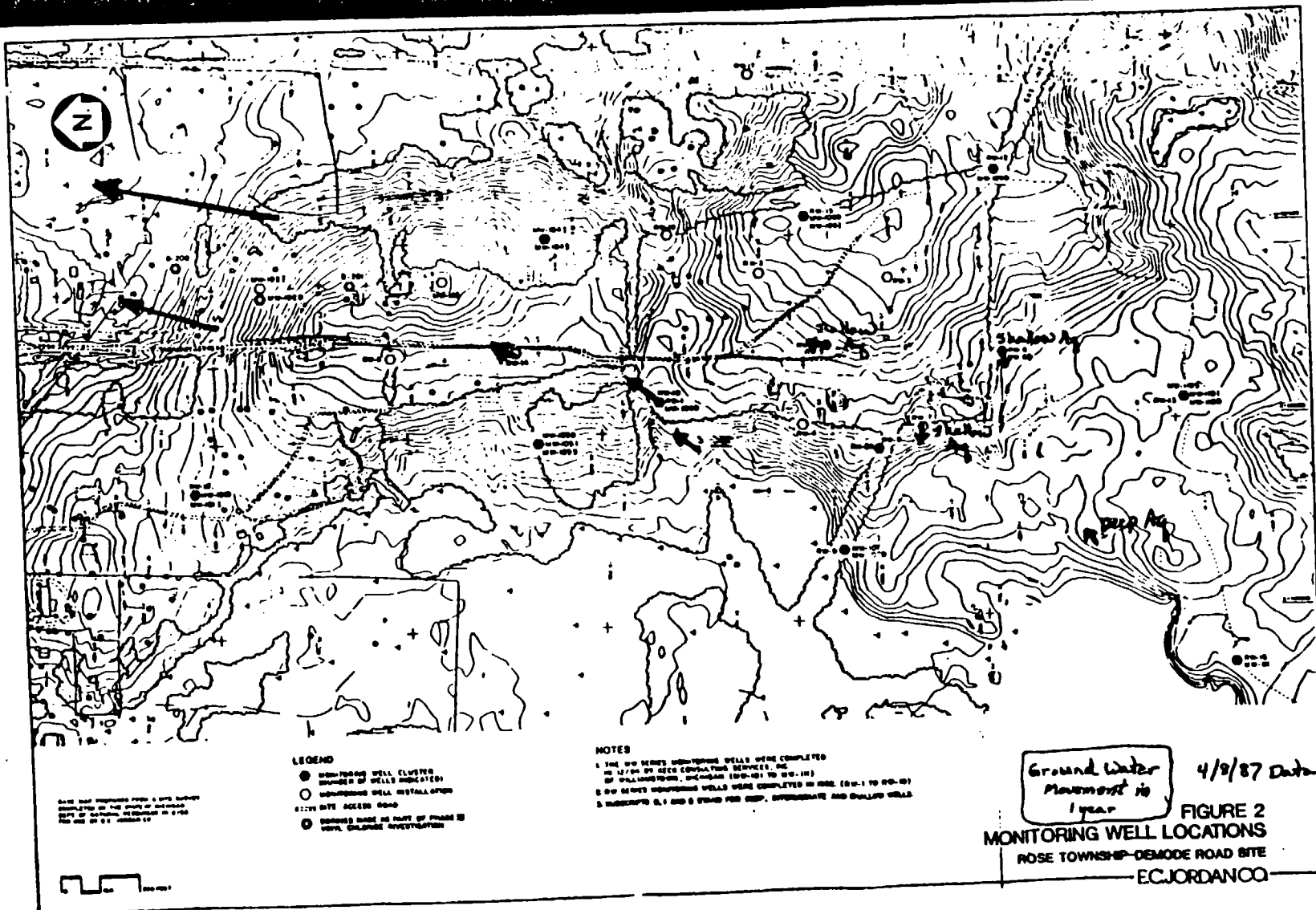
$$I = \frac{1.45}{1300} = .001$$

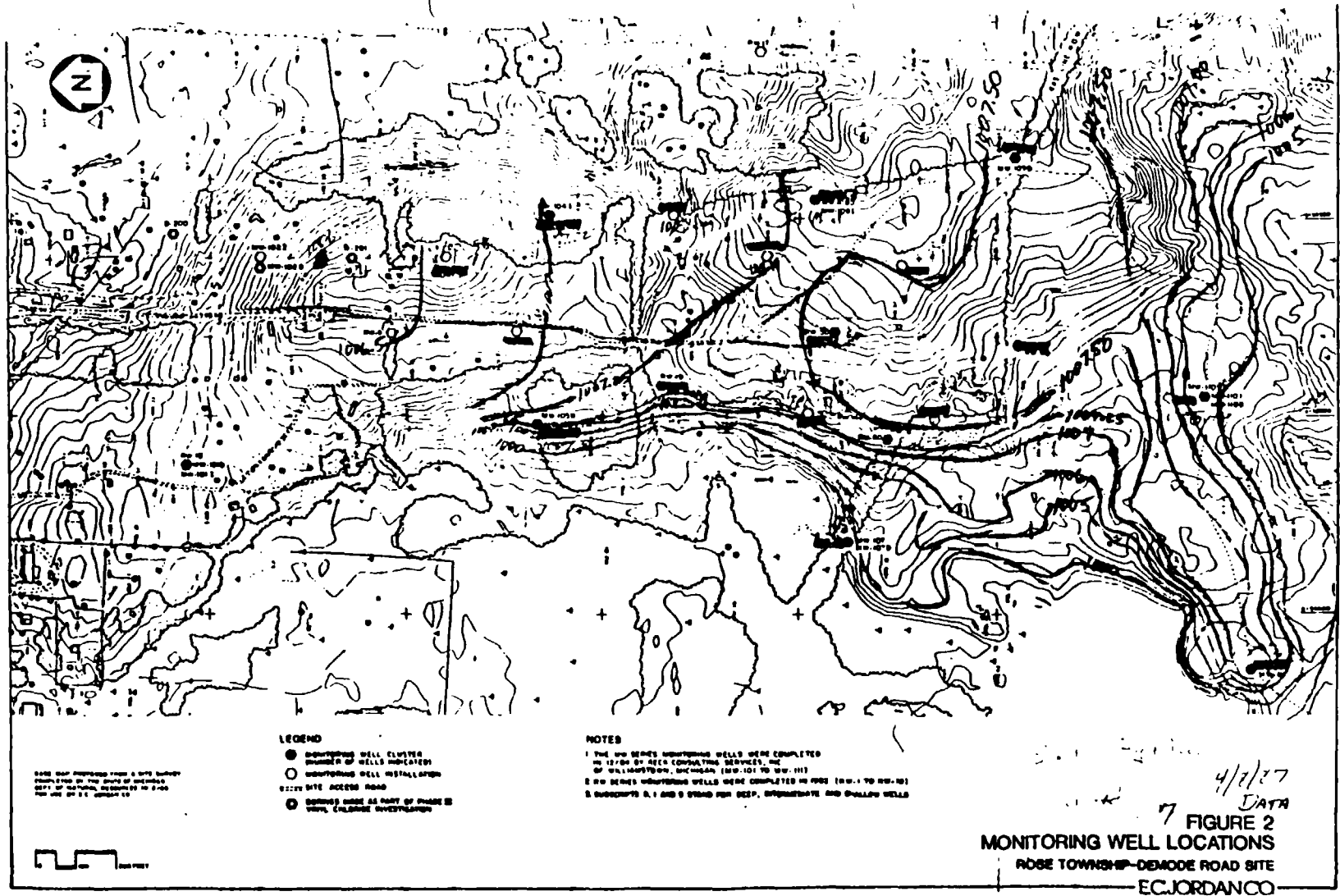
$$v = \frac{KI}{n} = \frac{30 \text{ ft/day} \times .001}{.25} \text{ approx. } 0.14 \text{ ft/day}$$

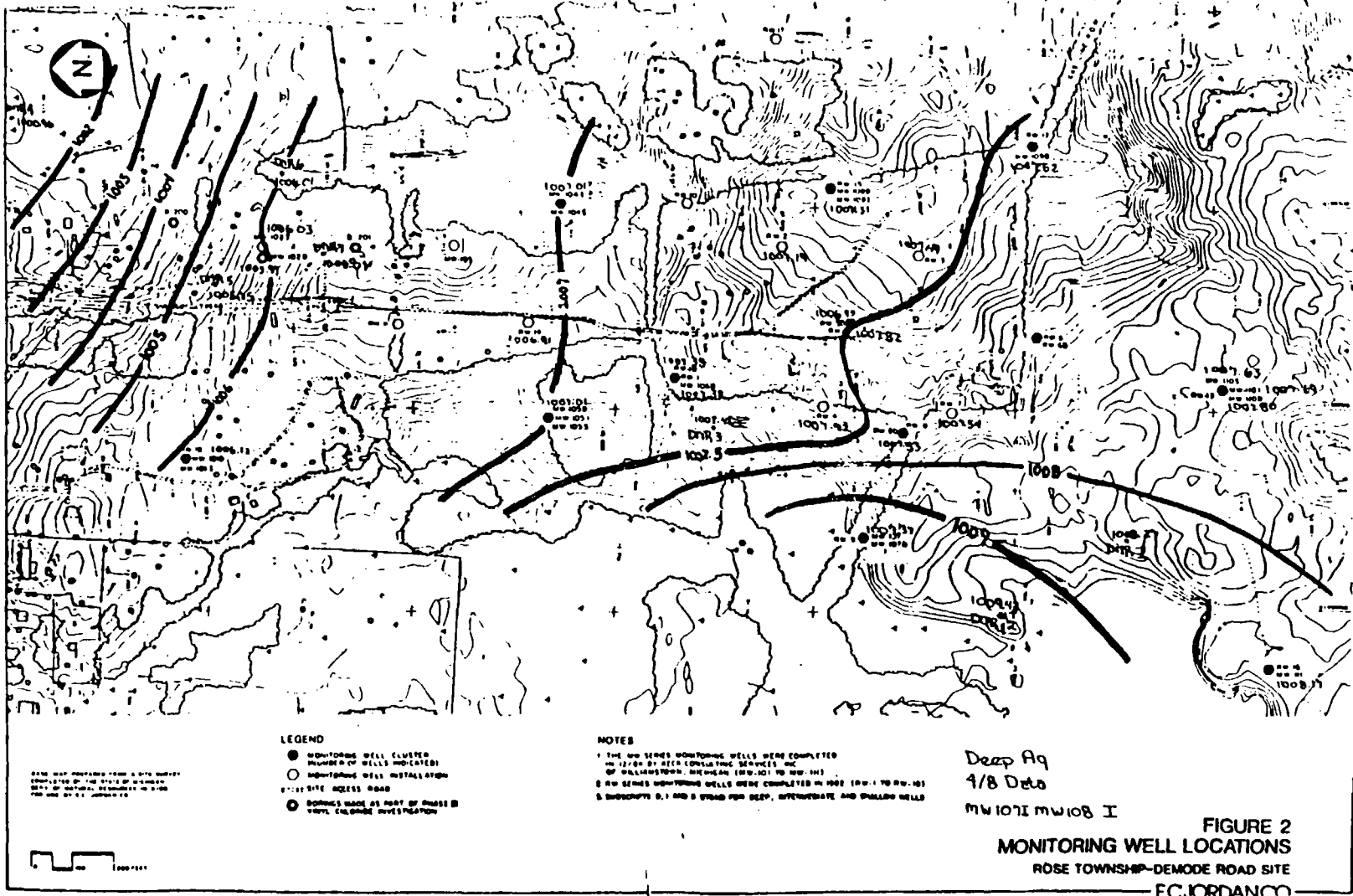
$$\text{approx. } 50 \text{ ft/year}$$

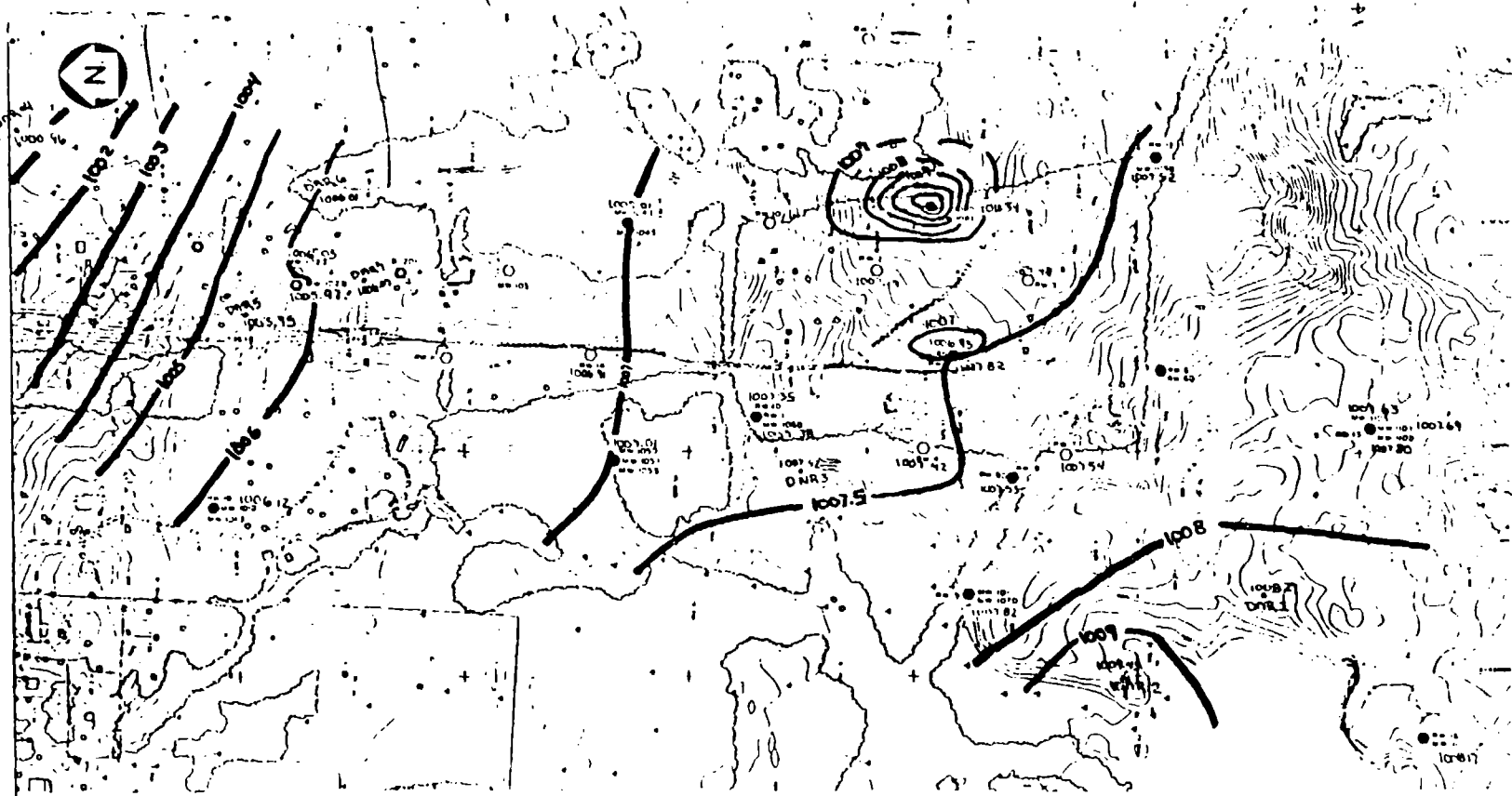
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LEGEND

- MONITORING WELL (NUMBER OF WELLS IN CIRCLE)
- MONITORING WELL INSTALLATION
- SITE ACCESS ROAD
- BORINGS MADE AS PART OF PHASE II WATER CHARACTER INVESTIGATION

NOTES

1. THE 24 SHALLOW MONITORING WELLS WERE COMPLETED IN 12 BY DEE CONSULTING SERVICES, INC. OF WILLIAMSTON, MICHIGAN (AW 101 TO AW 112).

2. 24 SHALLOW MONITORING WELLS WERE COMPLETED IN 1997 (AW 113 TO AW 136).

3. SUBDRYPTS 1, 2 AND 3 STAND FOR DEEP, INTERMEDIATE AND SHALLOW WELLS.

Deep Aq
 4/8 Data
 MW107D : MW108D

FIGURE 2
MONITORING WELL LOCATIONS
 ROSE TOWNSHIP-DEMODE ROAD SITE
 EC JORDANCO

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