MICHIGAN DIOXIN STUDIES

SCREENING SURVEY OF SURFACE WATER SUPPLIES, POTABLE GROUND WATER, AND DOW CHEMICAL BRINE OPERATIONS

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I. INTRODUCTION

The U.S. Environmental Protection Agency (USEPA) is conducting a series of comprehensive multi-media studies of dioxins and other toxic pollutants at the Dow Chemical - Midland Plant, in the Tittabawassee River, and in and near the city of Midland, Michigan. The purposes of these studies are to determine current ambient levels of toxic pollutants and whether those levels warrant remedial action to minimize or eliminate public exposure and environmental risks. Soil sampling was conducted in Midland, at Dow Chemical, and at comparison and background sites during 1983 and 1984. Results from the soil study, released in April 1985, indicate that current levels of dioxins and other toxic chemicals in surface soils away from the Dow Chemical plant do not pose an unacceptable health risk. 1/

During 1984, samples were also collected from Dow Chemical's waste incinerator; ambient air; Dow Chemical's brine system and industrial wastewater discharges; potable well water; public water supplies; and river sediments. Some of these studies in the Midland area have been incorporated into USEPA's Dioxin Strategy which is examining potential sources and risks of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2378-TCDD) in the environment. The national strategy focuses on seven tiers of sources, ordered by decreasing potential for 2378-TCDD contamination. While the primary focus of the Midland area studies is on 2378-TCDD, USEPA also monitored other polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), as well as other toxic organic and toxic metal pollutants.

USEPA collected samples of potable ground water, surface water supplies, and Dow Chemical's brine operation during the period August 1984 to September 1985.

This report presents the results of that sampling program, comparisons of the drinking water data with national primary and secondary drinking water criteria, and USEPA's Health Advisories, recommended maximum contaminant levels (RMCLs), and maximum contaminant levels (MCLs), where available. Also presented are toxic pollutant data for the Dow Chemical brine operation.

The Safe Drinking Water Act of 1974 was passed to establish water quality standards for public water supplies. The standards are designed to protect the public from health hazards associated with contaminated drinking water. As required by this legislation, National Interim Primary Drinking Water Regulations were promulgated by USEPA in 1975. The regulations set limits on contaminants in drinking water known to be important to public health. Additional regulations establishing limits and associated monitoring requirements for trihalomethanes (THMs) were promulgated in November 1979. THMs are introduced into drinking water by the reaction of naturally occurring organic substances with chlorine in the course of water treatment. National Secondary Drinking Water Regulations have also been established, setting recommended

limits for aesthetic qualities of water, such as taste, odor, color, and appearance. These secondary limits are not federally enforceable. Public water systems having 15 or more service connections or serving at least 25 year-round residents are subject to the primary regulations.

In the absence of formal drinking water standards for identified drinking water contaminants, USEPA has developed health advisories following the state-of-the-art concepts for noncarcinogenic risk for short and longer term exposure. EPA health advisories are not legally enforceable standards; they are not issued as an official regulation and they may or may not lead to the issuance of national standards. Recommended maximum contaminant levels (RMCLs) are nonenforceable health goals which are set at levels which would result in no known or anticipated adverse health effects with an adequate margin of safety. Proposing RMCLs is the initial stage in rulemaking for the establishment of primary drinking water regulations. Following the promulgation of RMCLs, maximum contaminant levels (MCLs) will be proposed. MCLs are enforceable standards and are to be set as close to the RMCLs as is feasible and are based upon health consideration, treatment technologies, cost and other factors.

The environmental data obtained for public and private drinking water supplies as part of this study were presented with available drinking water standards and health criteria for comparison purposes. As noted above, the primary standards do not apply to small public drinking water systems or private systems.

II. OBJECTIVES

The objectives of this screening survey are set out below:

A. Potable Waters

Determine whether current levels of toxic organic pollutants, metals, and inorganic constituents found in surface water supplies from Saginaw Bay and selected public and private ground water supplies exceed any applicable National Interim Primary or Secondary Drinking Water Standards, USEPA's Health Advisories, recommended maximum contaminant levels (RMCLs), or maximum contaminant levels (MCLs). Determine whether toxic pollutants identified in Dow Chemical brine operations are present in nearby potable ground waters.

B. Dow Chemical Brine System

Determine current levels of toxic organic pollutants, metals, and inorganic constituents in Dow Chemical raw brine, spent brine, and brine pond sediments.

III. FINDINGS AND CONCLUSIONS

A. Saginaw Bay Public Water Supplies

The Saginaw/Midland, Bay City, and Pinconning raw water supply intakes from Saginaw Bay did not contain detectable levels of any toxic organic pollutants monitored in this survey. The quality of raw water from each intake was within National Interim Primary Drinking Water Standards. In addition, city of Midland finished water quality was within the National Interim Primary Drinking Water Standards for trihalomethanes.

B. Public and Private Ground Water Supplies

One public ground water supply, fourteen private ground water supplies generally located near Dow Chemical brine operations and landfills, and one artesian well reportedly used as a source of drinking water were sampled as part of this screening survey. Although the National Interim Primary and Secondary Drinking Water Standards do not apply to private water supplies, data from this survey were compared with those standards and USEPA's Health Advisories. Data for toxic organic pollutants and metals show that each of the sampled public and private water supplies was within the National Interim Primary Drinking Water Standards and USEPA's Health Advisories. One public and three private water supplies exceeded the National Secondary Drinking Water Standards for chlorides. Other exceedances of the secondary standards include iron (13 sites), sulfate (1 site), and manganese (1 site).

Qualified findings of trace levels of two commonly used laboratory solvents (acetone and methylene chloride); tetrachloroethylene (tetrachloroethene); toluene; phthalate compounds; phenol; and 1,2- and 1,3- dichlorobenzene were noted for a few samples. Based upon analysis of quality control samples and the use of solvents in the laboratory, the presence of the solvents is ascribed to laboratory operations. Phthalate compounds are used extensively in the manufacture of plastics and are commonly found at low levels in environmental samples. The qualified findings of toluene, phenol, 1,2-dichlorobenzene, and 1,3-dichlorobenzene were at or near the analytical method detection levels. Trace levels of these compounds are well below USEPA's Health Advisories, recommended maximum contaminant levels (RMCLs), or other available health criteria. Tetrachloroethylene was detected at or near the analytical detection limit in samples from four wells. Split sample data suggest the presence of this compound may result from laboratory operations. USEPA is in the process of proposing and adopting an RMCL for tetrachloroethylene. The levels of tetrachloroethylene detected in this survey are below the proposed RMCL of 10 ppb. A final RMCL will be established after review and comment on recent toxicological data for tetrachloroethylene.

More recent supplemental data obtained by the Michigan Department of Public Health confirm that sampled private water supplies had no detectable levels of the organic pollutants studied.

C. Dow Chemical Brine Operations

Several volatile and semi-volatile toxic organic pollutants including benzene, ethylbenzene, toluene, xylenes, and phenol were found in Dow Chemical raw brine samples in the range of 10 to 600 ppb. These findings are consistent with data for oil field brines from elsewhere in Michigan and oil and gas brines from elsewhere in the United States. A few solvents (acetone, bromoform, and tetrachloroethylene) were found in the range of 3 to 21 ppb in Dow Chemical filtered brines reinjected to the Sylvania formation. Also, 1,2-dichlorobenzene was detected at 14 ppb in the filtered brine sample. Based upon analysis of quality control samples and split-sample analyses with the Michigan Department of Natural Resources and Dow Chemical, the presence of the solvents and 1,2-dichlorobenzene is ascribed to laboratory operations.

Dow Chemical brine pond sediments were found to contain polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) as summarized below:

Dow Chemical Brine Pond Sediments
(ppb)

	CDDs	CDFs
2378-	ND	0.03-0.11
Tetra	ND-0.016	0.04-0.21
Penta	ND-0.15	ND
Hexa	ND-0.07	ND-3.5
Hepta	0.19-0.21	ND-2.8
Octa	1.5-3.8	0.5-5.8

2378-TCDD was not found in these sediments. Likely sources of the PCDDs and PCDFs are fallout from atmospheric emissions from the Dow Chemical hazardous waste incinerator and other past or current Dow Chemical emission sources. However, sufficient data for PCDDs and PCDFs are not available to pinpoint possible sources. Since there is no direct public exposure to these sediments, the presence of PCDDs and PCDFs at these low levels does not present a public health concern.

Dow Chemical filters the spent brine prior to reinjection to the Sylvania formation. The presence of PCDDs and PCDFs other than 2378-TCDD in brine pond sediments and the suspected route of contamination indicate the potential for low-level contamination of the unfiltered spent brines and possibly the filtered spent brines. Unfortunately, analytical data for PCDDs and PCDFs other than 2378-TCDD in brine samples obtained during this survey are not valid (see below). Hence, the levels of PCDDs and PCDFs, if any, in filtered brines cannot be determined at this writing. 2378-TCDD was not detected in any Dow Chemical brine samples at low parts per quadrillion (ppq) detection levels.

D. Analysis for PCDDs and PCDFs

The study design called for analyses of PCDD and PCDF homologues in selected potable water and Dow Chemical brine samples. Due to a series of problems at one of three contract laboratories used for dioxin analyses for this study, the analyses of potable water and brine samples at this laboratory for PCDD and PCDF homologues did not yield valid results. However, 2378-TCDD data from this laboratory are valid. 2378-TCDD was not detected in any of the potable water or Dow Chemical brine samples at detection levels ranging from 2 to 54 parts per quadrillion (ppq). The laboratory problems involved in-lab contamination by PCDDs and PCDFs and were surfaced as a result of the quality control procedures established for the study (see Appendix D).

Data for the Saginaw Bay water supply intakes show no detectable levels of 2378-TCDD at a detection level of 10 ppq. These samples were analyzed by USEPA's National Water Quality Laboratory (NWQL) at Duluth, Minnesota. Also, data for two private wells show no detectable levels of any PCDDs or PCDFs at detection levels ranging from 20-40 ppq for 2378-TCDD and 7-110 ppq for other PCDDs and PCDFs. These data were produced by a contract laboratory that met all quality control objectives for analyses of PCDDs and PCDFs.

Supplemental monitoring was conducted in June 1985 at five wells for 2378-TCDD and PCDD and PCDF homologues at low ppq detection levels. These samples were also analyzed by the USEPA NWQL. PCDDs and PCDFs were not detected in these samples. Apparent 2378-TCDD findings in two of the samples were not confirmed by split sample analyses by a third contract laboratory or by Dow Chemical. A comprehensive three-way split sample study completed for additional samples collected in September 1985 showed that 2378-TCDD is not present in the public and private drinking waters sampled.

Based upon these results, Region V concludes that the public and private water supplies studied are not contaminated by 2378-TCDD or other PCDDs and PCDFs. Also, it is highly unlikely that other water supplies in the area are contaminated by PCDDs or PCDFs.

E. Comparison of Potable Ground Water Supplies and Dow Chemical Brine Operations

A summary of qualified and unqualified data for toxic organic pollutants detected in Dow Chemical's brine operation and 15 potable ground water supplies is presented below:

(Concentrations in ppb.)

Compound	Dow Chemical Brine Operations Range	Potable Ground Water Supplies Range	Number of Wells with Positive Analytical Result
Methylene chloride	2 - 88 ppb**	ND - 17 ppb**	9
Tetrachloroethylene	ND - 170 ppb	ND - 4 ppb*	3
Toluene	ND - 280 ppb	ND - 1 ppb*	2
Acetone	ND - 21 ppb*	ND - 17 ppb*	4
Phenol	ND - 35 ppb	ND - 3 ppb*	1
1,2-Dichlorobenzene	ND - 14 ppb*	ND - 14 ppb*	1

*Analytical results qualified by analyst.
**Analytical results qualified by analyst for five of six Dow Chemical brine samples and four of nine potable water samples.

As noted above, the presence of methylene chloride, tetrachloroethylene, and acetone in Dow Chemical brine samples and potable water samples is attributed to laboratory operations. The findings of toluene, phenol, and 1,2-dichlorobenzene in potable water samples were at or near the analytical detection levels and were qualified by the analysts. Also, supplemental monitoring by the Michigan Department of Public Health indicate the private water supplies are free of organic pollutants studied. Accordingly, the above data are not sufficient to conclude that Dow Chemical brine operations or nearby landfill operations have impacted the particular wells sampled as part of this study.

IV. RECOMMENDATIONS FOR SUPPLEMENTAL MONITORING

A. Public and Private Water Supplies

Based upon the results of this study, special monitoring programs for Saginaw Bay public surface water supplies beyond routine monitoring required by the Michigan Department of Public Health do not appear warranted.

The Michigan Department of Natural Resources or the Michigan Department of Public Health should establish a monitoring program at a limited number of selected public and private ground water supplies located near Dow Chemical landfills to assure the quality of those supplies. Sampling and analyses for a broad range of organic compounds is suggested on a periodic basis.

A short-term sampling program is recommended at those wells not recently sampled by the Michigan Department of Public Health where tetrachloroethylene,

phenol, 1,2,-dichlorobenzene, and 1,3-dichlorobenzene were detected. The purpose of this program is to confirm the water quality of those wells. At this writing, the Michigan Department of Public Health has initiated the recommended short-term sampling program.

B. Dow Chemical Brine Operations

Dow Chemical is required to conduct environmental studies pursuant to a Michigan Department of Natural Resources consent order at sites where brine operations have or may have impacted ground water. Consistent with that order, the toxic organic pollutants identified as constituents of the brine should be considered as part of those studies, where appropriate.

Additional analyses of the Dow Chemical brine operations for PCDDs and PCDFs should be considered as part of the remedial dioxin investigation to be conducted at the Midland plant.

V. SITE DESCRIPTION

A. Dow Chemical - Midland Plant

The Dow Chemical Midland plant is a large chemical manufacturing complex encompassing about 1500 acres along both banks of the Tittabawassee River at Midland, Michigan. Throughout its history, Dow Chemical has manufactured over 1000 different inorganic and organic chemicals. The types of chemicals produced at the Midland plant include: cyclical intermediates, industrial organic and inorganic chemicals, plastic materials, synthetic resins, nonvulcanized elastomers, medical chemicals, surface active agents, finishing agents, sulfonated oils, and botanical products including insecticides, herbicides, and formulated pesticides.

The manufacture of chlorinated phenols for use in herbicide, pesticide, and other products has been a significant operation at the Dow complex. According to Dow Chemical, commercial production of chlorinated phenols began in the 1930s and continued into the 1970s. Dow reports that only two chlorinated phenolic products are still manufactured:

- 2,4-dichlorophenol
- 2,4-dichlorophenoxyacetic acid (2,4-D).

Production of all other chlorinated phenolic products was terminated in the late 1970s. 2/ A list of those chlorinated phenolic compounds produced at the Dow site is presented in Table 1.

The Dow Chemical Midland plant falls within Tiers 1, 2, 3, 4, and 6 of the USEPA Dioxin Strategy 3/ in that 2,4,5-trichlorophenol (2,4,5-TCP) was produced (Tier 1); 2,4,5-TCP was used to make pesticide products (Tier 2); and 2,4,5-TCP

Table 1

A Compilation of the Commercially Significant Chlorophenolic Compounds Manufactured on the Midland Plant Site of the Dow Chemical Company

Chlorophenols

2-chlorophenol
4-chlorophenol
*2,4-dichlorophenol
2,4,5-trichlorophenol
Sodium 2,4,5-trichlorophenate
Zinc 2,4,5-trichlorophenate
2,4,6-trichlorophenol
Sodium tetrachlorophenate
2,3,4,6-tetrachlorophenol
Pentachlorophenol
Sodium pentachlorophenate

Chlorophenoxy Derivatives[1]

*2,4-dichlorophenoxyacetic acid (2,4-D)
2-(2,4-dichlorophenoxy) propanoic acid
2-methyl-4-chlorophenoxyacetic acid
2,4,5-trichlorophenoxyacetic acid (2,4,5-T)
2-(2,4,5-trichlorophenoxy) propanoic acid

Other Chlorophenol Derivatives

2-(2,4,5-trichlorophenoxy) ethanol
2-(2,4,5-trichlorophenoxy) ethyl 2,2-dichloropropanoate
O,O-dimethyl-O-(2,3,5-trichlorophenyl) phosphorothioate
2-cyclopentyl-4-chlorophenol
4-t-butyl-2-chlorophenol
4-t-butyl-2-chlorophenyl methyl N-methyl-phosphoramidate
Chlorinated phenyl phenols
Chlorinated diphenyl oxide derivatives

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*2,4-dichlorophenol and 2,4-D are the only compounds from this list that are currently being manufactured on the Midland plant site.

[1]These chlorophenoxy acid derivatives have also been converted into various water soluble salts.

Source: Point Sources and Environmental Levels of 2378-TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin) on the Midland Plant Site of the Dow Chemical Company and in the City of Midland, Michigan, Dow Chemical Company, Midland, Michigan, November 1984.

and derivatives were formulated into pesticidal products (Tier 3). The plant is a combustion source (Tier 4), and Dow Chemical operates processes for other organic chemicals or pesticides that could possibly result in dioxin formation (Tier 6).

1. Dow Chemical Brine Operation

The Dow Chemical Company was founded in Midland in 1897 as a producer of brine chemicals. Presently, Dow Chemical is pumping naturally occurring brine from the Sylvania aquifer, a tight sandstone formation about 5000 feet deep. The raw calcium chloride brine is conveyed through a network of underground piping and ancillary equipment to the Dow Chemical complex in Midland. After removal of salts and minerals, the spent brine is sent to Brine Pond #6 on-site for holding prior to filtration and pressure injection to the same formation through return wells.

The existing brine operating system, as permitted by Michigan DNR, consists of the following:

- 70 brine production wells
- 35 brine injection wells
- 7 solution mining wells
- about 150 miles of pipelines, 25-30 years old.

The brine system occupies portions of three counties:

- Midland County (Midland, Ingersoll, Homer, Lee, Larkin, Greendale, Porter, and Mt. Haley Townships)
- Bay County (Williams Township)
- Saginaw County (Richland, Freemont, Bryant, Thomas, St. Charles, and Swan Creek Townships)

The areal extent of the Dow Chemical brine operation is illustrated by Figure 1.

The physical make-up of the calcium chloride brine mined by Dow is as follows:

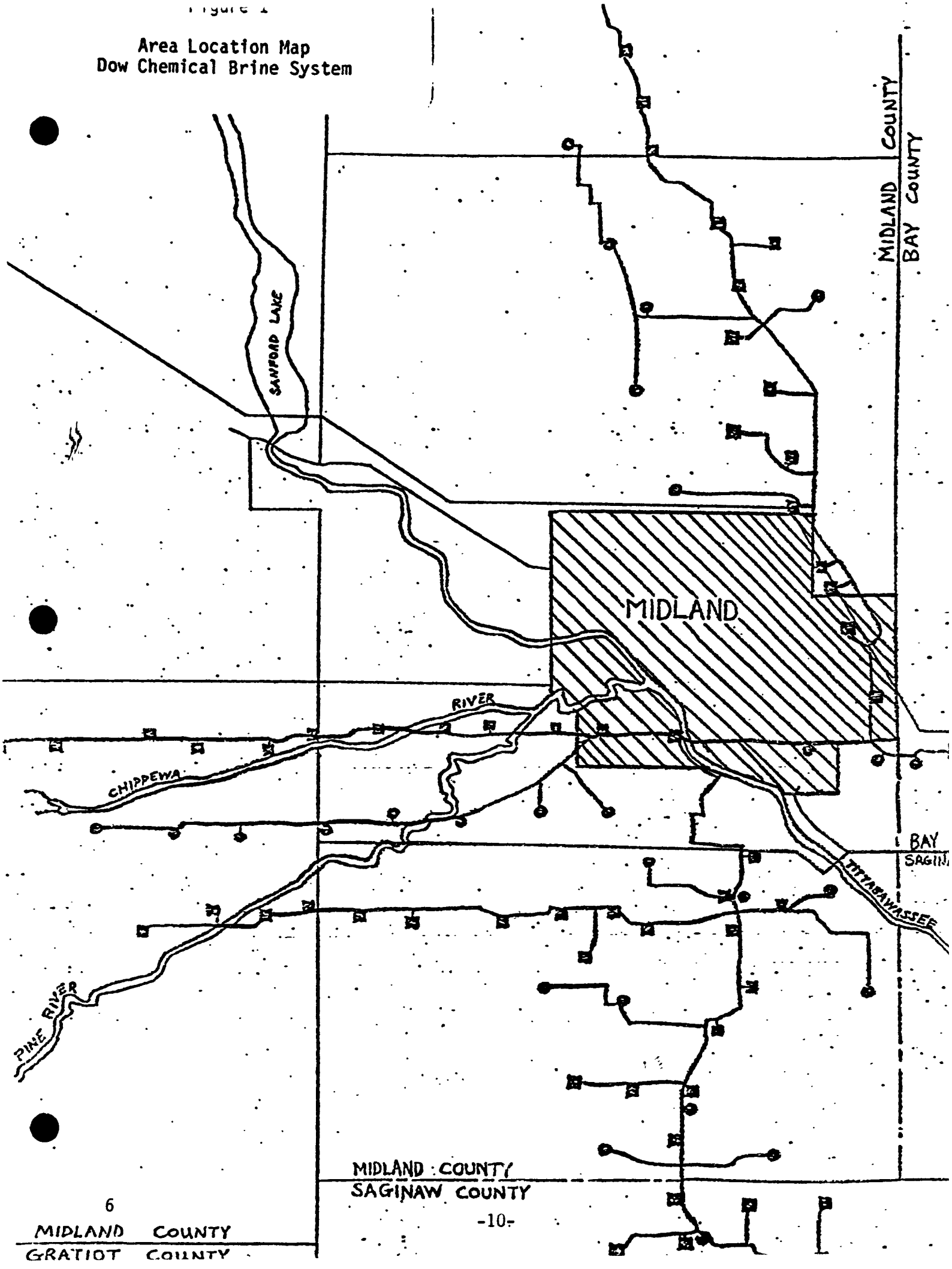
- 70% water
- approximately 20% calcium chloride
- approximately 5% sodium chloride
- approximately 5% inorganic salts

Brine processing in the Dow Chemical complex removes iodine, bromine, and calcium.

Dow Chemical has also operated chemical disposal wells, injecting process chemical wastes into the Sylvania and Dundee formations. 4/ Michigan DNR well

Figure 1

Area Location Map
Dow Chemical Brine System



and reservoir data on underground industrial waste disposal systems for Dow Chemical have been reviewed. According to these data, phenolic compounds were reported to have been injected into the Sylvania formation. Other chemical process wastes, including copper, butyl alcohol, chlorinated benzene compounds, phenolic compounds, tordan, pyridenes, and 2,4,5-T were also injected into the Dundee formation. Table 2 summarizes chemical disposal well location, receiving formation, interval of receiving aquifer, and injected fluid characteristics obtained from the MDNR data. There is local concern about the potential for chemical contamination of upperlying aquifers used for drinking water due to occasional leaks and spills from the brine system. According to Dow Chemical, use of the chemical disposal wells was discontinued in December 1982. 5/

With respect to the issue of brine spills and releases, the Michigan Department of Natural Resources issued a Notice of Violation to Dow Chemical on April 11, 1984, alleging failure to properly operate and maintain the brine system and failure to report brine spills in a timely manner. Dow Chemical subsequently decided to cease operation of the brine system in Midland. The Michigan Department of Natural Resources and Dow entered into a Consent Order on May 3, 1985, concerning the brine operation. 6/ In the Consent Order, MDNR alleged that certain losses of brine from the system have reached the soil and ground water and may have affected waters of the state. Dow agreed to expedite the upgrading of its brine system as stipulated in the Order. Additionally, Dow has agreed to conduct environmental studies and develop remedial plans for clean-up, if warranted, of contamination of soil, ground water, and surface water. The Consent Order calls for the shutdown of the entire brine system by December 31, 1986, with a phased reduction in the number of operating and production wells by September 30, 1985.

One site of brine contamination in Midland County has received considerable evaluation by the MDNR and remedial action has been initiated by Dow Chemical. In Section 10 Ingersoll Township, Dow operates a brine recovery well to remove a pocket of brine contamination identified in an investigation conducted by a Dow consultant. Brine removed from this site is returned to Dow's on-site brine pond. Initial chloride levels were in the range of 4000 ppm. Potable water wells in that area were sampled as part of this study.

2. Dow Chemical Landfills

Dow Chemical presently operates one active landfill receiving hazardous wastes, the Salzburg Road Landfill. Dow Chemical also used two landfills sites, Poseyville Road and Rockwell Drive Landfills, which are now closed. Dow activity at these sites includes leachate collection, site dewatering, and ground water monitoring. Figure 2 presents the location of these landfills.

B. Saginaw Bay Raw Water Intakes

In response to a congressional request 7/, USEPA included sampling of municipal water supply intakes in Saginaw Bay as part of the National Dioxin Study. There are three intakes in Saginaw Bay used as raw water supplies for four Michigan communities:

Table 2

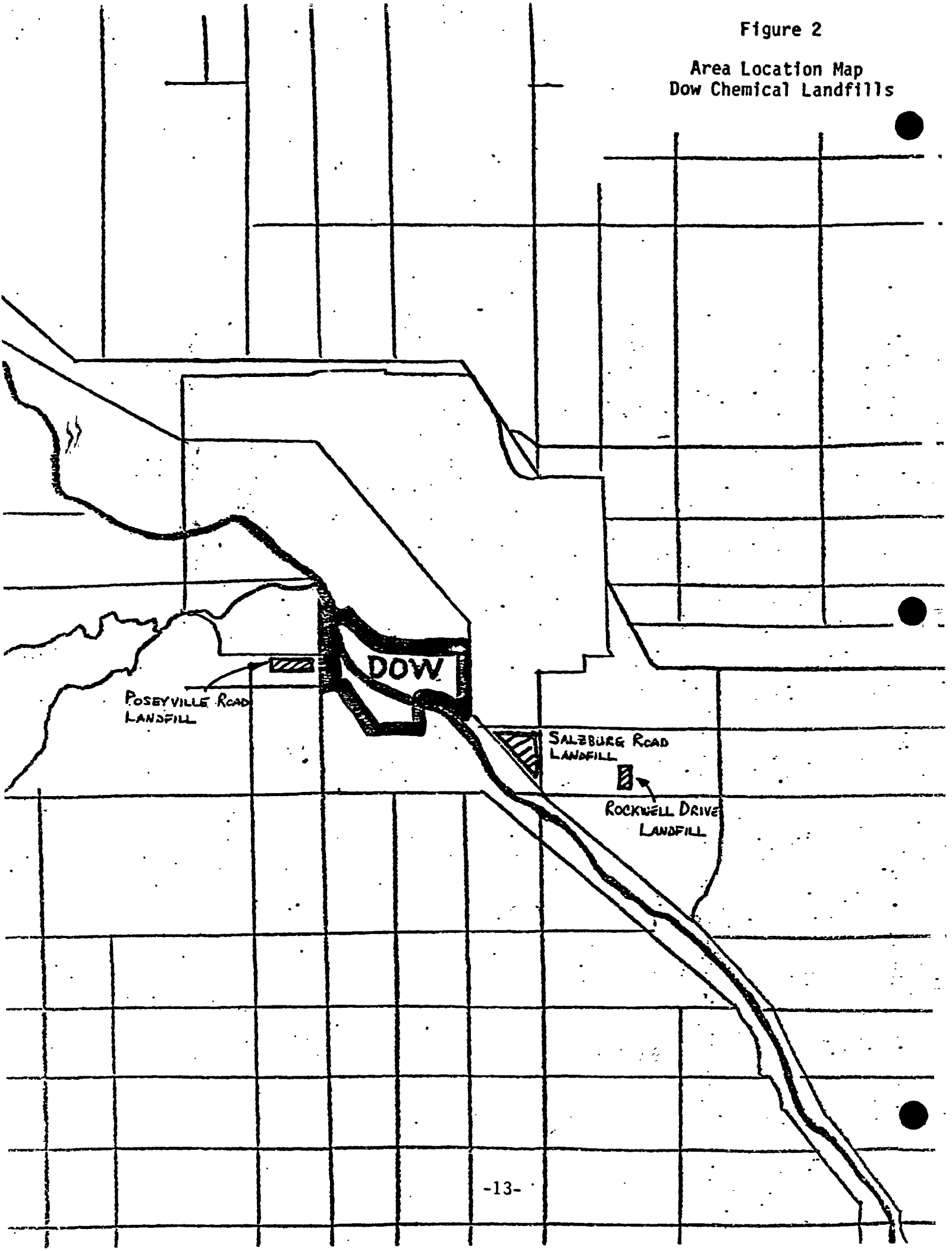
Dow Chemical
Disposal Well Data

Chemical Disposal Well No.	Location (Midland County)	Receiving Formation	Interval of Receiving Aquifer	Injected Fluid Characteristics
W.D. #1	NE 1/4, NE 1/4, SE 1/4; Sec. 27, T14N; R2E	Dundee	3606'-3985'	Activated sludge.
W.D. #2	SE 1/4, SW 1/4, SE 1/4; Sec. 22, T14N; R2E	Dundee	3645'-3984'	Copper, butyl alcohol, chlorinated benzene compounds, phenolic compounds, tordan, pyridenes, 2,4,5-T.
W.D. #3	SW 1/4, NW 1/4, SW 1/4; Sec. 21, T14N; R2E	Dundee	3645'-3900'	Copper, butyl alcohol, chlorinated benzene compounds, phenolic compounds, tordan, pyridenes, 2,4,5-T.
#4CD	SW 1/4, SW 1/4, SW 1/4; Sec. 22, T14N; R2E	Sylvania	4986'-5117'	Phenolic compounds.
W.D. #5	NW 1/4, NW 1/4, NW 1/4; Sec. 28, T14N; R2E	Dundee	3645'-3888'	Copper, butyl alcohol, chlorinated benzene compounds, phenolic compounds, tordan, pyridenes, 2,4,5-T.
W.D. #8	SE 1/4, SW 1/4, NE 1/4; Sec. 27, T14N; R2E	Sylvania	4925'-5150'	Phenolic compounds.
W.D. #9	SE 1/4, SE 1/4, NE 1/4; Sec. 26, T14N; R2E	Sylvania	4917'-5182'	Phenolic compounds.

Source: Michigan Department of Natural Resources Geological Survey Division
Well and Reservoir Data on Underground Industrial Waste Disposal Systems.

Figure 2

Area Location Map
Dow Chemical Landfills



- Saginaw/Midland
- Bay City
- Pinconning

The Saginaw/Midland intake extends about 2 miles into Saginaw Bay east-northeast of Whitestone Point. The Bay City intake extends about 3 1/2 miles into the bay from shore in a northerly direction. The Pinconning intake extends about 1 mile into the bay in a east-northeast direction. Figure 3 is a location map for these intakes.

VI. STUDY DESIGN

A. Public Water Supply Intakes

With respect to raw water municipal water supplies, the following locations were selected for sampling:

1. Saginaw/Midland Intake. Tap located in the pump building at Whitestone Point.

2. Pinconning Intake. Tap located at the pump building.

3. Bay City Intake. Continuously flowing sample line in the laboratory running from the low service pump station.

A sample of finished Midland city tap water was collected for dioxin and other toxic pollutant analyses. A sample from the Saginaw River identified as a standby city of Saginaw water intake was also taken.

B. Potable Wells

The study plans called for sampling a number of public and private ground water wells located near Dow Chemical brine operations and landfills to determine if those operations had adversely impacted drinking water supplies. Sites were selected based upon their proximity to the brine operations and landfills and in response to requests from the public for monitoring. Initially eleven sites were selected and sampled during August and October 1984. Nine sites were resampled during December 1984 because of analytical problems encountered at a contract laboratory with dioxins analyses. Four additional potable wells were also sampled at that time. Five of these sites were again sampled in June and September 1985 for dioxin analyses. One additional site was sampled for dioxin in September. Figure 4 presents the location of the potable wells sampled.

C. Dow Chemical Brine Operation

Sampling sites for the Dow Chemical brine operation were selected to characterize the quality of raw brine, filtered brine prior to reinjection, and brine pond sediments. Dow Chemical operates and maintains three main raw brine

Figure 3

Area Location Map
Saginaw Bay Public Water Supply Intakes

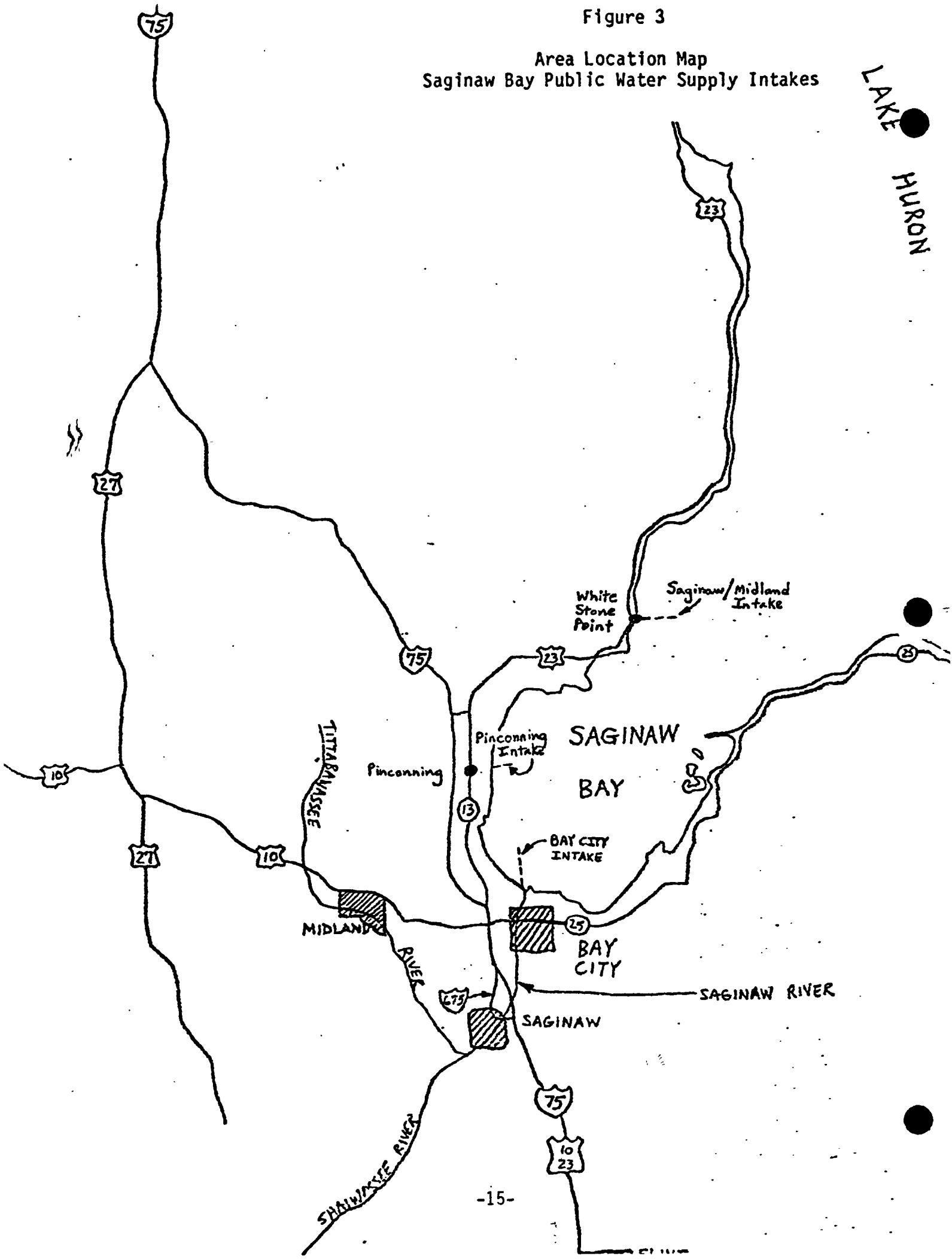
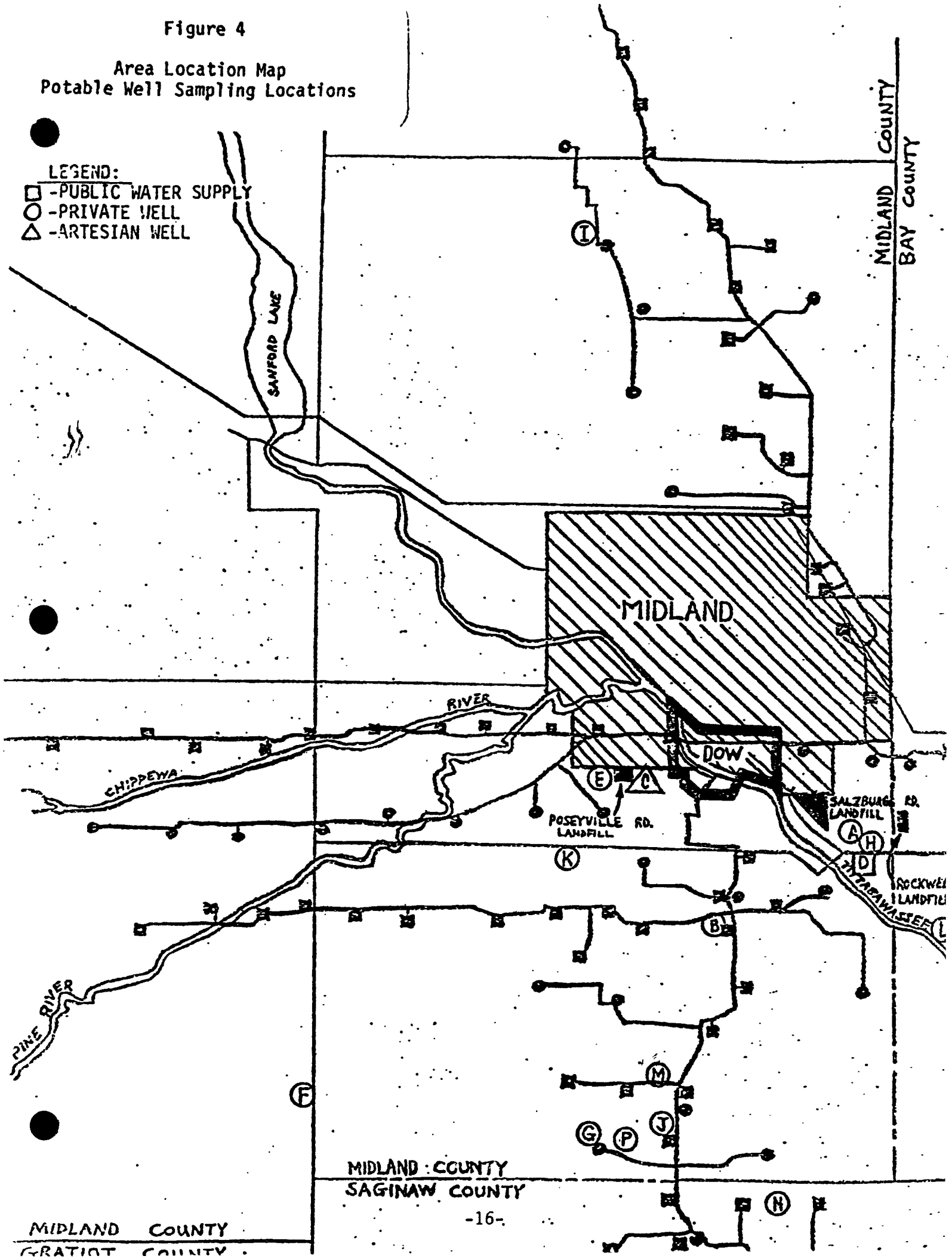


Figure 4

Area Location Map
Potable Well Sampling Locations



branches in its system which combine at a common point for processing within the Dow complex. EPA sampled the north, south-southwest, and combined raw brine main lines. The west raw brine line was not sampled due to physical limitations in the field. The spent brine was sampled after processing in the Dow facility, detention in the Dow Brine Pond #6, filtration, and prior to reinjection. A production well, #29, was selected for sampling as it was adjacent to an area where Dow Chemical had operated chemical disposal wells. Brine pond sediments were sampled at three locations: near the inlet and outlet of Brine Pond #6 and at one intermediate location.

Additionally, EPA sampled TH-18, a recovery well located in Ingersoll Township, Section 10, to characterize the brine being removed from a brine spill in this area.

VII. CONDUCT OF THE STUDY

A. Field Sampling and Field Quality Assurance

For these studies, samples were collected in the Midland, Michigan, and Saginaw Bay areas at the following times:

Location/Sampling Event	Date
Dow Chemical Brine Operation	August 13-14, 1984 October 22, 1984 December 3, 1984
Potable Water	August 14-15, 1984 October 23, 1984 December 3-5 & 17, 1984 June 12, 1985 August 2, 1985 September 3, 1985
Saginaw Bay Intakes	August 15, 1984 December 3-5, 1984

Samples were collected and handled according to the protocols outlined in the USEPA draft study plans with minor field revisions. The types of samples consisted of grab and manual composite samples at the water sites and grab samples at the sediment locations.

Field work was documented to identify sampling conditions and track the individual samples. Sample documentation included: unique sample identification numbers and tags, field notebooks, field log book sheets, USEPA Sample Management Office traffic reports and packing lists, and photographs.

Field quality assurance consisted of the collection of duplicate field samples and the analyses of field blank samples.

B. Laboratory Analyses

The samples collected during these studies were air-shipped to various EPA and contract laboratories. Selection of the laboratories was coordinated by USEPA Region V Central Regional Laboratory. The analytical laboratories used for these studies are listed in Table 3.

C. Quality Assurance

Dioxin data were reviewed by USEPA Region V Central Regional Laboratory for accuracy, precision, and other quality assurance criteria. A discussion of the dioxin analyses performed by Midwest Research Institute can be found in Appendix D. Dioxin analyses were also performed by Battelle Memorial Institute on two well samples and the brine pond sediments and by the Brehm Laboratory at Wright State University for drinking water samples. These data are considered acceptable for use. Method blanks, field blanks, and lab duplicates were acceptable for these samples. The matrix spike data for the water samples showed considerable variability in recoveries.

Overall, the non-dioxin data were determined to be acceptable for use with some qualifications noted. The brine pond samples for organic pollutants were analyzed 2-4 days beyond the required holding times. It is not expected that the analytical results would be appreciably affected by this relatively short delay. Mercury data for two well samples and the brine pond sediments were not acceptable due to analyses five months after sample collection. The laboratory duplicate precision was poor in the brine pond sediments for aluminum (50% RPD) and copper (54% RPD). The laboratory spike recoveries were biased high for cadmium (136%), manganese (130%), nickel (128%), and vanadium (188%). For the water intake samples and a few well samples, spike recovery data for sodium and calcium were out of control and could not be calculated. Also, spike recoveries for lead, selenium, and thallium were not calculated because both spiked sample results and sample results were below the detection limit.

Based upon a duplicate analysis of chloride (22% RPD), the chloride data for two well samples may lack precision. Sulfate data for one well sample and residue data for several wells are not reported due to the apparent analysis of sample preserved with acid rather than analyses of an unpreserved sample.

Field blank samples were prepared with distilled, filtered, deionized water. Analytical results of the field blanks are presented in Table 4. Several organic compounds were detected and tentatively identified in the field blanks as well as the environmental samples. Compounds such as methylene chloride, 2-butanone, di-n-butyl phthalate, acetone, and bis(2-ethylhexyl) phthalate were detected in the laboratory method blanks and are attributed to probable laboratory contamination. Other organic compounds were tentatively identified in the field blank samples. Refer to Section VIII.D.4 for a discussion of tentatively identified compounds.

Table 3

Analytical Laboratories Utilized
in USEPA Screening Studies

Laboratory	Location	Parameter			
		Metals	Inorganics	Organics	Dioxins/Furans
ChemTech	New York, NY	X	X		
IT/WCTS	Cerritos, CA			X	
U.S. Testing	Hoboken, NJ		X		
Battelle Memorial Institute	Columbus, OH				X
California Analytical Laboratories	Sacramento, CA			X	
Rocky Mountain Analytical	Arvada, CO	X			
Science Applications, Inc.	La Jolla, CA			X	
Midwest Research Institute	Kansas City, MO				X
USEPA-NWQL	Duluth, MN				X
Brehm Laboratory, Wright State University	Dayton, OH				X

Table 4

Analytical Results
Field Blanks

Blank Type:	Water Blank	Sediment Blank	Water Blank	Water Blank
Sample Number:	84ER05R40	85ER01R30	85ER01R31	85ER03R41
Parameter:	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)
Methylene chloride	11	ND/ 5	14B	8
2-butanone	19B*	ND/10	14B	ND/10
Di-n-butyl phthalate	4B*	1500	ND/10	2JB
Acetone	ND/10	11B	ND/10	ND/10
Bis(2-ethylhexyl) phthalate	ND/ 2	330JB	ND/10	ND/10
Tentatively Identified Compounds:				
7-oxabicyclo [4.1.0] heptane	50 SC	ND	ND	ND
2-pentanone, 4-hydroxy-4-methyl	ND	4900A	291.0A	ND
Hexanedioicacid, bis(2-ethylhex)	ND	18100A, 600A	ND	ND
Cyclohexanone	ND	ND	11.7A	ND
Ethane, 1,1,2,2-tetrachloro-	ND	ND	12.1D	ND
Phosphine, bis (pentafluoropheny)	ND	ND	11.9C	ND
Unknown hydrocarbon	ND	ND	ND	45J, 96J

NOTES:

* = Detected below quantitation limit (quantitation limit is 10 x detection limit).
J = Greater than zero but below detection limit.
SC = Suspected lab contaminant.
A = High probability for correct identification.
C = Low probability for correct identification.
D = Solvent impurity.
B = Analyte is also found in lab blank; possible/probable blank contamination.

VIII. DISCUSSION OF RESULTS

A. Saginaw Bay Intakes

1. Presentation of Data

Complete analytical results for samples taken of Saginaw Bay intakes, the Saginaw River standby intake, and Midland city tap water are presented in Appendix A. Pertinent data are summarized below.

a. 2378-TCDD

2378-TCDD was not detected in any of these samples. Detection levels ranged from 2-10 ppq. These samples were not analyzed for other PCDDs and PCDFs.

b. Toxic Organic Compounds

Table 5 below summarizes those toxic organic compounds identified by the laboratories.

Table 5
Saginaw Bay Water Supply Intakes
Toxic Organic Compound Summary

Toxic Organic Compounds	Saginaw River Standby ug/l (ppb)	Saginaw/ Midland Intake ug/l (ppb)	Pinconning Intake ug/l (ppb)	Bay City Intake ug/l (ppb)	Midland City Tap Water ug/l (ppb)
Chloroform	ND/ 1	ND/ 5	ND/ 5	ND/ 5	26
Methylene chloride	12*	ND/ 5	ND/ 5	ND/ 5	ND/ 5
Bromodichloromethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	9
Benzoic acid	3	ND/50	ND/50	ND/50	ND/50
Di-n-butyl phthalate	ND/ 2	3*	1*	1*	ND/10

*Detected in blank sample.

c. Metals

Those metals positively identified are summarized in Table 6 below:

Table 6
Saginaw Bay Water Supply Intakes
Metals Analyses Summary

Metal	Saginaw/Midland Intake ug/l (ppb)	Pinconning Intake ug/l (ppb)	Bay City Intake ug/l (ppb)
Aluminum	52	182	223
Barium	17	27	19
Copper	ND/ 5	ND/ 5	35
Iron	84	352	464
Manganese	ND/ 4	18	19
Zinc	ND/ 3	7.2	5.2
Calcium (mg/l)	27.3	48.1	33.2
Magnesium (mg/l)	7.56	13.4	8.68
Sodium (mg/l)	4.11	15.6	8.29

2. Discussion of Results

The detection of 2378-TCDD is Saginaw Bay water intakes was not expected given the documented discharge levels of dioxins from Dow Chemical, the affinity of dioxin to particulate matter, and the amount of dilution from the point of Dow Chemical's discharge to the respective water intakes. The study results are consistent with this expection. Accordingly, USEPA does not believe that supplemental dioxin sampling at these intakes is warranted.

The data show that the raw water supply intakes are essentially free of organic compounds. The presence of methylene chloride in the Saginaw River standby intake can be attributed to glassware cleaning or laboratory operations. Methylene chloride and di-n-butyl phthalate were also detected in the field blank sample. The qualified finding of benzoic acid was slightly above the analytical detection limit. Benzoic acid is not a priority pollutant but is often reported in the broad organic scan.

Analytical results of Saginaw Bay raw water intakes and drinking water regulations are presented for comparison in Appendix E. While drinking water regulations are applicable to water quality at the consumer's tap, primary standards were not exceeded for the raw water supplies. The Midland city tap water sample results conformed with primary and secondary regulations.

Chloroform (26 ppb) and bromodichloromethane (9 ppb) were detected in the Midland city tap water sample. These compounds are members of a family of organic compounds called trihalomethanes. Other trihalomethane compounds include dibromochloromethane and bromoform. Trihalomethanes are introduced into drinking water by the reaction of naturally occurring organic substances

with chlorine in the course of water treatment. National Interim Primary Drinking Water Regulations promulgated in 1979 established a maximum contaminant level (MCL) of 0.10 mg/l (100 ppb) for the sum total of the trihalomethane compounds. The detection of chloroform and bromodichloromethane is consistent with levels typically found in finished chlorinated water and are less than the MCL.

B. Potable Well Water Samples

Complete analytical results for samples taken of potable water are presented in Appendix B.

1. Presentation of Data

a. 2378-TCDD

2378-TCDD was not detected in any of the potable water samples obtained on December 3-5, 1984, at low parts per quadrillion (ppq) levels (Table 7). These samples were analyzed by Midwest Research Institute. Five supplemental samples were obtained on June 12, 1985, and analyzed by USEPA's National Water Quality Laboratory (NWQL) located in Duluth, Minnesota. NWQL found apparent positive findings of 2378-TCDD for two samples. However, these findings were not confirmed by subsequent split sample analyses by the Brehm Laboratory at Wright State University and Dow Chemical or by analyses of additional samples obtained on August 2, 1985, at those two locations (Table 8). The August 2, 1985, samples were analyzed by NWQL and Dow Chemical.

To insure that 2378-TCDD was not present in ground water from these wells, USEPA initiated a follow-up survey which involved analyses of six potable water samples and blank and control samples. The NWQL, the Brehm Laboratory, and Dow Chemical analyzed split samples for that study. The results presented in Table 9 show that 2378-TCDD was not detected in any of the potable water samples by any of the participating laboratories.

b. Other PCDDs and PCDFs

Data for other dioxins and furans for potable well water samples developed by Midwest Research Institute are not valid due to in-lab contamination problems with TCDDs, OCDD, and OCDF (see Appendix D). Screening analyses for PCDDs and PCDFs by NWQL for samples collected on June 12, 1985, showed no detectable PCDDs or PCDFs.

c. Toxic Organic Pollutants

Priority pollutant analyses were completed for the potable water samples. Summaries of the organic compounds detected are presented in Tables 10 and 11. All compounds not listed were not detected in the samples. Refer to Appendix B for detection limits. Excluding those found in blank samples, a listing of organic compounds identified in the potable well sampling is presented below:

Table 7

Midland Area Ground Water Samples
2378-TCDD -- December 3-5, 1984

(parts per quadrillion)

Well Location	2378-TCDD	(DL)
A	ND	(4)
B	ND	(7)
C	ND	(4)
D	ND	(50)
E	ND	(4)
F	ND	(5)
G	ND	(12)
H	ND	(4)
I	ND	(2)
L	ND	(6)
M	ND	(12)
N	ND	(4)
P	ND	(7)

Notes: (1) Samples analyzed by Midwest Research Institute (MRI).
(2) ND - Not detected.
(3) Detection level - ( ).

Table 8

Midland Area Ground Water Samples
2378-TCDD -- June 12, 1985

(Results in parts per quadrillion (ppq).)

Sample Number	Location	NWQL 2378-TCDD	NWQL (DL)	Brehm Laboratory 2378-TCDD	Brehm Laboratory (DL)	Dow Chemical 2378-TCDD	Dow Chemical (DL)
Samples Collected on June 12, 1985							
DE017601	Mapleton	20	(10)	--	--	ND	(6)
602	Mapleton (Dup)	ND	(10)	ND	(8)	--	--
603	Artesian	ND*	(10)	--	--	ND	(8)
604	Private	ND	(10)	--	--	ND	(7)
605	Private	ND	(10)	ND	(9)	--	--
606	Private	30-40	(10)	ND	(10)	--	--
607	Field Blank	ND	(10)	ND	(9)	--	--
--	NWQL Lab Blank	ND	(10)	--	--	--	--
--	Brehm Laboratory Reagent Blank	--	--	ND	(6)	--	--
--	Dow Chemical Reagent Blank	--	--	--	--	ND	(5)

*ND (10) at resolution 9000; 40 (10) at resolution 5000.
All other samples analyzed at resolution 5000.

Samples Collected on August 2, 1985							
85EG09S02	Mapleton	ND	(7)	--	--	ND	(1)
S01	Artesian	ND	(10)	--	--	ND	(1)
D01	Artesian (Dup)	ND	(6)	--	--	--	--
	Field Blank	ND	(3)	--	--	--	--
	NWQL Lab Blank	ND	(3)	--	--	--	--

Notes: 1. DL - Detection level.
2. ND - Not detected at stated detection level.
3. Screening analyses for PCDDs and PCDFs by NWQL for samples collected on June 12, 1985, showed no detectable PCDDs or PCDFs.

Table 9

Midland Area Ground Water Samples
2378-TCDD -- September 3, 1985

EPA Sample Number	USEPA - NWQL		Brehm Laboratory Wright State University		Dow Chemical		
	2378-TCDD ppq (pg/kg)	Method Efficiency at 125 pg/kg	2378-TCDD ppq (pg/kg)	Method Efficiency at 125 pg/kg	2378-TCDD (ppq)	^{13}C 2378-TCDD % Recovery[a]	pg 2378-TCDD Observed[b]
Field Samples:							
DE 017901	ND (1.0)	68%	ND (1.4)/ND (1.2)	52%/59%	ND (1)	56%	---
DE 017902	ND (0.2)	65%	ND (1.5)/ND (1.8)	59%/50%	ND (0.9)	87%	---
DE 017903**	ND (0.3)	68%	ND (1.6)/ND (2.0)	64%/45%*	ND (1)	82%	---
DE 017904	ND (1.0)	66%	ND (1.3)/ND (1.1)	73%/51%	ND (0.8)	63%	---
DE 017908	ND (1.3)	17%*	ND (1.6)/ND (1.7)	68%/61%	ND (1)	83%	---
DE 017909	ND (3.6)	39%*	ND/(1.9)	55%	ND (0.8)	85%	---
QA Samples:							
Field Blank (DE 017905)	ND (0.3)	78%	ND (1.2)/ND (2.0)	56%/48%*	ND (0.8)	81%	---
Field Sample Spiked (DE 017906)	ND (11)	27%*	11.6/9.9	55%/59%	10 (0.8)	83%	35 pg
Field Blank Spiked (DE 017907)	9 (1.5)	73%	13.9/10.5	61%/51%	12 (0.8)	67%	40 pg

Notes:

- Blank water - 39%*, ND(0.2)
- Spiked water[1] - 65%,29(1.7)
- Sample DE 017906 - positive signals observed for M/E 320 and 322; did not meet ion-ratio-criteria.

*Method efficiency below acceptable level for national dioxin study.

[1]Spike level 26 pg/kg (ppq).

Notes:

*Method efficiency below acceptable level for national dioxin study.

Notes:

Reagent Blank #	Analyses Set #	2378-TCDD (pg)	^{13}C 2378-TCDD % Recovery[a]
#1	Set #1	ND (3)	68%
#2	Set #2	ND (3)	71%
#3	Set #3	ND (3)	79%

[a] Fortification level = 5.0 ng ^{13}C 2378-TCDD per sample.

[b] Two samples were spiked with 40 pg native 2378-TCDD.

**Field sample spiked DE 017906 corresponds to field sample DE 017903.

Table 10

Toxic Organic Summary
Potable Water

Toxic Organic Compound	A ug/l (ppb)	B ug/l (ppb)	C ug/l (ppb)	D ug/l (ppb)	E ug/l (ppb)	F ug/l (ppb)	G ug/l (ppb)	G ug/l (ppb)	G ug/l (ppb)	H ug/l (ppb)
Methylene chloride	17*	10*	10*	13*	4A*	13*	6A*	ND/ 5	NA	6A*
Tetrachloroethylene	ND/ 1	1A	ND/ 1	1A	ND/ 1	4A	ND/ 1	ND/ 5	NA	ND/ 1
Toluene	ND/ 1	ND/ 1	1A	ND/ 1	ND/ 1	1A	ND/ 1	ND/ 5	NA	ND/ 1
Acetone	ND/10	13A	17A	17A	13A	ND/10	ND/10	ND/10	NA	ND/10
1,2-Dichlorobenzene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	14A
Bis(2-ethylhexyl) phthalate	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	7A	ND/10	ND/1.0	6A
Di-n-butyl phthalate	ND/ 2	ND/ 2	ND/ 4	3A*	2A*	2A*	6A*	1J*	ND/0.5	6A*

NOTES: A = Detected below quantitation limit.
Quantitation limit is 10 x detection limit.
J = Estimated value.
NA = Not analyzed.
ND = Not detected. Value given is detection limit.
* = Detected in blank sample.

Table 11

Toxic Organic Summary
Potable Water

Toxic Organic Compound	I ug/l (ppb)	J ug/l (ppb)	K ug/l (ppb)	L ug/l (ppb)	M ug/l (ppb)	N ug/l (ppb)	P ug/l (ppb)
Methylene chloride	9A*	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5
Phenol	3A	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10
1,3-Dichlorobenzene	ND/ 2	10J**	ND/10	ND/10	ND/10	ND/10	ND/10
Di-n-butyl phthalate	3A*	ND/10	ND/10	ND/10	2J*	6J*	ND/10

NOTES: A = Detected below quantitation limit.
Quantitation limit is 10 x detection limit.
J = Estimated value, detected below minimum specified contract detection limit but greater than zero.
ND = Not detected. Value given is detection limit.
* = Detected in blank sample.
** = 1,3-Dichlorobenzene (ND/10) in field duplicate sample.

Organic Compound	Number of Occurrences	Concentration(s) [Detection Limit (ppb)]
Tetrachloroethylene	3	1, 1, 4 [1]
Toluene	2	1, 1 [1]
Acetone	4	13, 13, 17, 17 [10]
Bis(2-ethylhexyl) phthalate	2	6, 7 [4]
Phenol	1	3 [2]
1,2-Dichlorobenzene	1	14 [4]

The organic compounds detected in individual wells, excluding those found in blank samples, are listed below:

Well	Organic Compound(s) [Concentration (ppb)]	Well	Organic Compound(s) [Concentration (ppb)]
A	All ND	G	Bis(2-ethylhexyl) phthalate [7]
B	Tetrachloroethylene [1]	H	1,2-Dichlorobenzene [14]
	Acetone [13]		Bis(2-ethylhexyl) phthalate [6]
C	Toluene [1]	I	Phenol [3]
	Acetone [17]	J	1,3-Dichlorobenzene [<10]
D	Tetrachloroethylene [1]	K	All ND
	Acetone [17]	L	All ND
E	Acetone [13]	M	All ND
F	Tetrachloroethylene [4]	N	All ND
	Toluene [1]	P	All ND

Six of the 15 wells had no detectable toxic organic pollutants. Chlorinated organic compounds were detected in five wells at concentrations ranging from 1-14 ppb. Phenol was detected in Well I at 3 ppb.

Organic analyses on the potable well samples at location A-I, J-K, and L-P were conducted at three different laboratories. The findings of acetone and other solvents were limited to the first set (A-I) of well analyses.

d. Inorganics

Chloride analyses showed a wide range of concentrations of the 15 potable well samples. Chloride values ranged from 4.4-1100 mg/l. Bromide and iodide were analyzed in nine potable well samples. Bromide was detected in one sample, Well D (3.0 mg/l). All others were not detected at a 2 mg/l detection limit. Iodide was detected in Wells B and C at 2.1 and 4.5 mg/l, respectively. All other iodide results were reported not detected at a 2 mg/l detection limit.

e. Metals

A summary of metals analyzed in the potable well samples is presented in Table 12.

Table 12
Potable Well Samples
Metals Analyses Summary

	Number of Analyses	Number of Positive Identifications	Number Not Detected	Range (low-high) (ppb)	Average (ppb)
Aluminum	16	2	14	ND/35-162	20.2
Antimony	16	2	14	ND/20-82	10.2
Arsenic	16	2	14	ND/ 3-17	1.3
Barium	16	10	6	ND/12-300	92
Beryllium	16	6	10	ND/0.6-10	0.97
Cadmium	16	0	16	ND/1-ND/5	ND
Chromium	16	1	15	ND/3.4-14	0.88
Cobalt	16	0	16	ND/4.7-ND/50	ND
Iron	16	16	0	62-5230	1066
Manganese	16	13	3	ND/4-61	20.3
Nickel	16	0	16	ND/4-ND/40	ND
Selenium	16	0	16	ND/2-ND/5	ND
Silver	16	2	14	ND/5-10	1.1
Thallium	16	0	16	ND/5-ND/10	ND
Vanadium	16	2	14	ND/5-11	1.4
Zinc	16	15	1	ND/3-970	297
Copper	16	2	14	ND/5-53	4.8
Lead	16	7	9	ND/2-17.5	3.8
Tin	16	3	13	ND/14-52	6.9
Calcium (ppm)	6	6	0	18.1-86.5	53
Magnesium "	6	6	0	7.42-25.6	18
Sodium "	6	6	0	16.1-899	174
Potassium "	6	6	0	1.85-8.69	3.4

Note: Results in parts per billion (ppb) unless otherwise stated as parts per million (ppm).

2. Discussion of Results

A total of 17 water samples were collected from 15 residential and public potable well sites and analyzed for a variety of inorganic and toxic organic parameters. In general, as a group the potable well samples were characterized by elevated iron content and variable chloride content. Iron values ranged from 62-5230 ppb with an average of 1066 ppb. Chlorides ranged from 4.4-1100 ppm. These data are comparable to results from the USEPA study of the Hemlock area 8/, which are presented in Appendix F. There are no health related standards for iron or chloride in public drinking water supplies. National Secondary Drinking Water regulations have been established for setting recommended limits for aesthetic qualities of water provided by public water systems. A comparison of analytical results of the potable wells samples in

this screening survey to National Interim Primary Drinking Water regulations and secondary non-health related standards is presented in Appendix E and summarized in Table 13. For secondary standards, there were four exceedances for chloride, 13 exceedances for iron, one exceedance for sulfate, and one exceedance for manganese. All analytical results were within the primary standards with the exception of one analysis for fluoride of 2.7 ppm. USEPA is in the process of revising the fluoride MCL. An RMCL of 4 ppm has been adopted with a revised MCL to be established. The present MCL is based upon cosmetic and not health-related effects.

The toxic organic priority pollutant scan detected a few compounds at trace levels that are not regulated. These compounds include tetrachloroethylene, toluene, acetone, bis(2-ethylhexyl) phthalate, phenol, 1,2-dichlorobenzene, and 1,3-dichlorobenzene. These data were evaluated with respect to available criteria including EPA health advisories, maximum contaminant levels (MCL), and recommended maximum contaminant levels (RMCL). Refer to Table 14 for a comparison of USEPA screening survey results to available health advisory criteria. Based upon this evaluation, there is no evidence of significant toxic organic contamination of the potable wells sampled as part of this screening survey.

Follow-up sampling by the Michigan Department of Public Health was conducted in September 1985 at selected wells sampled previously by USEPA (C, D, E, G, H) to confirm the presence or absence of trace organics. The analytical results showed these well samples free from organic contamination. Specifically, for those trace organics detected previously by USEPA, toluene was ND at Well C, tetrachloroethylene was ND at Well D, and 1,2,-dichlorobenzene was ND at Well H all at the 1 ppb detection level.

C. Dow Chemical Brine Operation

1. Presentation of Data

Complete analytical results of sample taken of the Dow Chemical brine operation are presented in Appendix C. Selected data are reviewed in the following sections.

a. 2378-TCDD

2378-TCDD was not detected in any of the liquid brine or brine pond sediment samples taken. Detection limits on the liquid samples ranged from 2-54 ppq. 2378-TCDD was not detected in the three brine pond sediments at a detection limit of 6.9-15.7 ppt.

b. Other PCDDs and PCDFs

Other dioxin and furan data for the liquid brine samples are not valid due to the background levels of TCDDs and OCDD found in nearly every laboratory method blank sample (see Appendix D). Method blank contamination was also noted for H_pCDDs, H_xCDDs, and OCDFs.

Table 13

Comparison of Potable Well Results
to Available Drinking Water Regulations

	MCL (ppb)	Potable Well Results Range (ppb)	Number of Exceedances
National Interim Primary Drinking Water Regulations*			
Arsenic	50	ND-17	--
Barium	1000	ND-300	--
Cadmium	10	ND	--
Chromium	50	ND-14	--
Lead	50	ND-17.5	--
Mercury	2	ND-0.1	--
Selenium	10	ND	--
Silver	50	ND-1.1	--
Fluoride	1.4-2.4 ppm	0.24-2.7 ppm	1
Endrin	0.2	ND	--
Toxaphene	5	ND	--
Trihalomethanes	100	ND	--
National Secondary Drinking Water Regulations**			
Chloride	250 ppm	4.4-1100 ppm	4
Copper	1000	ND-53	--
Iron	300	62-5230	13
Manganese	50	ND-61	1
Zinc	5000	ND-970	--
Sulfate	250 ppm	6-268 ppm	1

Notes:

(1) National interim primary and secondary water regulations are applicable to public water systems and not to individual private or small semi-private water supplies. The data are presented above with the standards for comparison purposes.

(2) National secondary drinking water regulations are applicable to contaminants in drinking water that primarily affect the aesthetic qualities relating to public acceptance of drinking water.

(3) ND = Not detected.

(4) USEPA is in the process of revising the fluoride MCL. A final RMCL of 4 ppm has been adopted with a revised MCL to be established. The present MCL is based on cosmetic and not health-related effects.

* 40 CFR 141.1-141.6, as amended
** 40 CFR 143.1-143.4

Table 14

Comparison of U.S. EPA Screening Survey Results
to Available Health Advisory Criteria
(all values ppb)

Contaminant	Study Results		Available Health Advisory Criteria						
			USEPA Health Advisories[a]				NAS* Chronic Health Advisory	Proposed RMCL	Taste and Odor Threshold[b]
	Number of Occurrences	Range	1-Day	10-Day	Longer Term	Lifetime			
Tetrachloroethylene[c]	3	ND-4	--	34,000	1940	680	--	10[d]	--
Toluene[c]	2	ND-1	18,000	6000	--	10,800	--	2000[e]	--
Acetone[c]	4	ND-17	--	--	--	--	--	--	41000
Bis(2-ethylhexyl) phthalate	2	ND-7	--	--	--	--	4200	--	--
Phenol	1	ND-3	--	--	--	--	--	--	1000[b]
1,2-Dichlorobenzene	1	ND-14	--	--	8930	3125	--	620[e]	--
1,3-Dichlorobenzene	1	ND-<10	--	--	8930	3125	--	--	--

Notes: (a) Health Advisories are draft criteria and are subject to change.
(b) Estimated level for controlling undesirable taste and odor quality of ambient water.
(c) May be attributed to laboratory operations.
(d) Draft
(e) FR vol. 50, No. 219, November 13, 1985 (46936).
* NAS = National Academy of Sciences

However, other dioxin isomer classes and furans were positively detected in the three brine pond sediment samples analyzed by a different laboratory. Table 15 below summarizes the range of values found.

Table 15
Dow Chemical Brine Pond Sediments
PCDDs and PCDFs

PCDDs	Range (ppb)	PCDFs	Range (ppb)
Total TCDDs	ND-0.016	2378-TCDF	0.03-0.11
Total PCDDs	ND-0.15	Total TCDFs	0.04-0.21
Total H_xCDDs	ND-0.07	Total PCDFs	ND
Total H_pCDDs	0.19-0.21	Total H_xCDFs	ND-3.5
OCDD	1.5-3.8	Total H_pCDFs	ND-2.8
		OCDF	0.5-5.8

c. Toxic Organic Pollutants

Toxic organic pollutants in the volatile and acid and base neutral fractions were identified in the liquid brine and brine pond sediment samples. All other toxic organic pollutants were not detected. Table 16 summarizes the volatile pollutants identified.

Acid and base neutral pollutants detected in the liquid brine samples included:

	Raw Brine				Filtered Brine	TH-18
	North	South	Combined	Prod. Well #29		
Phenol	27	35	16	24	ND	ND
4-Methylphenol	ND	5	ND	2	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	14	ND

Several polynuclear aromatic hydrocarbons (PAH) were detected near or estimated below the detection limit of the compound at the intermediate brine pond sampling point. These compounds were not found in any of the liquid brine samples.

1) Raw Brine Samples

The analytical data show that the following organic pollutants were detected in all three main Dow Chemical raw brine lines sampled and at one individual production well, #29:

- benzene (390-580 ppb)
- toluene (130-280 ppb)
- trichloroethylene (14-150 ppb)
- phenol (16-35 ppb)

Table 16

Dow Chemical Brine Operation
Volatile Organic Pollutant Summary

Volatile Compound	Raw Brine North	Raw Brine Combined	Raw Brine South	Filtered Brine	Production Well #29	TH-18	Brine Pond Sed. #1	Brine Pond Sed. #2	Brine Pond Sed. #3
Date:	8/14/84	8/14/84	8/14/84	8/14//84	8/13/84	8/13/84	10/22/84	10/22/84	10/22/84
	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/kg (ppb)	ug/kg (ppb)	ug/kg (ppb)
Benzene	580	530	400	ND/ 1	390	ND/ 1	ND/ 5	ND/ 5	6.4
Chlorobenzene	ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1	5J	24	13
1,2-Dichloroethane	ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1	ND/ 5	ND/ 5	15
1,1,1-Trichloroethane	ND/10	ND/10	35A*	ND/ 1	ND/10	ND/ 1	5.7	ND/ 5	16
Chloroform	ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1	ND/ 5	ND/ 5	7.1
Ethylbenzene	16A	ND/10	25A	ND/ 1	ND/10	ND/ 1	ND/ 5	ND/ 5	ND/ 5
Methylene chloride	59A*	32A*	49A*	2A*	88A*	24*	ND/ 5	ND/ 5	ND/ 5
Bromoform	ND/10	ND/10	ND/10	3A*	ND/10	ND/ 1	5J	ND/ 5	39
Chlorodibromomethane	ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1	ND/ 5	ND/ 5	15
Tetrachloroethylene	71A*	ND/10	170*	3A*	64A*	12*	5J	ND/ 5	25
Toluene	270	130	280	ND/ 1	160	ND/ 1	ND/ 5	ND/ 5	ND/ 5
Trichloroethylene	57A*	14A*	150*	ND/ 1	39A*	ND/ 1	ND/ 5	ND/ 5	ND/ 5
Acetone	ND/100	ND/100	ND/100	21A	ND/100	12A	92*	130*	230*
2-Butanone	ND/100	ND/100	ND/100	11A*	ND/100	26A*	ND/10	ND/10	35*
Carbon disulfide	ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1	ND/ 5	ND/ 5	25
Total xylenes	90A	37A	110	ND/ 1	ND/10	ND/ 1	ND/ 5	ND/ 5	18

NOTES: A = Detected below quantitation limit (quantitation limit = 10 x detection limit).
J = Estimated value, detected below minimum specified contract detection limit, but greater than zero.
* = Presence of compounds may be due to sample bottle preparation, field and/or laboratory contamination.

Other organic pollutants detected in one or more of the raw brine sampling sites included: 1,1,1-trichloroethane (35 ppb); ethylbenzene (16 ppb, 25 ppb); tetrachloroethylene (64-170 ppb); xylenes (37-110 ppb); and 4-methylphenol (2-5 ppb).

2) Filtered/Spent Brine Sample

Aside from two compounds found in the blank sample, three organic compounds were detected in the filtered brine sample which is representative of the processed brine prior to injection. The compounds were tetrachloroethylene, bromoform, and acetone at concentrations near the respective detection limits (3, 3, and 21 ppb). One chlorinated benzene compound, 1,2-dichlorobenzene, was detected at 14 ppb in the filtered brine sample.

3) Dow Chemical Recovery Well TH-18

Aside from compounds found in the blank sample, two organic compounds were detected in the sample taken at recovery well TH-18:

- tetrachloroethylene (12 ppb)
- acetone (12 ppb)

d. Inorganics

The liquid brine samples were analyzed for several inorganic constituents. These data are summarized below:

	Raw Brine		Filtered Brine	TH-18
Parameter	Range	Average		
Chloride, mg/l	226,100-273,600	250,000	233,300	2850
Fluoride, mg/l	0.25-0.38	0.30	0.28	0.15
Bromide, mg/l	31-52	37	30	5.1
Iodide, mg/l	ND-7.9	6.0	7.2	ND/ 2

e. Metals

Positive identification of heavy metals in all of the raw brine samples included: aluminum (1617 ppb average); cadmium (11 ppb average); manganese (499 ppb average); nickel (226 ppb average); and zinc (57 ppb average).

2. Discussion of Results

While 2378-TCDD was not detected, other PCDDs and PCDFs were found in the brine pond sediments, including 2378-TCDF ranging from 0.016-5.8 ppb. Their presence in the brine pond sediments may be attributable to atmospheric

deposition over the years. As noted earlier, PCDD and PCDF data for raw and filtered brines are not valid due to a quality control problem at an analytical contract laboratory.

With respect to toxic organic pollutants, the screening study identified several aromatic hydrocarbons and phenolic compounds in the raw brine samples including benzene, toluene, ethylbenzene, total xylenes, phenol, and 4-methyl phenol.

The literature was reviewed for priority pollutant and other analyses of brines. 9,10,11/ Available data for oil field and other brines in Michigan and offshore-produced oil and gas brines are summarized in Appendix G.

Michigan DNR has conducted research investigating the quantity of aromatic hydrocarbons in oil field and other brines utilized for roadway application. 9/ Twenty-five sites were sampled representing ten distinct formations in the state. Most of the samples were taken from the Dundee, Niagran, and Traverse formations. Study results indicated measurable quantities of benzene in all samples of oil field brine and, in lesser concentrations, in samples of other brines. Other organic compounds detected in measurable quantities in many samples included ethylbenzene, toluene, and xylenes. In addition to compounds targeted by this study, trace amounts of polynuclear aromatic hydrocarbons (acenaphtylene; chrysene; naphthalene, phenanthrene; pyrene) and phenolics (phenol; 4-nitrophenol) were detected. One brine sample taken from the Sylvania formation in Midland County showed the presence of benzene at 270 ppb and toluene at 70 ppb.

Organic priority pollutants were determined in samples of produced water (brine) from Alaska and California oil-producing fields. 10/ Six organic priority pollutants (benzene, toluene, ethylbenzene, naphthalene, 2,4-dimethyl-phenol, and phenol) were present in all brine samples analyzed making up over 99 percent of all organic priority pollutants detected. A USEPA verification study of 30 oil and gas drilling platforms in the Gulf of Mexico identified the presence of similar organic priority pollutants. 11/

The analytical results for this study are consistent with the above findings. Solvents were also detected in the brine samples including trichloroethylene, 1,1,1-trichloroethane, tetrachloroethylene, and bromoform. However, based upon the results of split sample analyses with the Michigan Department of Natural Resources and Dow Chemical, the findings are likely due to laboratory operations. None of these compounds were detected by the other laboratories. The USEPA-Dow Chemical-MDNR split sample data are presented in Appendix H. Low-level laboratory contamination at USEPA contract laboratories may be responsible for these findings. Michigan DNR conducted additional sampling at two injection wells and two production wells in February 1985. These data are presented in Appendix I. The solvents in question were not detected at lower detection levels than achieved by USEPA contract laboratories for the first round of sampling in this survey.

Chlorinated phenolic compounds and chlorinated benzene compounds were not detected in the raw brine samples or TH-18, the site of a brine spill recovery well.

The filtered brine sample, taken prior to reinjection, was characterized by the absence of most of the volatile compounds found in the raw brine. Tetrachloroethylene was detected in a trace amount near the detection limit for this compound. Given the concentrations found in the raw brine, processing through the Dow complex and the retention in the brine holding pond, these findings are not unexpected. The finding of 1,2-dichlorobenzene at low levels in the filtered brine appears anomalous as this compound was not detected in any of the liquid brine or the brine pond sediment samples.

Based upon these results, spills of Dow Chemical production raw brine would be expected to result in the release of aromatic and phenolic compounds identified in this screening study. As mentioned earlier, MDNR has required that Dow Chemical conduct environmental studies to determine the environmental impact of the release of brine from the Dow brine operation at 75 sites using chloride or an equivalent indicator parameter. Consistent with the MDNR consent order, the organic pollutants identified in this screening survey should be considered for evaluation at sites where Dow Chemical studies show an aquifer may be impacted.

D. Tentatively Identified Compounds

Several organic compounds were tentatively identified in the field blank samples and certain environmental samples. These compounds are not EPA priority pollutants. The concentrations of these compounds were estimated. The identification of each compound is based upon a computer match between the mass spectra of the unknown chromatograph and the EPA/NIH (National Institute of Health) mass spectral database of over 38,000 compounds. If visual inspection shows an acceptable match, the peak is tentatively identified. If an acceptable match with the EPA/NIH database is not obtained, the peak is characterized as "unknown".

Estimated concentrations of tentatively identified and unknown compounds are calculated by ratio of the peak area against the peak area of a known concentration of an internal laboratory standard. The reported concentrations are considered estimates since response factors for the compounds cannot be calculated. In order to positively identify and quantify these compounds, standards of each compound would have to be injected on a GC/MS and the retention times, mass spectra and peak areas determined. This work was beyond the scope of the analytical protocols for this study.

As shown in Table 4, the analytical laboratory noted that the probability of correct identification of the tentatively identified compounds is variable. Solvent impurity is a suspected source of laboratory induced contamination of these compounds.

The data for tentatively identified compounds for environmental samples are presented in the appendices. Given the findings of these compounds in blank samples, the types of compounds tentatively identified, and the nature of the identification and quantitation, Region V did not initiate additional sampling and analyses for these compounds in environmental samples.

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Appendix A

Analytical Results
Saginaw Bay Water Supply Intakes/Midland City Water

Discharger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Sample Date:

Saginaw Bay Water Intake Analyses
Midland City Water

	Saginaw River Standby	Saginaw/ Midland Intake	Pincon-ning Intake	Bay City Intake	Midland City Tap Water					
Sample Number	84ER05 S22	85ER03 S30	85ER03 S32	85ER03 S35	85ER03 S34					
Date	8/15/84	12/4/84	12/4/84	12/4/84	12/4/84					
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)					
I. VOLATILES (continued)										
Bromomethane	ND/ 1	ND/10	ND/10	ND/10	ND/10					
Bromoform	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5					
Bromodichloromethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	9					
Trichlorofluoromethane	ND/ 1	NA	NA	NA	NA					
Dichlorodifluoromethane	ND/ 1	NA	NA	NA	NA					
Chlorodibromomethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5					
Tetrachloroethene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5					
Toluene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5					
Trichloroethene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5					
Vinyl chloride	ND/ 1	ND/10	ND/10	ND/10	ND/10					
Acetone	ND/10	ND/10	ND/10	ND/10	ND/10					
2-butanone	ND/10	ND/10	ND/10	ND/10	ND/10					
Carbon disulfide	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5					
2-hexanone	ND/ 1	ND/10	ND/10	ND/10	ND/10					
4-methyl-2-pentanone	ND/ 1	ND/10	ND/10	ND/10	ND/10					
Styrene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5					
Vinyl acetate	ND/ 1	ND/10	ND/10	ND/10	ND/10					
Total xylenes	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5					

Discharger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Sample Date:

Saginaw Bay Water Intake Analyses
Midland City Water

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

	Saginaw River Standby	Saginaw/ Midland Intake	Pincon-ning Intake	Bay City Intake	Midland City Tap Water				
Sample Number	84ER05 S22	85ER03 S30	85ER03 S32	85ER03 S35	85ER03 S34				
Date	8/15/84	12/4/84	12/4/84	12/4/84	12/4/84				
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)				
I. VOLATILES									
Acrolein	ND/10	NA	NA	NA	NA				
Acrylonitrile	ND/10	NA	NA	NA	NA				
Benzene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
Carbon tetrachloride	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
Chlorobenzene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
1,2-dichloroethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
1,1,1-trichloroethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
1,1-dichloroethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
1,1,2-trichloroethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
1,1,2,2-tetrachloroethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
Chloroethane	ND/ 1	ND/10	ND/10	ND/10	ND/10				
Bis(chloromethyl)ether	ND/ 1	NA	NA	NA	NA				
2-chloroethylvinyl ether	ND/10	ND/10	ND/10	ND/10	ND/10				
Chloroform	ND/ 1	ND/ 5	ND/ 5	ND/ 5	26				
1,1-dichloroethene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
Trans-1,2-dichloroethene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
1,2-dichloropropane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
Trans-1,3-dichloropropene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
Cis-1,3-dichloropropene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
Ethylbenzene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
Methylene chloride	12*	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
Chloromethane	ND/ 1	ND/10	ND/10	ND/10	ND/10				

[Refer to notes page for explanation of data qualifiers and acronyms.]

scharger:

mple Date:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Saginaw Bay Water Intake Analyses
Midland City Water

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

	Saginaw River Standby	Saginaw/ Midland Intake	Pincon-ning Intake	Bay City Intake	Midland City Tap Water					
Sample Number	84ER05 S22	85ER03 S30	85ER03 S32	85ER03 S35	85ER03 S34					
Date	8/15/84	12/3-4/84	12/3-4/84	12/3-4/84	12/4/84					
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)					
II. ACID AND BASE NEUTRAL POLLUTANTS (continued)										
2-chloronaphthalene	ND/ 2	ND/10	ND/10	ND/10	ND/10					
1,2-dichlorobenzene	ND/ 2	ND/10	ND/10	ND/10	ND/10					
1,3-dichlorobenzene	ND/ 2	ND/10	ND/10	ND/10	ND/10					
1,4-dichlorobenzene	ND/ 2	ND/10	ND/10	ND/10	ND/10					
3,3¼-dichlorobenzidine	ND/ 2	ND/20	ND/20	ND/20	ND/20					
2,4-dinitrotoluene	ND/ 2	ND/10	ND/10	ND/10	ND/10					
2,6-dinitrotoluene	ND/ 2	ND/10	ND/10	ND/10	ND/10					
1,2-diphenylhydrazine	ND/ 2	NA	NA	NA	NA					
Fluoranthene	ND/ 2	ND/10	ND/10	ND/10	ND/10					
4-chlorophenyl phenyl ether	ND/ 2	ND/10	ND/10	ND/10	ND/10					
4-bromophenyl phenyl ether	ND/ 2	ND/10	ND/10	ND/10	ND/10					
Bis(2-chloroisopropyl)ether	ND/ 2	ND/10	ND/10	ND/10	ND/10					
Bis(2-chloroethoxy)methane	ND/ 2	ND/10	ND/10	ND/10	ND/10					
Hexachlorobutadiene	ND/ 2	ND/10	ND/10	ND/10	ND/10					
Hexachlorocyclopentadiene	ND/ 2	ND/10	ND/10	ND/10	ND/10					
Isophorone	ND/ 2	ND/10	ND/10	ND/10	ND/10					
Naphthalene	ND/ 2	ND/10	ND/10	ND/10	ND/10					
Nitrobenzene	ND/ 2	ND/10	ND/10	ND/10	ND/10					
N-nitrosodimethylamine	ND/ 2	ND/10	ND/10	ND/10	ND/10					
N-nitrosodiphenylamine	ND/ 2	ND/10	ND/10	ND/10	ND/10					
N-nitrosodiproplyamine	ND/ 2	ND/10	ND/10	ND/10	ND/10					
Bis(2-ethylhexyl)phthalate	ND/ 2	ND/10	ND/10	ND/10	ND/10					

Discharger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Sample Date:

Saginaw Bay Water Intake Analyses
Midland City Water

	Saginaw River Standby	Saginaw/ Midland Intake	Pincon-ning Intake	Bay City Intake	Midland City Tap Water				
Sample Number	84ER05 S22	85ER03 S30	85ER03 S32	85ER03 S35	85ER03 S34				
Date	8/15/84	12/3-4/84	12/3-4/84	12/3-4/84	12/4/84				
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)				
II. ACID AND BASE NEUTRAL POLLUTANTS									
2,4,6-trichlorophenol	ND/ 2	ND/10	ND/10	ND/10	ND/10				
4-chloro-3-methylphenol	ND/ 2	ND/10	ND/10	ND/10	ND/10				
2-chlorophenol	ND/ 2	ND/10	ND/10	ND/10	ND/10				
2,4-dichlorophenol	ND/ 2	ND/10	ND/10	ND/10	ND/10				
2,4-dimethylphenol	ND/ 2	ND/10	ND/10	ND/10	ND/10				
2-nitrophenol	ND/ 2	ND/10	ND/10	ND/10	ND/10				
4-nitrophenol	ND/ 2	ND/50	ND/50	ND/50	ND/50				
2,4-dinitrophenol	ND/ 2	ND/50	ND/50	ND/50	ND/50				
4,6-dinitro-2-methylphenol	ND/ 2	ND/50	ND/50	ND/50	ND/50				
Pentachlorophenol	ND/ 2	ND/50	ND/50	ND/50	ND/50				
Phenol	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Benzoic acid	3A	ND/50	ND/50	ND/50	ND/50				
2-methylphenol	ND/ 2	ND/10	ND/10	ND/10	ND/10				
4-methylphenol	ND/ 2	ND/10	ND/10	ND/10	ND/10				
2,4,5-trichlorophenol	ND/ 2	ND/50	ND/50	ND/50	ND/50				
Acenaphthene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Benzidine	ND/ 2	ND/100	ND/100	ND/100	ND/100				
1,2,4-trichlorobenzene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Hexachlorobenzene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Hexachloroethane	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Bis(2-chloroethyl)ether	ND/ 2	ND/10	ND/10	ND/10	ND/10				

Discharger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Sample Date:

Saginaw Bay Water Intake Analyses
Midland City Water

	Saginaw River Standby	Saginaw/ Midland Intake	Pincon-ning Intake	Bay City Intake	Midland City Tap Water				
Sample Number	84ER05 S22	85ER03 S30	85ER03 S32	85ER03 S35	85ER03 S34				
Date	8/15/84	12/3-4/84	12/3-4/84	12/3-4/84	12/4/84				
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)				
II. ACID AND BASE NEUTRAL POLLUTANTS (continued)									
Butyl benzyl phthalate	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Di-n-butyl phthalate	ND/ 2	3J*	1J*	1J*	ND/10				
Di-n-octyl phthalate	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Diethyl phthalate	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Dimethyl phthalate	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Benzo(a)anthracene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Benzo(a)pyrene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Benzo(b & k)fluoranthene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Benzo(k)fluoranthene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Chrysene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Acenaphthylene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Anthracene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Benzo(ghi)perylene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Fluorene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Phenanthrene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Dibenzo(a,h)anthracene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Indeno(1,2,3-cd)pyrene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Pyrene	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Aniline	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Benzyl alcohol	ND/ 2	ND/10	ND/10	ND/10	ND/10				
4-chloroaniline	ND/ 2	ND/10	ND/10	ND/10	ND/10				
Dibenzofuran	ND/ 2	ND/10	ND/10	ND/10	ND/10				

ischarger:

ample Date:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Saginaw Bay Water Intake Analyses
Midland City Water

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

	Saginaw River Standby	Saginaw/ Midland Intake	Pincon-ning Intake	Bay City Intake	Midland City Tap Water					
Sample Number	84ER05 S22	85ER03 S30	85ER03 S32	85ER03 S35	85ER03 S34					
Date	8/15/84	12/3-4/84	12/3-4/84	12/3-4/84	12/4/84					
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)					
II. ACID AND BASE NEUTRAL POLLUTANTS (continued)										
2-methylnaphthalene	ND/ 2	ND/10	ND/10	ND/10	ND/10					
2-nitroaniline	ND/ 2	ND/50	ND/50	ND/50	ND/50					
3-nitroaniline	ND/ 2	ND/50	ND/50	ND/50	ND/50					
4-nitroaniline	ND/ 2	ND/50	ND/50	ND/50	ND/50					

Discharger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Sample Date:

Saginaw Bay Water Intake Analyses
Midland City Water

	Saginaw River Standby	Saginaw/ Midland Intake	Pincon-ning Intake	Bay City Intake	Midland City Tap Water				
Sample Number	84ER05 S22	85ER03 S30	85ER03 S32	85ER03 S35	85ER03 S34				
Date	8/15/84	12/3-4/84	12/3-4/84	12/3-4/84	12/4/84				
Parameter III. PCB/PESTICIDE POLLUTANTS	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)				
Aldrin	ND/0.1	ND/.05	ND/.05	ND/.05	ND/.05				
Dieldrin	ND/0.1	ND/.10	ND/.10	ND/.10	ND/.10				
Chlordane	ND/1.0	ND/.5	ND/.5	ND/.5	ND/.5				
4,4'-DDT	ND/0.1	ND/.10	ND/.10	ND/.10	ND/.10				
4,4'-DDE	ND/0.1	ND/.10	ND/.10	ND/.10	ND/.10				
4,4'-DDD	ND/0.1	ND/.10	ND/.10	ND/.10	ND/.10				
Alpha-endosulfan	ND/0.1	ND/.05	ND/.05	ND/.05	ND/.05				
Beta-endosulfan	ND/0.1	ND/.10	ND/.10	ND/.10	ND/.10				
Endosulfan sulfate	ND/0.1	ND/.10	ND/.10	ND/.10	ND/.10				
Endrin	ND/0.1	ND/.10	ND/.10	ND/.10	ND/.10				
Endrin aldehyde	ND/0.1	ND/.10	ND/.10	ND/.10	ND/.10				
Heptachlor	ND/0.1	ND/.05	ND/.05	ND/.05	ND/.05				
Heptachlor epoxide	ND/0.1	ND/.05	ND/.05	ND/.05	ND/.05				
Alpha-BHC	ND/0.1	ND/.05	ND/.05	ND/.05	ND/.05				
Beta-BHC	ND/0.1	ND/.05	ND/.05	ND/.05	ND/.05				
Gamma-BHC	ND/0.1	ND/.05	ND/.05	ND/.05	ND/.05				
Delta-BHC	ND/0.1	ND/.05	ND/.05	ND/.05	ND/.05				
PCB-1242	ND/1.0	ND/.5	ND/.5	ND/.5	ND/.5				
PCB-1254	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0				
PCB-1221	ND/1.0	ND/.5	ND/.5	ND/.5	ND/.5				
PCB-1232	ND/1.0	ND/.5	ND/.5	ND/.5	ND/.5				
PCB-1248	ND/1 0	ND/.5	ND/.5	ND/.5	ND/.5				
PCB-1260	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0				
PCB-1016	ND/1.0	ND/.5	ND/.5	ND/.5	ND/.5				
Toxaphene	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0				

ischarger:

ample Date:

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REGION V
EASTERN DISTRICT OFFICE

Saginaw Bay Water Intake Analyses
Midland City Water

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

	Saginaw River Standby	Saginaw/ Midland Intake	Pincon-ning Intake	Bay City Intake	Midland City Tap Water				
Sample Number	84ER05 S22	85ER03 S30	85ER03 S32	85ER03 S35	85ER03 S34				
Date	8/15/84	12/3-4/84	12/3-4/84	12/3-4/84	12/4/84				
Parameter IV. METALS	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)				
Aluminum	287	52	182	223	ND/35				
Antimony	ND/20	ND/51	ND/51	ND/51	ND/51				
Arsenic	ND/10	ND/ 3	ND/10	ND/10	ND/ 3				
Barium	56	17	27	19	ND/12				
Beryllium	16	ND/.6	ND/.6	ND/.6	0.8				
Cadmium	3	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
Chromium	18	ND/ 4	ND/ 4	ND/ 4	ND/ 4				
Cobalt	ND/50	ND/ 6	ND/ 6	ND/ 6	ND/ 6				
Copper	56	ND/ 5	ND/ 5	35	24				
Iron	785	84	352	464	62				
Lead	ND/ 5	ND/ 2	ND/ 5	ND/ 5	ND/ 2				
Manganese	71	ND/ 4	18	19	ND/ 4				
Mercury	ND/.2	ND/.1	ND/.1	ND/.1	ND/.1				
Nickel	ND/40	ND/ 7	ND/ 7	ND/ 7	ND/ 7				
Selenium	ND/ 2	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
Silver	ND/10	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
Thallium	ND/10	ND/10	ND/10	ND/10	ND/10				
Tin	33	ND/28	ND/28	ND/28	ND/28				
Vanadium	ND/200	ND/ 5	ND/ 5	ND/ 5	ND/ 5				
Zinc	38	ND/ 3	7.2	5.2	ND/ 3				
Calcium (mg/l)	NA	27.3	48.1	33.2	18.1				
Magnesium (mg/l)	NA	7.56	13.4	8.68	7.4				
Sodium (mg/l)	NA	4.11	15.6	8.29	16.6				

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EASTERN DISTRICT OFFICE

Sample Date:

Saginaw Bay Water Intake Analyses
Midland City Water

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

	Saginaw River Standby	Saginaw/ Midland Intake	Pincon-ning Intake	Bay City Intake	Midland City Tap Water					
Sample Number	84ER05 S22	85ER03 S30	85ER03 S32	85ER03 S35	85ER03 S34					
Date	12/5/84	12/3-4/84	12/3-4/84	12/3-4/84	12/4/84					
Parameter	ppq	ppq	ppq	ppq	ppq					
V. DIOXINS										
2378-TCDD	ND/10	ND/10	ND/10	ND/10	ND/ 2					

ischarger:

ample Date:

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Saginaw Bay Water Intake Analyses
Midland City Water

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

	Saginaw River Standby	Saginaw/ Midland Intake	Pincon- ning Intake	Bay City Intake	Midland City Tap Water					
Sample Number	84ER05 S22	85ER03 S30	85ER03 S32	85ER03 S35	85ER03 S34					
Date	8/15/84	12/4/84	12/4/84	12/4/84	12/4/84					
Parameter	mg/l	mg/l	mg/l	mg/l	mg/l					
VI. OTHER PARAMETERS										
TKN	NA	ND/0.10	0.17	0.16	ND/0.10					
NH_4	NA	ND/0.10	ND/0.10	ND/0.10	ND/0.10					
Total Phosphorus	NA	ND/0.06	0.077	0.077	0.14					
Chloride	69	NA	NA	NA	19					
Sulfate	38	NA	NA	NA	18					
TDS	NR	121	2.8	137	104					
TSS	NR	4	20	23	ND/ 2					

NOTES:

1. ND = Compound was analyzed for but not detected. Value reported is the detection limit.
2. NA = Not analyzed.
3. A = Detected below quantitation limit (quantitation limit is 10 x detection limit).
4. * = Presence of compound is most likely due to sample bottle preparation and/or laboratory contamination. Compound was present in blank sample. Methylene chloride is used as a cleaning agent for sample bottles. Phthalate compounds are components of certain plastics and are widespread in the environment at low levels.
5. J = Estimated value, detected below minimum specified contract detection limit but greater than zero.
6. ug/l = micrograms per liter.
7. ppb = parts per billion.
8. ppq = parts per quadrillion.

Saginaw Bay Water Intake Analyses
Midland City Water
Tentatively Identified Compounds

CAS Number	Parameter	Saginaw River Standby	Saginaw/ Midland Intake	Pinconning Intake	Bay City Intake	City Tap Water
	Sample Number:	84ER05S22	85ER03S30	85ER03S32	85ER03S35	85ER03S34
	Sample Date:	8/15/84	12/4/84	12/4/84	12/4/84	12/4/84
		ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)
286-20-4	7-Oxabicyclo[4.1.0]heptane	30 SC				
	Unknown hydrocarbon		50 J	39 J	31 J	42 J
110-83-8	Cyclohexene				42 J	320 J
29538-77-0	Cyclohexanol, 4-chloro-, trans					32 J
5074-71-5	Phosphine, bis(pentafluorophenyl) phenyl					47 J
	Unknown	20 J				

SC = Suspected laboratory-induced contaminant.
J = Concentration estimated using a peak height assuming a response factor of one.

Appendix B

Analytical Results
Potable Well Water

Discharger.

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Potable Water Analyses

Sample Date:

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	A	B	C	D	E	F	G	G	G	H
Sample Type Time										
Sample Date	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	12/4/84	12/17/84	8/14/84
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)
I. VOLATILES										
Acrolein	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	NA	NA	ND/10
Acrylonitrile	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	NA	NA	ND/10
Benzene	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Carbon tetrachloride	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Chlorobenzene	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
1,2-dichloroethane	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
1,1,1-trichloroethane	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
1,1-dichloroethane	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
1,1,2-trichloroethane	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
1,1,2,2-tetrachloroethane	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Chloroethane	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/10	NA	ND/ 1
Bis(chloromethyl)ether	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	NA	NA	ND/ 1
2-chloroethylvinyl ether	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	NA	ND/10
Chloroform	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
1,1-dichloroethene	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Trans-1,2-dichloroethene	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
1,2-dichloropropane	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Trans-1,3-dichloropropene	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Cis-1,3-dichloropropene	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Ethylbenzene	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Methylene chloride	17*	10*	10*	13*	4A*	13*	6A*	ND/ 5	NA	6A*
Chloromethane	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/10	NA	ND/ 1

ischarger:

ample Date:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	I	J	K	L	M	N	P			
Sample Type Time										
Sample Date	8/15/84	10/23/84	10/23/84	12/5/84	12/3/84	12/3/84	12/4/84			
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)			
I. VOLATILES										
Acrolein	ND/10	NA	NA	NA	NA	NA	NA			
Acrylonitrile	ND/10	NA	NA	NA	NA	NA	NA			
Benzene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Carbon tetrachloride	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Chlorobenzene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
1,2-dichloroethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
1,1,1-trichloroethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
1,1-dichloroethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
1,1,2-trichloroethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
1,1,2,2-tetrachloroethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Chloroethane	ND/ 1	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Bis(chloromethyl)ether	ND/ 1	NA	NA	NA	NA	NA	NA			
2-chloroethylvinyl ether	ND/10	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Chloroform	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
1,1-dichloroethene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Trans-1,2-dichloroethene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
1,2-dichloropropane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Trans-1,3-dichloropropene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Cis-1,3-dichloropropene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Ethylbenzene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Methylene chloride	9A*	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Chloromethane	ND/ 1	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			

Discharger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Sample Date:

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	A	B	C	D	E	F	G	G	G	H
Sample Type Time										
Sample Date	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	12/4/84	12/17/84	8/14/84
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)
I. VOLATILES (continued)										
Bromomethane	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/10	NA	ND/ 1
Bromoform	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Bromodichloromethane	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Trichlorofluoromethane	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	NA	NA	ND/ 1
Dichlorodifluoromethane	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	NA	NA	ND/ 1
Chlorodibromomethane	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Tetrachloroethene	ND/ 1	1A	ND/ 1	1A	ND/ 1	4A	ND/ 1	ND/ 5	NA	ND/ 1
Toluene	ND/ 1	ND/ 1	1A	ND/ 1	ND/ 1	1A	ND/ 1	ND/ 5	NA	ND/ 1
Trichloroethene	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Vinyl chloride	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/10	NA	ND/ 1
Acetone	ND/10	13A	17A	17A	13A	ND/10	ND/10	ND/10	NA	ND/10
2-butanone	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	NA	ND/10
Carbon disulfide	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
2-hexanone	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/10	NA	ND/ 1
4-methyl-2-pentanone	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/10	NA	ND/ 1
Styrene	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Vinyl acetate	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/10	NA	ND/ 1
Total xylenes	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1

ischarger:

ample Date:

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Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	I	J	K	L	M	N	P			
Sample Type Time										
Sample Date	8/15/84	10/23/84	10/23/84	12/5/84	12/3/84	12/3/84	12/4/84			
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)			
I. VOLATILES (continued)										
Bromomethane	ND/ 1	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Bromoform	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Bromodichloromethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Trichlorofluoromethane	ND/ 1	NA	NA	NA	NA	NA	NA			
Dichlorodifluoromethane	ND/ 1	NA	NA	NA	NA	NA	NA			
Chlorodibromomethane	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Tetrachloroethene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Toluene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Trichloroethene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Vinyl chloride	ND/ 1	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Acetone	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
2-butanone	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Carbon disulfide	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
2-hexanone	ND/ 1	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
4-methyl-2-pentanone	ND/ 1	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Styrene	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Vinyl acetate	ND/ 1	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Total xylenes	ND/ 1	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5			

Discharger:

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EASTERN DISTRICT OFFICE

Potable Water Analyses

Sample Date:

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	A	B	C	D	E	F	G	G	G	H
Sample Type Time										
Sample Date	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	12/4/84	12/17/84	8/14/84
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)
II. ACID AND BASE NEUTRAL POLLUTANTS										
2,4,6-trichlorophenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1	ND/ 4
4-chloro-3-methylphenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
2-chlorophenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
2,4-dichlorophenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
2,4-dimethylphenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
2-nitrophenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/3	ND/ 4
4-nitrophenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/50	ND/3	ND/ 4
2,4-dinitrophenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/50	ND/10	ND/ 4
4,6-dinitro-2-methylphenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/50	ND/6	ND/ 4
Pentachlorophenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/50	ND/4	ND/ 4
Phenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Benzoic acid	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/50	ND/3	ND/ 4
2-methylphenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
4-methylphenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
2,4,5-trichlorophenol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/50	ND/1	ND/ 4
Acenaphthene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Benzidine	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/100	NA	ND/ 4
1,2,4-trichlorobenzene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Hexachlorobenzene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1.0	ND/ 4
Hexachloroethane	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1.0	ND/ 4
Bis(2-chloroethyl)ether	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4

Discharger:

Sample Date:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	I	J	K	L	M	N	P			
Sample Type Time										
Sample Date	8/15/84	10/23/84	10/23/84	12/5/84	12/3/84	12/3/84	12/4/84			
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)			
II. ACID AND BASE NEUTRAL POLLUTANTS										
2,4,6-trichlorophenol	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
4-chloro-3-methylphenol	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
2-chlorophenol	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
2,4-dichlorophenol	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
2,4-dimethylphenol	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
2-nitrophenol	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
4-nitrophenol	ND/ 2	ND/50	ND/50	ND/50	ND/50	ND/50	ND/50			
2,4-dinitrophenol	ND/ 2	ND/50	ND/50	ND/50	ND/50	ND/50	ND/50			
4,6-dinitro-2-methylphenol	ND/ 2	ND/50	ND/50	ND/50	ND/50	ND/50	ND/50			
Pentachlorophenol	ND/ 2	ND/50	ND/50	ND/50	ND/50	ND/50	ND/50			
Phenol	3A	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Benzoic acid	ND/ 2	ND/50	ND/50	ND/50	ND/50	ND/50	ND/50			
2-methylphenol	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
4-methylphenol	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
2,4,5-trichlorophenol	ND/ 2	ND/50	ND/50	ND/50	ND/50	ND/50	ND/50			
Acenaphthene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Benzidine	ND/ 2	ND/100	ND/100	ND/100	ND/100	ND/100	ND/100			
1,2,4-trichlorobenzene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Hexachlorobenzene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Hexachloroethane	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Bis(2-chloroethyl)ether	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			

Discharger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Sample Date:

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	A	B	C	D	E	F	G	G	G	H
Sample Type Time										
Sample Date	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	12/4/84	12/17/84	8/14/84
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)
II. ACID AND BASE NEUTRAL POLLUTANTS (continued)										
2-chloronaphthalene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
1,2-dichlorobenzene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	14A
1,3-dichlorobenzene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
1,4-dichlorobenzene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
3,3'-dichlorobenzidine	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/20	NA	ND/ 4
2,4-dinitrotoluene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1.5	ND/ 4
2,6-dinitrotoluene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1.5	ND/ 4
1,2-diphenylhydrazine	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	NA	ND/0.5	ND/ 4
Fluoranthene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
4-chlorophenyl phenyl ether	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
4-bromophenyl phenyl ether	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1.5	ND/ 4
Bis(2-chloroisopropyl)ether	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Bis(2-chloroethoxy)methane	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Hexachlorobutadiene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1.0	ND/ 4
Hexachlorocyclopentadiene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1.5	ND/ 4
Isophorone	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Naphthalene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Nitrobenzene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
N-nitrosodimethylamine	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	NA	ND/ 4
N-nitrosodiphenylamine	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
N-nitrosodiproplyamine	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Bis(2-ethylhexyl)phthalate	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	7A	ND/10	ND/1.0	6A

ischarger:

ample Date:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	I	J	K	L	M	N	P			
Sample Type Time										
Sample Date	8/15/84	10/23/84	10/23/84	12/5/84	12/3/84	12/3/84	12/4/84			
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)			
II. ACID AND BASE NEUTRAL POLLUTANTS (continued)										
2-chloronaphthalene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
1,2-dichlorobenzene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
1,3-dichlorobenzene	ND/ 2	10J	ND/10	ND/10	ND/10	ND/10	ND/10			
1,4-dichlorobenzene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
3,3'-dichlorobenzidine	ND/ 2	ND/20	ND/20	ND/20	ND/20	ND/20	ND/20			
2,4-dinitrotoluene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
2,6-dinitrotoluene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
1,2-diphenylhydrazine	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Fluoranthene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
4-chlorophenyl phenyl ether	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
4-bromophenyl phenyl ether	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Bis(2-chloroisopropyl)ether	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Bis(2-chloroethoxy)methane	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Hexachlorobutadiene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Hexachlorocyclopentadiene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Isophorone	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Naphthalene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Nitrobenzene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
N-nitrosodimethylamine	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
N-nitrosodiphenylamine	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
N-nitrosodiproplyamine	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Bis(2-ethylhexyl)phthalate	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			

Discharger: [redacted]

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REGION V
EASTERN DISTRICT OFFICE

Potable Water Analyses

Sample Date:

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	A	B	C	D	E	F	G	G	G	H
Sample Type Time										
Sample Date	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	12/4/84	12/17/84	8/14/84
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)
II. ACID AND BASE NEUTRAL POLLUTANTS (continued)										
Butyl benzyl phthalate	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/2	ND/ 4
Di-n-butyl phthalate	ND/ 2	ND/ 2	ND/ 4	3A*	2A*	2A*	6A*	1J*	ND/0.5	6A*
Di-n-octyl phthalate	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1	ND/ 4
Diethyl phthalate	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Dimethyl phthalate	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Benzo(a)anthracene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1	ND/ 4
Benzo(a)pyrene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1.5	ND/ 4
Benzo(b & k)fluoranthene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1	ND/ 4
Benzo(k)fluoranthene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1	ND/ 4
Chrysene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/1	ND/ 4
Acenaphthylene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Anthracene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Benzo(ghi)perylene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/2.3	ND/ 4
Fluorene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Phenanthrene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Dibenzo(a,h)anthracene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/2.5	ND/ 4
Indeno(1,2,3-cd)pyrene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/2.5	ND/ 4
Pyrene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Aniline	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Benzyl alcohol	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
4-chloroaniline	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
Dibenzofuran	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4

Discharger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Sample Date:

Potable Water Analyses

Location Code:	I	J	K	L	M	N	P			
Sample Type Time										
Sample Date	8/15/84	10/23/84	10/23/84	12/5/84	12/3/84	12/3/84	12/4/84			
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)			
II. ACID AND BASE NEUTRAL POLLUTANTS (continued)										
Butyl benzyl phthalate	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Di-n-butyl phthalate	3A*	ND/10	ND/10	ND/10	2J*	6J*	ND/10			
Di-n-octyl phthalate	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Diethyl phthalate	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Dimethyl phthalate	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Benzo(a)anthracene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Benzo(a)pyrene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Benzo(b & k)fluoranthene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Benzo(k)fluoranthene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Chrysene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Acenaphthylene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Anthracene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Benzo(ghi)perylene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Fluorene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Phenanthrene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Dibenzo(a,h)anthracene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Indeno(1,2,3-cd)pyrene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Pyrene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Aniline	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Benzyl alcohol	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
4-chloroaniline	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
Dibenzofuran	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			

Discharger:

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REGION V
EASTERN DISTRICT OFFICE

Potable Water Analyses

Sample Date:

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	A	B	C	D	E	F	G	G	G	H
Sample Type										
Time										
Sample Date	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	12/4/84	12/17/84	8/14/84
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)
II. ACID AND BASE NEUTRAL POLLUTANTS (continued)										
2-methylnaphthalene	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/10	ND/0.5	ND/ 4
2-nitroaniline	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/50	ND/1.5	ND/ 4
3-nitroaniline	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/50	ND/1.5	ND/ 4
4-nitroaniline	ND/ 2	ND/ 2	ND/ 4	ND/ 2	ND/ 2	ND/ 2	ND/ 4	ND/50	ND/ 4	ND/ 4

ischarger:

ample Date:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal. volume composite
G-Grab

Location Code:	I	J	K	L	M	N	P			
Sample Type Time										
Sample Date	8/15/84	10/23/84	10/23/84	12/5/84	12/3/84	12/3/84	12/4/84			
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)			
II. ACID AND BASE NEUTRAL POLLUTANTS (continued)										
2-methylnaphthalene	ND/ 2	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10			
2-nitroaniline	ND/ 2	ND/50	ND/50	ND/50	ND/50	ND/50	ND/50			
3-nitroaniline	ND/ 2	ND/50	ND/50	ND/50	ND/50	ND/50	ND/50			
4-nitroaniline	ND/ 2	ND/50	ND/50	ND/50	ND/50	ND/50	ND/50			

Discharger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Sample Date:

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	A	B	C	D	E	F	G	G	H	I
Sample Type										
Time										
Sample Date	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	12/4/84	12/17/84	8/14/84
Parameter III. PCB/PESTICIDE POLLUTANTS	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)
Aldrin	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.05	ND/0.1	ND/0.2
Dieldrin	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.10	ND/0.1	ND/0.2
Chlordane	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/2.0	ND/0.5	ND/1.0	ND/2.0
4,4'-DDT	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.1	ND/0.1	ND/0.2
4,4'-DDE	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.1	ND/0.1	ND/0.2
4,4'-DDD	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.1	ND/0.1	ND/0.2
Alpha-endosulfan	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.05	ND/0.1	ND/0.2
Beta-endosulfan	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.1	ND/0.1	ND/0.2
Endosulfan sulfate	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.1	ND/0.1	ND/0.2
Endrin	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.1	ND/0.1	ND/0.2
Endrin aldehyde	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.1	ND/0.1	ND/0.2
Heptachlor	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.05	ND/0.1	ND/0.2
Heptachlor epoxide	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.05	ND/0.1	ND/0.2
Alpha-BHC	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.05	ND/0.1	ND/0.2
Beta-BHC	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.05	ND/0.1	ND/0.2
Gamma-BHC	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.05	ND/0.1	ND/0.2
Delta-BHC	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.05	ND/0.1	ND/0.2
PCB-1242	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/2.0	ND/0.5	ND/1.0	ND/2.0
PCB-1254	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/2.0	ND/1.0	ND/1.0	ND/2.0
PCB-1221	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/2.0	ND/0.5	ND/1.0	ND/2.0
PCB-1232	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/2.0	ND/0.5	ND/1.0	ND/2.0
PCB-1248	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/2.0	ND/0.5	ND/1.0	ND/2.0
PCB-1260	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/2.0	ND/1.0	ND/1.0	ND/2.0
PCB-1016	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/2.0	ND/0.5	ND/1.0	ND/2.0
Toxaphene	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/2.0	ND/1.0	ND/1.0	ND/2.0

scharger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

ımple Date:

Location Code:	J	K	L	M	N	P				
Sample Type Time										
Sample Date	10/23/84	10/23/84	12/5/84	12/3/84	12/3/84	12/4/84				
Parameter III. PCB/PESTICIDE POLLUTANTS	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)				
Aldrin	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05				
Dieldrin	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1				
Chlordane	ND/0.5	ND/0.5	ND/0.5	ND/0.5	ND/0.5	ND/0.5				
4,4'-DDT	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1				
4,4'-DDE	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1				
4,4'-DDD	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1				
Alpha-endosulfan	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05				
Beta-endosulfan	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1				
Endosulfan sulfate	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1				
Endrin	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1				
Endrin aldehyde	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1				
Heptachlor	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05				
Heptachlor epoxide	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05				
Alpha-BHC	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05				
Beta-BHC	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05				
Gamma-BHC	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05				
Delta-BHC	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05	ND/0.05				
PCB-1242	ND/0.5	ND/0.5	ND/0.5	ND/0.5	ND/0.5	ND/0.5				
PCB-1254	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0				
PCB-1221	ND/0.5	ND/0.5	ND/0.5	ND/0.5	ND/0.5	ND/0.5				
PCB-1232	ND/0.5	ND/0.5	ND/0.5	ND/0.5	ND/0.5	ND/0.5				
PCB-1248	ND/0.5	ND/0.5	ND/0.5	ND/0.5	ND/0.5	ND/0.5				
PCB-1260	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0				
PCB-1016	ND/0.5	ND/0.5	ND/0.5	ND/0.5	ND/0.5	ND/0.5				
Toxaphene	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0				

Discharger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Sample Date:

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	A	B	C	D	E	F	G	G	G	H
Sample Type										
Time										
Sample Date	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	12/4/84	12/17/84	8/14/84
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)
IV. METALS										
Aluminum	ND/100	ND/100	ND/100	ND/100	ND/100	ND/100	ND/100	ND/35	NA	ND/100
Antimony	ND/20	ND/20	ND/20	ND/20	ND/20	ND/20	ND/20	ND/51	NA	ND/20
Arsenic	17	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	3.7	NA	ND/10
Barium	263	ND/100	ND/100	230	ND/100	ND/100	110	129	NA	300
Beryllium	10	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/.6	NA	ND/ 5
Cadmium	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	NA	ND/ 1
Chromium	14	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	ND/ 4	NA	ND/10
Cobalt	ND/50	ND/50	ND/50	ND/50	ND/50	ND/50	ND/50	ND/ 6	NA	ND/50
Copper	ND/50	ND/50	ND/50	ND/50	53	ND/50	ND/50	ND/ 5	NA	ND/50
Iron	5230	590	580	1520	410	455	840	882	NA	2680
Lead	7.5	ND/ 5	6	5	17.5	ND/ 5	ND/ 5	4.4	NA	ND/ 5
Manganese	61	46	18	27	ND/10	17	22	16	NA	29
Mercury	ND/.2	ND/.2	ND/.2	ND/.2	ND/.2	ND/.2	ND/.2	ND/.1	NA	ND/.2
Nickel	ND/40	ND/40	ND/40	ND/40	ND/40	ND/40	ND/40	ND/ 7	NA	ND/40
Selenium	ND/ 2	ND/ 2	ND/ 2	ND/ 2	ND/ 2	ND/ 2	ND/ 2	ND/ 5	NA	ND/ 2
Silver	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	ND/ 5	NA	ND/10
Thallium	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	ND/10	NA	ND/10
Tin	ND/20	ND/20	ND/20	23	35	52	ND/20	ND/28	NA	ND/20
Vanadium	ND/200	ND/200	ND/200	ND/200	ND/200	ND/200	ND/200	ND/ 5	NA	ND/200
Zinc	425	30	21	34	234	150	72	31	NA	970

ischarger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

ample Date:

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	I	J	K	L	M	N	P			
Sample Type Time										
Sample Date	8/15/84	10/23/84	10/23/84	12/5/84	12/3/84	12/3/84	12/4/84			
Parameter IV. METALS	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)			
Aluminum	ND/100	160	162	ND/35	ND/35	ND/35	ND/35			
Antimony	ND/20	81	82	ND/51	ND/51	ND/51	ND/51			
Arsenic	ND/10	ND/9.0	ND/9.0	ND/ 3	ND/10	ND/10	ND/ 3			
Barium	ND/100	123	139	82	80	12	ND/12			
Beryllium	ND/ 5	2.3	ND/1.3	0.8	0.8	0.8	0.8			
Cadmium	ND/ 1	ND/2.3	ND/2.3	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Chromium	ND/10	ND/3.4	ND/3.4	ND/ 4	ND/ 4	ND/ 4	ND/ 4			
Cobalt	ND/50	ND/4.7	ND/4.7	ND/ 6	ND/ 6	ND/ 6	ND/ 6			
Copper	ND/50	ND/7.8	ND/7.8	ND/ 5	ND/ 5	ND/ 5	24			
Iron	140	1260	995	669	357	379	62			
Lead	11	ND/4.5	ND/4.5	9.4	ND/ 5	ND/ 5	ND/ 2			
Manganese	ND/10	22	15	17	6.1	29	ND/ 4			
Mercury	ND/.2	NR	NR	ND/.1	0.1	ND/.1	ND/.1			
Nickel	ND/40	ND/4.0	ND/4.0	ND/ 7	ND/ 7	ND/ 7	ND/ 7			
Selenium	ND/ 2	ND/ 2	ND/ 2	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Silver	ND/10	10	7.7	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Thallium	ND/10	ND/ 5	ND/ 5	ND/10	ND/10	ND/10	ND/10			
Tin	ND/20	ND/ 14	ND/ 14	ND/28	ND/28	ND/28	ND/28			
Vanadium	ND/200	11	11	ND/ 5	ND/ 5	ND/ 5	ND/ 5			
Zinc	510	711	289	518	72	677	ND/ 3			
Calcium (mg/l)	NA	52.1	61.8	36.3	60.6	86.5	18.1			
Magnesium (mg/l)	NA	18.3	25.6	15.4	25.3	15.7	7.42			
Sodium (mg/l)	NA	50.4	25.5	16.1	35.5	899	16.6			
Potassium (mg/l)	NA	1.9	1.9	3.1	2.79	8.69	1.85			

Discharger: [redacted]

U.S. ENVIRONMENTAL PROTECTION [redacted]NCY
REGION V
EASTERN DISTRICT OFFICE

Sample Date:

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	A	B	C	D	D (rerun)	E	E (rerun)	F	G	H
Sample Type										
Time										
Sample Date	12/4/84	12/4/84	12/4/84	12/4/84	12/4/84	12/4/84	12/4/84	12/4/84	12/4/84	12/4/84
Parameter	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)
V. DIOXINS AND FURANS										
2378-TCDD	ND/ 4	ND/ 7	ND/ 4	ND/73[a]	ND/50[e]	f	ND/ 5	ND/ 4	ND/12	ND/ 4
Total Tetra CDDs	310	260	280	4900[a]	7000[e]	f	290	240	480	300
Total Penta CDDs	ND/ 2	ND/20	ND/22	ND/440[a]	ND/660[e]	f	ND/ 7	ND/16	ND/34	ND/24
Total Hexa CDDs	ND/10	ND/ 7	ND/ 5	ND/350[a]	ND/30	f	ND/17	ND/ 2	ND/ 4	ND/14
Total Hepta CDDs	ND/32	ND/38	ND/12	230[a]	ND/55	f	ND/24	ND/11	ND/22	ND/13
Total Octa CDDs	460	480	460	2600[a]	600	f	680	420	59	400
2378-TCDF	ND/ 1	ND/ 3	ND/ 1	ND/22[a]	ND/20[e]	f	ND/ 2	ND/ 1	ND/ 4	ND/ 1
Total Tetra CDFs	ND/ 2	ND/10	ND/ 6	ND/120[a]	ND/45[e]	f	ND/ 2	ND/ 7	ND/32	ND/ 3
Total Penta CDFs	ND/ 4	ND/10	ND/11	ND/350[a]	ND/50	f	ND/ 3	ND/ 5	ND/29	ND/ 9
Total Hexa CDFs	ND/ 9	ND/ 9	ND/48	ND/270[a]	ND/87	f	ND/18	ND/ 4	ND/ 9	ND/38
Total Hepta CDFs	ND/ 9	ND/ 9	ND/ 4	ND/210[a]	ND/26	f	250	ND/ 3	ND/ 4	47
Total Octa CDFs	ND/14	ND/13	ND/12	ND/180[a]	ND/34	f	550	ND/19	ND/29	ND/24

a = High background sample will be reanalyzed following cleanup on Carbopak C/Celite.
e = Internal standard recovery was low for the $^{13}C_{12}$-TCDF and $^{13}C_{12}$-TCDD.
f = Internal standards not detected.
ND = Not detected (detection limit).

ischarger:

ample Date:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	I	J	K	L	M	N	P	R		
Sample Type Time										
Sample Date	12/5/84	10/23/84	10/23/84	12/5/84	12/3/84	12/3/84	12/4/84	9/5/85		
Parameter	pg/l (ppq)	pg/ml (ppq)	pg/ml (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)		
V. DIOXINS AND FURANS										
2378-TCDD	ND/ 2	ND	ND	ND/ 6	ND/12	ND/ 4	ND/ 7	ND/ 1		
Total Tetra CDDs	230	ND/40	ND/20	400	510	250	270	NA		
Total Penta CDDs	ND/39	ND/ 9	ND/12	ND/29	ND/90	ND/16	ND/10	NA		
Total Hexa CDDs	ND/ 8	ND/13	ND/15	ND/ 2	ND/ 3	ND/ 4	ND/ 4	NA		
Total Hepta CDDs	ND/16	ND/18	ND/17	ND/24	ND/17	ND/ 9	ND/10	NA		
Total Octa CDDs	430	ND/110	ND/65	120	56	56	53	NA		
2378-TCDF	ND/ 2	ND	ND	ND/ 3	ND/ 4	ND/ 1	ND/ 1	NA		
Total Tetra CDFs	ND/ 5	ND/20	ND/20	ND/13	ND/26	3	64	NA		
Total Penta CDFs	ND/ 4	ND/ 7	ND/12	ND/10	ND/22	ND/ 3	ND/ 4	NA		
Total Hexa CDFs	ND/ 8	ND/10	ND/10	ND/12	ND/ 6	ND/ 5	ND/ 4	NA		
Total Hepta CDFs	ND/ 3	ND/20	ND/17	ND/ 6	ND/ 2	ND/ 3	ND/ 5	NA		
Total Octa CDFs	ND/20	ND/76	ND/55	ND/37	ND/38	ND/ 4	ND/16	NA		

Discharger:

Sample Date:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

Location Code:	A	B	C	D	E	F	G	G	H	I
Sample Type										
Time										
Sample Date	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	12/4/84	12/17/84	8/14/84
Parameter	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
VI. OTHER PARAMETERS										
Chloride	46.0	29	216	323	564	48.5	8.6	4.4	147	714
Sulfate	15	15	52	70.6	117.5	57	9.6	6	50	134
Fluoride	0.741	0.24	0.76	1.7	2.7	0.8	1.8	NA	1.7	1.9
Bromide	ND/ 2	ND/ 2	ND/ 2	3.0	ND/ 2	ND/ 2	ND/ 2	NA	ND/ 2	ND/ 2
Iodide	ND/ 2	2.1	4.5	ND/ 2	ND/ 2	ND/ 2	ND/ 2	NA	ND/ 2	ND/ 2
Phenolics (4AAP)	0.006*	0.006*	ND/.005	ND/.005	ND/.005	0.007*	0.008*	ND/.01	0.008*	0.007*
TKN	NA	NA	NA	NA	NA	NA	NA	0.22	NA	NA
NH_4	NA	NA	NA	NA	NA	NA	NA	0.20	NA	NA
Total Phosphorus	NA	NA	NA	NA	NA	NA	NA	ND/.06	NA	NA
TDS	NR	NR	NR	NR	NR	NR	NR	289	NR	NR
TSS	NR	NR	NR	NR	NR	NR	NR	ND/ 2	NR	NR

ischarger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Potable Water Analyses

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

ample Date:

Location Code:	J	K	L	M	N					
Sample Type										
Time										
Sample Date	10/23/84	10/23/84	12/5/84	12/3/84	12/3/84					
Parameter	mg/l	mg/l	mg/l	mg/l	mg/l					
VI. OTHER PARAMETERS										
Chloride	18	8	140	10	1100					
Sulfate	23	NR	30	8	268					
Fluoride	0.49	0.43	NA	NA	NA					
Bromide	NA	NA	NA	NA	NA					
Iodide	NA	NA	NA	NA	NA					
Phenolics (4AAP)	ND/.005	ND/.005	ND/.01	ND/.01	ND/.01					
TKN	0.26	0.49	0.48	ND/0.1	0.79					
NH_4	0.22	0.43	0.43	ND/0.1	0.51					
Total Phosphorus	ND/.05	0.05	ND/.06	ND/.06	ND/.06					
TDS	668	86	548	322	2670					
TSS	1.0	8.0	ND/ 2	ND/ 2	ND/ 2					

NR - Not reported. Sample run on preserved sample.

Tentatively Identified Compounds
Potable Water Analyses

(estimated concentration)

CAS Number	Tentatively Identified Compound	Location Code: A	B	C	D	E	F	G	G	H	I
		ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)
286-20-4	7-oxabicyclo [4.1.0] heptane	30 SC	60 SC	90	40 SC	40 SC	50 SC	60 SC	ND	100 SC	30 SC
96-23-1	1,3-dichloro-2-propanol	ND	ND	ND	ND	ND	ND	50 J	ND	ND	ND
616-23-9	2,3-dichloro-1-propanol	ND	ND	ND	ND	ND	ND	50 J	ND	ND	20 J
	Unknown	ND	ND	ND	ND	ND	ND	30 J	ND	ND	ND
	Unknown	ND	ND	ND	ND	ND	ND	40 J	ND	ND	ND
	Chlorocyclohexanol isomer	ND	ND	ND	ND	ND	ND	ND	ND	ND	40 J
	Unknown	ND	ND	ND	ND	ND	ND	ND	ND	ND	30 J
110-83-8	Cyclohexene	ND	ND	ND	ND	ND	ND	ND	20J	ND	ND
	Unknown hydrocarbon	ND	ND	ND	ND	ND	ND	ND	47J,21J	ND	ND

Notes: SC = Suspected contaminant - lab induced.
J = Concentration estimated using peak height assuming a response factor of one.

NOTES:

1. NA = Not analyzed.
2. ND = Compound was analyzed for but not detected. Value reported is the detection limit.
3. NR = Not reported. Sample run on preserved sample.
4. A = Detected below quantitation limit (quantitation limit is 10 x detection limit).
5. J = Estimated value, detected below minimum specified contract detection limit but greater than zero.
6. * = Presence of compound is most likely due to sample bottle preparation and/or laboratory contamination. Compound was present in blank sample. Methylene chloride is used as a cleaning agent for sample bottles. Phthalate compounds are components of certain plastics and are widespread in the environment at low levels.
7. ug/l = micrograms per liter.
8. mg/l = milligrams per liter.
9. pg/l = picograms per liter.
10. ppb = parts per billion.
11. ppq = parts per quadrillion.

Tentatively Identified Compounds
Potable Water Analyses

(estimated concentration)

CAS Number	Tentatively Identified Compound	Location Code: J ug/l (ppb)	K ug/l (ppb)	L ug/l (ppb)	M ug/l (ppb)	N ug/l (ppb)	P ug/l (ppb)
	Unknown hydrocarbon	ND	ND	ND	ND	ND	47J
1528-30-9	Cyclopentane, methylene	ND	ND	33J	ND	ND	ND
	Unknown hydrocarbon	ND	ND	38J	ND	ND	ND
110-33-8	Cyclohexene	ND	ND	ND	710J	ND	ND
	Unknown hydrocarbon	ND	ND	ND	40J	ND	ND
5074-71-5	Phosphine, bis(pentafluorophenyl)	ND	ND	ND	55J	56J	ND
	Unknown hydrocarbon	ND	ND	ND	ND	1200J	ND
						45J	
6670-13-9	2(3H)-oxazolethione, 4,5-diphenyl	ND	ND	ND	ND	17J	ND
108-94-1	Cyclohenanone	12	7D	ND	ND	ND	ND
79-34-5	Ethane, 1,1,2,2-tetrachloro	16D	8D	ND	ND	ND	ND
822-86-6	Cyclohexane, 1,2-dichloro-trans	ND	4D	ND	ND	ND	ND

Notes: J = Concentration estimated using a peak height assuming a response factor of one.
D = Possible solvent impurity.

Appendix C

Analytical Results
Dow Chemical Brine Operation

Discharger: [redacted]

U.S. ENVIRONMENTAL PROTECTION [redacted]NCY
REGION V
EASTERN DISTRICT OFFICE

Dow Chemical Brine Operation

Sample Date:

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

		Raw Brine-North	Raw Brine-Combined	Raw Brine-South	Filtered Brine	Prod. Well #29	TH-18		Brine Pond Sed. #1	Brine Pond Sed. #2	Brine Pond Sed. #3
Sample Type		G	G	G	G	G	G		G	G	G
Sample Number	84ER05	S04	S07	S14	S21	S23	S24	85ER01	S01	S03	S04
Date		8/14/84	8/14/84	8/14/84	8/14/84	8/13/84	8/13/84		10/22/84	10/22/84	10/22/84
Parameter		ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)		ug/kg (ppb)	ug/kg (ppb)	ug/kg (ppb)
I. VOLATILES											
Acrolein		ND/100	ND/100	ND/100	ND/10	ND/100	ND/10		NA	NA	NA
Acrylonitrile		ND/100	ND/100	ND/100	ND/10	ND/100	ND/10		NA	NA	NA
Benzene		580	530	400	ND/ 1	390	ND/ 1		ND/ 5	ND/ 5	6.4
Carbon tetrachloride		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	ND/ 5
Chlorobenzene		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		5J	24	13
1,2-dichloroethane		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	15
1,1,1-trichloroethane		ND/10	ND/10	35A	ND/ 1	ND/10	ND/ 1		5.7	ND/ 5	16
1,1-dichloroethane		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	ND/ 5
1,1,2-trichloroethane		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	ND/ 5
1,1,2,2-tetrachloroethane		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	ND/ 5
Chloroethane		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/10	ND/10	ND/10
Bis(chloromethyl)ether		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		NA	NA	NA
2-chloroethylvinyl ether		ND/100	ND/100	ND/100	ND/10	ND/100	ND/10		ND/10	ND/10	ND/10
Chloroform		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	7.1
1,1-dichloroethene		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	ND/ 5
Trans-1,2-dichloroethene		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	ND/ 5
1,2-dichloropropane		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	ND/ 5
Trans-1,3-dichloropropene		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	ND/ 5
Cis-1,3-dichloropropene		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	ND/ 5
Ethylbenzene		16A	ND/10	25A	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	ND/ 5
Methylene chloride		59A*	32A*	49A*	2A*	88A*	24*		ND/ 5	ND/ 5	ND/ 5
Chloromethane		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/10	ND/10	ND/10

[Refer to notes page for explanation of data qualifiers and acronyms.]

ischarger:

ample Date:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Dow Chemical Brine Operation

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

		Raw Brine-North	Raw Brine-Combined	Raw Brine-South	Filtered Brine	Prod. Well #29	TH-18		Brine Pond Sed. #1	Brine Pond Sed. #2	Brine Pond Sed. #3
Sample Type		G	G	G	G	G	G		G	G	G
Sample Number	84ER05	S04	S07	S14	S21	S23	S24	85ER01	S01	S03	S04
Date		8/14/84	8/14/84	8/14/84	8/14/84	8/13/84	8/13/84		10/22/84	10/22/84	10/22/84
Parameter		ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)		ug/kg (ppb)	ug/kg (ppb)	ug/kg (ppb)
I. VOLATILES (continued)											
Bromomethane		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/10	ND/10	ND/10
Bromoform		ND/10	ND/10	ND/10	3A	ND/10	ND/ 1		5J	ND/ 5	39
Bromodichloromethane		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	ND/ 5
Trichlorofluoromethane		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		NA	NA	NA
Dichlorodifluoromethane		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		NA	NA	NA
Chlorodibromomethane		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	15
Tetrachloroethene		71A	ND/10	170	3A	64A	12		5J	ND/ 5	25
Toluene		270	130	280	ND/ 1	160	ND/ 1		ND/ 5	ND/ 5	ND/ 5
Trichloroethene		57A	14A	150	ND/ 1	39A	ND/ 1		ND/ 5	ND/ 5	ND/ 5
Vinyl chloride		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/10	ND/10	ND/10
Acetone		ND/100	ND/100	ND/100	21A	ND/100	12A		92*	130*	230*
2-butanone		ND/100	ND/100	ND/100	11A*	ND/100	26A*		ND/10	ND/10	35
Carbon disulfide		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	25
2-hexanone		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/10	ND/10	ND/10
4-methyl-2-pentanone		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/10	ND/10	ND/10
Styrene		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	ND/ 5
Vinyl acetate		ND/10	ND/10	ND/10	ND/ 1	ND/10	ND/ 1		ND/10	ND/10	ND/10
Total xylenes		90A	37A	110	ND/ 1	ND/10	ND/ 1		ND/ 5	ND/ 5	18

Discharger:

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REGION V
EASTERN DISTRICT OFFICE

Dow Chemical Brine Operation

Sample Date:

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

	Raw Brine-North	Raw Brine-Combined	Raw Brine-South	Filtered Brine	Prod. Well #29	TH-18		Brine Pond Sed. #1	Brine Pond Sed. #2	Brine Pond Sed. #3
Sample Type	EVC	EVC	EVC	G	G	G		G	G	G
Sample Number 84ER05	S05	S10	S15	S21	S23	S24	85ER01	S01	S03	S04
Date	8/14/84	8/14/84	8/14/84	8/14/84	8/13/84	8/13/84		10/22/84	10/22/84	10/22/84
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)		ug/kg (ppb)	ug/kg (ppb)	ug/kg (ppb)
II. ACID AND BASE NEUTRAL POLLUTANTS										
2,4,6-trichlorophenol	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
4-chloro-3-methylphenol	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
2-chlorophenol	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
2,4-dichlorophenol	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
2,4-dimethylphenol	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
2-nitrophenol	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
4-nitrophenol	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/1600	ND/1600	ND/1600
2,4-dinitrophenol	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/1600	ND/1600	ND/1600
4,6-dinitro-2-methylphenol	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/1600	ND/1600	ND/1600
Pentachlorophenol	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/1600	ND/1600	ND/1600
Phenol	27	16A	35	ND/10	24	ND/ 2		ND/330	ND/330	ND/330
Benzoic acid	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/1600	ND/1600	ND/1600
2-methylphenol	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
4-methylphenol	ND/ 2	ND/ 4	5A	ND/10	2A	ND/ 2		ND/330	ND/330	ND/330
2,4,5-trichlorophenol	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/1600	ND/1600	ND/1600
Acenaphthene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Benzidine	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/1600	ND/1600	ND/1600
1,2,4-trichlorobenzene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Hexachlorobenzene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Hexachloroethane	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Bis(2-chloroethyl)ether	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330

ischarger:

ample Date:

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REGION V
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Dow Chemical Brine Operation

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

	Raw Brine-North	Raw Brine-Combined	Raw Brine-South	Filtered Brine	Prod. Well #29	TH-18		Brine Pond Sed. #1	Brine Pond Sed. #2	Brine Pond Sed. #3
Sample Type	EVC	EVC	EVC	G	G	G		G	G	G
Sample Number 84ER05	S05	S10	S15	S21	S23	S24	85ER01	S01	S03	S04
Date	8/14/84	8/14/84	8/14/84	8/14/84	8/13/84	8/13/84		10/22/84	10/22/84	10/22/84
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)		ug/kg (ppb)	ug/kg (ppb)	ug/kg (ppb)
II. ACID AND BASE NEUTRAL POLLUTANTS (continued)										
2-chloronaphthalene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
1,2-dichlorobenzene	ND/ 2	ND/ 4	ND/ 2	14A	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
1,3-dichlorobenzene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
1,4-dichlorobenzene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
3,3'-dichlorobenzidine	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/660	ND/660	ND/660
2,4-dinitrotoluene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
2,6-dinitrotoluene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
1,2-diphenylhydrazine	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		NA	NA	NA
Fluoranthene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	330J	ND/330
4-chlorophenyl phenyl ether	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
4-bromophenyl phenyl ether	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Bis(2-chloroisopropyl)ether	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Bis(2-chloroethoxy)methane	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Hexachlorobutadiene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Hexachlorocyclopentadiene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Isophorone	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Naphthalene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Nitrobenzene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
N-nitrosodimethylamine	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
N-nitrosodiphenylamine	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
N-nitrosodiproplyamine	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Bis(2-ethylhexyl)phthalate	2A	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330

Discharger:

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REGION V
EASTERN DISTRICT OFFICE

Dow Chemical Brine Operation

Sample Date:

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

		Raw Brine-North	Raw Brine-Combined	Raw Brine-South	Filtered Brine	Prod. Well #29	TH-18		Brine Pond Sed. #1	Brine Pond Sed. #2	Brine Pond Sed. #3
Sample Type		EVC	EVC	EVC	G	G	G		G	G	G
Sample Number	84ER05	S05	S10	S15	S21	S23	S24	85ER01	S01	S03	S04
Date		8/14/84	8/14/84	8/14/84	8/14/84	8/13/84	8/13/84		10/22/84	10/22/84	10/22/84
Parameter		ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)		ug/kg (ppb)	ug/kg (ppb)	ug/kg (ppb)
II. ACID AND BASE NEUTRAL POLLUTANTS (continued)											
Butyl benzyl phthalate		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Di-n-butyl phthalate		3A*	4A*	2A*	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Di-n-octyl phthalate		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Diethyl phthalate		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Dimethyl phthalate		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Benzo(a)anthracene		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	330J	ND/330
Benzo(a)pyrene		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	330J	ND/330
Benzo(b & k)fluoranthene		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	410	ND/330
Benzo(k)fluoranthene		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	410	ND/330
Chrysene		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	330J	ND/330
Acenaphthylene		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Anthracene		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Benzo(ghi)perylene		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	330J	ND/330
Fluorene		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Phenanthrene		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	330J	ND/330
Dibenzo(a,h)anthracene		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Indeno(1,2,3-cd)pyrene		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	330J	ND/330
Pyrene		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	330J	ND/330
Aniline		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Benzyl alcohol		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
4-chloroaniline		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
Dibenzofuran		ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330

ischarger:

ample Date:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Dow Chemical Brine Operation

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

	Raw Brine-North	Raw Brine-Combined	Raw Brine-South	Filtered Brine	Prod. Well #29	TH-18		Brine Pond Sed. #1	Brine Pond Sed. #2	Brine Pond Sed. #3
Sample Type	EVC	EVC	EVC	G	G	G		G	G	G
Sample Number 84ER05	S05	S10	S15	S21	S23	S24	85ER01	S01	S03	S04
Date	8/14/84	8/14/84	8/14/84	8/14/84	8/13/84	8/13/84		10/22/84	10/22/84	10/22/84
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)		ug/kg (ppb)	ug/kg (ppb)	ug/kg (ppb)
II. ACID AND BASE NEUTRAL POLLUTANTS (continued)										
2-methylnaphthalene	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/330	ND/330	ND/330
2-nitroaniline	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/1600	ND/1600	ND/1600
3-nitroaniline	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/1600	ND/1600	ND/1600
4-nitroaniline	ND/ 2	ND/ 4	ND/ 2	ND/10	ND/ 2	ND/ 2		ND/1600	ND/1600	ND/1600

Discharger:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Sample Date:

Dow Chemical Brine Operation

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

		Raw Brine-North	Raw Brine-Combined	Raw Brine-South	Filtered Brine	Prod. Well #29	TH-18		Brine Pond Sed. #1	Brine Pond Sed. #2	Brine Pond Sed. #3
Sample Type		EVC	EVC	EVC	G	G	G		G	G	G
Sample Number	84ER05	S05	S10	S15	S21	S23	S24	85ER01	S01	S03	S04
Date		8/14/84	8/14/84	8/14/84	8/14/84	8/13/84	8/13/84		10/22/84	10/22/84	10/22/84
Parameter		ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)		ug/kg (ppb)	ug/kg (ppb)	ug/kg (ppb)
III. PCB/PESTICIDE POLLUTANTS											
Aldrin		ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2	ND/0.1		ND/20	ND/20	ND/20
Dieldrin		ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2	ND/0.1		ND/40	ND/40	ND/40
Chlordane		ND/2.0	ND/2.0	ND/2.0	ND/1.0	ND/2.0	ND/1.0		ND/200	ND/200	ND/200
4,4'-DDT		ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2	ND/0.1		ND/40	ND/40	ND/40
4,4'-DDE		ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2	ND/0.1		ND/40	ND/40	ND/40
4,4'-DDD		ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2	ND/0.1		ND/40	ND/40	ND/40
Alpha-endosulfan		ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2	ND/0.1		ND/20	ND/20	ND/20
Beta-endosulfan		ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2	ND/0.1		ND/40	ND/40	ND/40
Endosulfan sulfate		ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2	ND/0.1		ND/40	ND/40	ND/40
Endrin		ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2	ND/0.1		ND/40	ND/40	ND/40
Endrin aldehyde		ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2	ND/0.1		ND/40	ND/40	ND/40
Heptachlor		ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2	ND/0.1		ND/20	ND/20	ND/20
Heptachlor epoxide		ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2	ND/0.1		ND/20	ND/20	ND/20
Alpha-BHC		ND/1.0	ND/1.0	ND/1.0	ND/0.5	ND/1.0	ND/0.1		ND/20	ND/20	ND/20
Beta-BHC		ND/1.0	ND/1.0	ND/1.0	ND/0.5	ND/1.0	ND/0.1		ND/20	ND/20	ND/20
Gamma-BHC		ND/1.0	ND/1.0	ND/1.0	ND/0.5	ND/1.0	ND/0.1		ND/20	ND/20	ND/20
Delta-BHC		ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2	ND/0.1		ND/20	ND/20	ND/20
PCB-1242		ND/2.0	ND/2.0	ND/2.0	ND/1.0	ND/2.0	ND/1.0		ND/200	ND/200	ND/200
PCB-1254		ND/2.0	ND/2.0	ND/2.0	ND/1.0	ND/2.0	ND/1.0		ND/400	ND/400	ND/400
PCB-1221		ND/2.0	ND/2.0	ND/2.0	ND/1.0	ND/2.0	ND/1.0		ND/200	ND/200	ND/200
PCB-1232		ND/2.0	ND/2.0	ND/2.0	ND/1.0	ND/2.0	ND/1.0		ND/200	ND/200	ND/200
PCB-1248		ND/2.0	ND/2.0	ND/2.0	ND/1.0	ND/2.0	ND/1.0		ND/200	ND/200	ND/200
PCB-1260		ND/2.0	ND/2.0	ND/2.0	ND/1.0	ND/2.0	ND/1.0		ND/400	ND/400	ND/400
PCB-1016		ND/2.0	ND/2.0	ND/2.0	ND/1.0	ND/2.0	ND/1.0		ND/200	ND/200	ND/200
Toxaphene		ND/2.0	ND/2.0	ND/2.0	ND/1.0	ND/2.0	ND/1.0		ND/400	ND/400	ND/400

Discharger:

Sample Date:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
EASTERN DISTRICT OFFICE

Dow Chemical Brine Operation

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

		Raw Brine-North	Raw Brine-Combined	Raw Brine-South	Filtered Brine	Prod. Well #29	TH-18		Brine Pond Sed. #1	Brine Pond Sed. #2	Brine Pond Sed. #3
Sample Type		EVC	EVC	EVC	G	G	G		G	G	G
Sample Number	84ER05	S05	S10	S15	S21	S23	S24	85ER01	S01	S03	S04
Date		8/14/84	8/14/84	8/14/84	8/14/84	8/13/84	8/13/84		10/22/84	10/22/84	10/22/84
Parameter		ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)		mg/kg (ppb)	mg/kg (ppb)	mg/kg (ppb)
IV. METALS											
Aluminum		1060	1590	1790	2100	2030	ND/100		1090	6850	3370
Antimony		ND/20	ND/20	ND/20	ND/20	ND/20	ND/20		78	ND/ 16	ND/ 14
Arsenic		ND/10	ND/10	ND/10	ND/10	ND/10	ND/10		ND/7.6	7.5	8.8
Barium		ND/100	ND/100	150	205	ND/100	2730		45	29	16
Beryllium		ND/ 5	ND/ 5	5	6	ND/ 5	12		ND/1.1	ND/0.9	2.3
Cadmium		10	10	12	15	12	ND/ 1		ND/1.9	ND/1.6	4.4
Chromium		ND/10	ND/10	ND/10	ND/10	ND/10	15		79	8.6	7.4
Cobalt		ND/50	ND/50	ND/50	ND/50	ND/50	ND/50		ND/4.0	4.4	ND/3.0
Copper		ND/50	ND/50	ND/50	ND/50	83	ND/50		18	26	13
Iron		ND/50	2180	5050	532	5840	18800		21700	16100	9640
Lead		ND/ 5	ND/ 5	ND/ 5	ND/ 5	ND/ 5	20		ND/3.8	ND/3.1	ND/2.8
Manganese		394	575	494	176	530	568		164	550	164
Mercury		ND/ 2	ND/ 2	ND/ 2	ND/ 2	ND/ 2	ND/.2		--	--	--
Nickel		154	230	248	290	273	ND/40		62	10	10
Selenium		ND/ 2	ND/ 2	ND/ 2	ND/ 2	ND/ 2	ND/ 2		ND/1.7	ND/1.4	ND/1.3
Silver		36	ND/10	ND/10	ND/10	12	ND/10		ND/4.4	ND/3.6	ND/3.3
Thallium		26	ND/10	54	142	24	ND/10		ND/4.2	ND/3.4	ND/3.2
Tin		ND/20	233	68	350	175	38		15	ND/9.6	15
Vanadium		ND/200	ND/200	210	247	240	ND/200		33	24	10
Zinc		140	12	22	19	53	50		145	76	41

Discharger:

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Sample Date:

Dow Chemical Brine Operation

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

	Raw Brine North	Raw Brine Combined	Raw Brine Combined	Raw Brine South	Raw Brine South	Filtered Brine (spent)	Filtered Brine (spent)	Prod. Well #29	TH-18	
Sample Type	G	G	G	G	G	G	G	G	G	
Time										
Sample Number 85ER03	S03	S01	S01	S02	S02	S04	S04	S05	S07	
Sample Date	12/3/84	12/3/84	12/3/84 (rerun)	12/3/84	12/3/84 (rerun)	12/3/84	12/3/84 (rerun)	12/3/84	12/3/84	
Parameter	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	
V. DIOXINS AND FURANS										
2378-TCDD	ND/11	ND/15[a]	ND/11	ND/54[a]	b	ND/ 6[a]	ND/ 2	ND/ 4	ND/ 2	
Total Tetra CDDs	450	260	130	290[a]	b	440[a]	290	230	290	
Total Penta CDDs	ND/86	ND/44[a]	ND/32	ND/53[a]	b	ND/380[a]	1000	ND/15	ND/34	
Total Hexa CDDs	ND/67	ND/28[a]	ND/ 6	ND/240[a]	ND/16	720	1100	ND/22	ND/26	
Total Hepta CDDs	ND/57	65	ND/17	ND/140[a]	180	90	62	ND/63	ND/19	
Total Octa CDDs	1300	1500	1000	1450[a]	1600	630	680	920	430	
2378-TCDF	ND/ 9	ND/ 8[a]	ND/ 2	ND/19[a]	b	ND/ 4[a]	ND/ 4	ND/ 4	ND/ 2	
Total Tetra CDFs	ND/29	ND/13[a]	200	ND/33[a]	b	ND/22[a]	ND/ 4	ND/ 6	ND/ 2	
Total Penta CDFs	ND/85	ND/62[a]	ND/10	ND/1860[a]	b	ND/120[a]	ND/ 7	ND/13	ND/22	
Total Hexa CDFs	ND/73	ND/110[a]	ND/ 7	ND/52[a]	70	ND/58[a]	ND/ 2	ND/17	ND/31	
Total Hepta CDFs	ND/80	ND/36[a]	ND/31	ND/240[a]	330	130	62	ND/ 8	ND/21	
Total Octa CDFs	ND/160	ND/85[a]	ND/16	ND/46[a]	290	91	88	ND/59	ND/19	

a = High background sample will be reanalyzed following cleanup on Carbopack C/Celite.
b = Not calculated. The carbon-13 labeled 2378-TCDD and 2378-TCDF internal standards were not recovered.

Discharger:

Sample Date:

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Dow Chemical Brine Operation

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

	Brine Pond Sed. #1	Brine Pond Sed. #2	Brine Pond Sed. #3							
Sample Type	G	G	G							
Time										
Sample Number 85ER01	S01	S03	S04							
Date	10/22/84	10/22/84	10/22/84							
Parameter	pg/g (ppt)	pg/g (ppt)	pg/g (ppt)							
V. DIOXINS AND FURANS										
2378-TCDD	ND	ND	ND							
Total Tetra CDDs	ND/6.9	ND/7.5	15.7							
Total Penta CDDs	ND/8.1	ND/3.3	152							
Total Hexa CDDs	ND/9.0	67.8	63							
Total Hepta CDDs	192.0	207	194							
Total Octa CDDs	1549	3791	3864							
2378-TCDF	116	29.5	43.1							
Total Tetra CDFs	207	36.3	55.7							
Total Penta CDFs	ND/9.1	ND/4.4	ND/6.1							
Total Hexa CDFs	3521	ND/7.1	152							
Total Hepta CDFs	2850	512	ND/45.3							
Total Octa CDFs	5766	957	501							

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Dow Chemical Brine Operation

Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

	Raw Brine North	Raw Brine Combined	Raw Brine South	Filtered Brine	Prod. Well #29	TH-18				
Sample Type	EVC	EVC	EVC	G	G	G				
Time										
Sample Number 85ER04	S05	S10	S15	S21	S23	S24				
Date	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84				
Parameter	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l				
VI. INORGANICS										
Chloride	273,600	226,100	247,700	233,300	270,700	2850				
Sulfate	25	ND/ 5	ND/ 5	5.5	ND/ 5	23.6				
Fluoride	0.25	0.296	0.38	0.283	0.286	0.153				
Bromide	31	31	33	30	52	5.1				
Iodide	7.9	7.9	7.8	7.2	ND/ 2	ND/ 2				
Phenolics (4AAP)	ND/.005	ND/.005	NA	ND/.005	0.008*	0.006*				

Tentatively Identified Compounds
Dow Chemical Brine Operation

(estimated concentration)

	South Raw Brine	Combined Raw Brine	North Raw Brine	Filtered Brine	Production Well #29	TH-18
Sample Type:	G	G	G	G	G	G
Sample Date:	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84	8/14/84
Parameter	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)
Toluene	70	ND	10	ND	30	ND
Iodine	100	80	80	ND	60	ND
Xylene isomer	20	ND	ND	ND	ND	ND
2,3-dichloro-1-propanol	20	100	ND	ND	ND	ND
Unknown	50	ND	ND	ND	ND	ND
Hydrocarbon	20/20	ND	40/20/20/20/10	ND	ND	ND
Chloroform	ND	40	ND	ND	ND	ND
2-cyclohexen-1-one	ND	60	ND	ND	ND	ND
Unknown	ND	90	ND	ND	ND	ND
Unknown	ND	30	ND	ND	ND	ND
Unknown	ND	ND	20	ND	ND	ND
Tridecane	ND	ND	20	ND	ND	ND
Hexadecane	ND	ND	50	ND	ND	ND
Heptadecane	ND	ND	20	ND	ND	ND
Nonadecane	ND	ND	30	ND	ND	ND
Heptacosane	ND	ND	30	ND	ND	ND
Unknown	ND	ND	ND	800	ND	ND
2-bromo-cyclohexanol	ND	ND	ND	400	ND	ND
1-bromo-2-chlorocyclohexane	ND	ND	ND	700	ND	ND
1,3-dibromocyclohexane	ND	ND	ND	500	ND	ND
4,5-dibromocyclohexene	ND	ND	ND	300	ND	ND
Unknown	ND	ND	ND	100	ND	ND
Unknown	ND	ND	ND	ND	70	ND
Unknown	ND	ND	ND	ND	30	ND
7-oxabicyclo [4.1.0] heptane	ND	ND	ND	ND	ND	40 SC

NOTES:

1. ND = Compound was analyzed for but not detected. Value reported is the detection limit.
2. NA = Not analyzed.
3. * = Presence of compound may be due to sample bottle preparation, field and/or laboratory contamination. Methylene chloride is used as a cleaning agent for sample bottles. Phthalate compounds are components of certain plastics and are widespread in the environment at low levels.
4. A = Detected below quantitation limit (quantitation limit is 10 x dectection limit).
5. J = Estimated value, detected below minimum specified contract detection limit but greater than zero.
6. C = Blank corrected.
7. ug/l = micrograms per liter.
8. ug/kg = micrograms per kilogram.
9. mg/kg = milligrams per kilogram.
10. ppb = parts per billion.
11. ppm = parts per million.
12. pg/g = picograms per gram.
13. pg/l = picograms per liter.
14. ppq = parts per quadrillion.
15. -- = mercury data unusuable.

Appendix D

Discussion of Laboratory Analyses of PCDDs and PCDFs

Appendix D

Laboratory Contamination Problems for Dioxin Analyses Conducted by Midwest Research Institute

Midwest Research Institute (MRI) extracted and analyzed 32 water samples, 4 spiked tap water samples, and 4 method blanks for tetra-, octa-, CDDs and CDFs and for 2378-TCDD and 2378-TCDF isomer specific. The samples, spikes, and blanks were extracted with hexane and taken through a two-part column. The first part contained sulfuric acid, treated silica gel, and untreated silica gel. The second part contained acidic alumina. This cleanup procedure is described in the USEPA dioxin analysis protocol for soil and sediment and is an optional procedure in the removal of readily oxidizable organic compounds. Samples with high levels of organic material required further cleanup with a Carbopak C/Celite column. The method blanks were not carried through the Carbopak/Celite cleanup step by MRI. Referring to Table D-1, method blank (MB) 1-3 and all other samples had positive results for two TCDD isomers. These isomers had peak maximums at scans 1046 and 1054 and were consistent throughout the analysis. The 2378-TCDD peak maximum occurred at scan 1100. MB4 reported total TCDD and ND (not detectable) with a detection limit of 10 pg/liter (ppq). OCDF was found in MB4 and 31 pg/l, less than the contract required detection limit of 90 pg/l. H_xCDD, H_pCDD, and OCDF were reported in MB2. MRI stated that this was apparently carry-over from a previous injection of spiked tap water which contained these compounds. A request was made for reanalysis of MB2. Verbal results from MRI indicate the presence of the two TCDD peaks and OCDD, which were found in all samples and blanks.

MRI initiated an investigation into the source of the TCDD isomer contamination. They have found that these two isomers correspond to 1368-TCDD and 1379-TCDD. MRI was unable to trace these isomers back to the solvents or spiking solutions used in the analyses. However, MRI has found evidence that the acidic alumina column used in the extract cleanup procedure may be responsible. According to MRI, it appears that the contribution of these isomers resulted from the prolonged activation of acidic alumina in a specific oven in the laboratory. Accordingly, Region V does not consider the data for PCDDs and PCDFs, other than 2378-TCDD, to be valid data.

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Sample Type: 8 C-8 hour flow proportioned composite
24C-24 hour flow proportioned composite
EVC-Equal volume composite
G-Grab

mple Date:

Table D-1
Laboratory Blanks/Field Blank

	MB1	TAPN1	MB2	TAPN2	MB3	TAPN3	MB4	TAPN4	Field Blank	
Sample Type										
Time										
Analysis Date	1/28/85	1/28/85	1/29/85	1/29/85	1/31/85	1/29/85	1/31/85	1/31/85	1/31/85	
Parameter	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	pg/l (ppq)	
V. DIOXINS AND FURANS										
2378-TCDD	ND/ 4	300	ND/ 6	300	ND/10	300	ND/ 4	300	ND/ 6	
Total Tetra CDDs	210	510	250	540	240	500	ND/10	300	250	
Total Penta CDDs	ND/40	380	ND/17	370	ND/30	400	ND/ 3	230	ND/19	
Total Hexa CDDs	ND/12	1300	34[a]	1140	ND/ 3	960	ND/ 3	640	ND/ 7	
Total Hepta CDDs	ND/ 3	1570	40[a]	1670	ND/21	1300	ND/25	1160	ND/ 6	
Total Octa CDDs	320	3760	440[a]	4970	100	3700	80	3490	29	
2378-TCDF	ND/ 1	290	ND/ 8	340	ND/ 2	250	ND/ 4	270	ND/ 1	
Total Tetra CDFs	ND/ 1	290	ND/12	340	ND/ 2	250	ND/ 3	270	ND/ 7	
Total Penta CDFs	ND/ 1	ND/ 4	ND/ 7	ND/ 2	ND/ 8	ND/ 9	ND/ 4	ND/ 5	ND/ 6	
Total Hexa CDFs	ND/15	ND/ 3	ND/ 8	ND/ 3	ND/ 9	ND/ 5	ND/ 2	ND/19	ND/ 6	
Total Hepta CDFs	ND/ 3	ND/28	ND/ 3	ND/ 3	ND/11	28	ND/ 1	ND/ 7	ND/ 1	
Total Octa CDFs	ND/ 9	2920	80[a]	3270	ND/ 8	2840	31	1760	ND/ 6	

[a] - Apparent carryover from previous injection of a spiked tap water sample. This method blank will be rerun.
MB - Method blank.
TAPN - Tap water spiked sample.

Appendix E

Comparison of Analytical Results to Primary and Secondary Drinking Water Standards

Saginaw Bay Water Intake/Drinking Water Regulations Comparison

Parameter	Saginaw River Standby	Saginaw/ Midland Intake	Pinconning Intake	Bay City Intake	Midland City Tap Water
Sample Number	84ER05S22	85ER03S30	85ER03S32	85ER03S35	85ER03S34
Date	8/15/84	12/3-4/84	12/3-4/84	12/3-4/84	12/4/84
	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)	ug/l (ppb)
I. National Interim Primary Drinking Water Regulations (ug/l)					
Arsenic (50)	ND/10	ND/ 3	ND/10	ND/10	ND/ 3
Barium (1000)	56	17	27	19	ND/0.2
Cadmium (10)	3	ND/ 5	ND/ 5	ND/ 5	ND/ 5
Chromium (50)	18	ND/ 4	ND/ 4	ND/ 4	ND/ 4
Lead (50)	ND/ 5	ND/ 2	ND/ 5	ND/ 5	ND/ 2
Mercury (2)	ND/0.2	ND/0.1	ND/0.1	ND/0.1	ND/0.1
Selenium (10)	ND/ 2	ND/ 5	ND/ 5	ND/ 5	ND/ 5
Silver (50)	ND/10	ND/ 5	ND/ 5	ND/ 5	ND/ 5
Fluoride (1.4-2.4 mg/l)	NA	NA	NA	NA	NA
Endrin (0.2)	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1
Toxaphene (5)	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0
Trihalomethanes (100)	ND	ND	ND	ND	35
II. National Secondary Drinking Water Regulations (ug/l)					
Chloride (250 mg/l)	NA	NA	NA	NA	19
Copper (1000)	56	ND/ 5	ND/ 5	35	24
Iron (300)	785	84	352	464	62
Manganese (50)	71	ND/ 4	18	19	ND/ 4
Zinc (5000)	38	ND/ 3	7.2	5.2	ND/ 3
Sulfate (250 mg/l)	NA	NA	NA	NA	18

Potable Well Results/Drinking Water Regulations Comparison

Parameter	Location Code:	A	B	C	D	E	F	G	G	H
I. National Interim Primary Drinking Water Regulations (ug/l)										
Arsenic	(50)	17	ND/ 10	ND/ 10	ND/ 10	ND/ 10	ND/ 10	ND/ 10	3.7	ND/ 10
Barium	(1000)	263	ND/100	ND/100	230	ND/100	ND/100	110	129	300
Cadmium	(10)	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 1	ND/ 5	ND/ 1
Chromium	(50)	14	ND/ 10	ND/ 10	ND/ 10	ND/ 10	ND/ 10	ND/ 10	ND/ 4	ND/ 10
Lead	(50)	7.5	ND/ 5	6	5	17.5	ND/ 5	ND/ 5	4.4	ND/ 5
Mercury	(2)	ND/0.2	ND/0.2	ND/0.2	ND/0.2	ND/0.2	ND/0.2	ND/0.2	ND/0.1	ND/0.2
Selenium	(10)	ND/ 2	ND/ 2	ND/ 2	ND/ 2	ND/ 2	ND/ 2	ND/ 2	ND/ 5	ND/ 2
Silver	(50)	ND/ 10	ND/ 10	ND/ 10	ND/ 10	ND/ 10	ND/ 10	ND/ 10	ND/ 5	ND/ 10
Fluoride	(1.4-2.4 mg/l)	0.741	0.24	0.76	1.7	2.7	0.8	1.8	NA	1.7
Endrin	(0.2)	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.2	ND/0.1	ND/0.1
Toxaphene	(5)	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/2.0	ND/1.0	ND/1.0
Trihalomethanes	(100)	ND	ND	ND	ND	ND	ND	ND	ND	ND
II. National Secondary Drinking Water Regulations (ug/l)										
Chloride	(250 mg/l)	46.0	29	216	323	564	48.5	8.6	4.4	147
Copper	(1000)	ND/50	ND/ 50	ND/ 50	ND/ 50	53	ND/ 50	ND/ 50	ND/ 5	ND/ 50
Iron	(300)	5230	590	580	1520	410	455	840	882	2680
Manganese	(50)	61	46	18	27	ND/ 10	17	22	16	29
Zinc	(5000)	425	30	21	34	234	150	72	31	970
Sulfate	(250 mg/l)	15	15	52	70.6	117.5	57	9.6	6	50

Potable Well Results/Drinking Water Regulations Comparison

Parameter	Location Code:	I	J	K	L	M	N	P
I. National Interim Primary Drinking Water Regulations (ug/l)								
Arsenic	(50)	ND/ 10	ND/ 9	ND/ 9	ND/ 3	ND/ 10	ND/ 10	ND/ 3
Barium	(1000)	ND/100	123J	139J	82	80	12	ND/ 12
Cadmium	(10)	ND/ 1	ND/2.3	ND/2.3	ND/ 5	ND/ 5	ND/ 5	ND/ 5
Chromium	(50)	ND/ 10	ND/3.4	ND/3.4	ND/ 4	ND/ 4	ND/ 4	ND/ 4
Lead	(50)	11	ND/4.5	ND/4.5	9.4	ND/ 5	ND/ 5	ND/ 2
Mercury	(2)	ND/0.2	NR	NR	ND/0.1	0.1	ND/0.1	ND/0.1
Selenium	(10)	ND/ 2	ND/ 2	ND/ 2	ND/ 5	ND/ 5	ND/ 5	ND/ 5
Silver	(50)	ND/ 10	10	7.7J	ND/ 5	ND/ 5	ND/ 5	ND/ 5
Fluoride	(1.4-2.4 mg/l)	1.9	0.49	0.43	NA	NA	NA	NA
Endrin	(0.2)	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1	ND/0.1
Toxaphene	(5)	ND/2.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0	ND/1.0
Trihalomethanes	(100)	ND	ND	ND	ND	ND	ND	ND
II. National Secondary Drinking Water Regulations (ug/l)								
Chloride	(250 mg/l)	714	18	8	140	10	1100	NA
Copper	(1000)	ND/ 50	ND/7.8	ND/7.8	ND/ 5	ND/ 5	ND/ 5	24
Iron	(300)	140	1260	995	669	357	379	62
Manganese	(50)	ND/ 10	22	15	17	6.1	29	ND/ 4
Zinc	(5000)	510	711	289	518	72	677	ND/ 3
Sulfate	(250 mg/l)	134	23	NR	30	8	268	NA

NR = Not reported. Sample run on preserved sample.

Appendix F

Comparison of Analytical Results to Hemlock Study

APPENDIX F

Analytical Results Comparison to Hemlock Study

Parameter	USEPA Results (1984) Range	Hemlock Study Results 9/ (1979-1980) Range
Arsenic (ppb)	ND/5-17	ND/5-19
Cadmium (ppb)	ND	ND/1-1.2
Lead (ppb)	ND/2-17.5	0.95-18
Calcium (ppm)	18.1-86.5	29-160
Sodium (ppm)	16.1-899	49-1175
Bromide (ppm)	ND/2-3	ND/0.01-0.82
Chloride (ppm)	4.4-1100	19-1550
Fluoride (ppm)	0.24-2.7	ND/0.1-2
Iodide (ppm)	ND/2-4.5	0.0007-0.01
Purgeable Organics	methylene chloride (ND-17) tetrachloroethene (ND-4) toluene (ND-1) acetone (ND-17)	Methylene chloride and toluene were detected in several samples attributed to laboratory or field contamination.
Nonpurgeable Organics	1,2-dichlorobenzene (14) 1,3-dichlorobenzene (<10) bis(2-ethylhexyl) phthalate (6-7) di-n-butyl phthalate (2-6) phenol (ND-3)	Bis(2-ethylhexyl) phthalate diethyl phthalate found in one sample.
Pesticides/PCBs	ND	ND

Appendix G

Summary of Literature Review of Brine Analyses

Table G-1

Comparison of Concentration of Light Aromatic Hydrocarbons Found in Brines by Recent Studies

Compound	USEPA Screening Survey Dow Chemical Raw Brines (1984)		MDNR Oil Field Brine Study (1984)		USEPA Verification Study for 30 Platforms		Buccaneer Field Gulf of Mexico (Brooks, et.al., 1980)		Seven Facilities Gulf of Mexico (Lysyj, et.al., 1982)		Three Facilities Alaskan Waters (Lysyj, et.al., 1982)	
Aromatic Hydrocarbons	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Benzene	475	390-580	1131	7.6-6900	2977	2-12150	9500	5600-17700	1100	400-2400	5500	3700-6500
Toluene	210	130-280	590	ND-3300	2007	60-19800	4575	2600-8500	800	400-2100	2700	1900-3400
Xylenes	59	ND-110	369	ND-1400								
Ethylbenzene	10	ND-25	68	ND-470	431	6-6010	533	220-1100	NS	--	NS	--
Naphthalene	--	ND		Trace	187	19-1454	NS	--	27	ND-44	NS	--
m,p-Xylene							1043	500-1900	NS	--	NS	--
Xylenes/ethylbenzene							NS	--	300	200-300	900	500-1300

Notes: ND = Not detected.
NS = Not sampled.

Table G-2

Comparison of Heavy Metals Concentrations
Found in Brines by Recent Studies
(ppb)

Metal	USEPA Screening Survey Dow Chemical Raw Brines		MDNR Oil Field Brine Study (1984)		USEPA Verification Study for 30 Platforms		Multi-Platform Study Gulf of Mexico (Lysyj, et.al., 1982)	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Cadmium	11	10-12	--	ND	5.1	ND-98	48.3[a]	39-56
Copper	21[a]	ND-83	783	<500-1700	81.9	ND-1455	124.7	100-137
Lead	--	ND	638	<50-800	115.7	ND-5700	597	160-915
Nickel	226	154-273	400	<500-700	25.9	ND-276	1195[a]	68-1674
Silver	12[a]	ND-36			8.1	ND-107	111[a]	72-108
Zinc	57	12-140	2066	<50-600	168	5-519	351[a]	190-640

Notes: a = Mean includes only detected concentrations.
ND = Not detected.

Table G-3

Comparison of Other Priority Pollutants
Found in Brines by Recent Studies

USEPA Screening Survey - Dow Chemical Raw Brines:

Phenol	10-35 ppb
4-Methylphenol	2-5 ppb

MDNR Oil Field Brine Study (1984):

Trace amounts of polynuclear aromatics detected included:

- Acenaphthylene
- Chrysene
- Naphthalene
- Phenanthrene
- Pyrene

Detected phenols included:

Phenol	(low ug/l range)
4-Nitrophenol	(low ug/l range)

USEPA Verification Study for 30 Platforms:

	Mean	Range
2,4-Dimethyl phenol	200	ND-3504
Phenol	2343	65-20812

Appendix H

Split Sample Results

Split Sample Analytical Results
Dow Chemical Brine Operation

(Samples taken August 13-14, 1984)
(Analyses in parts per billion (ppb) unless otherwise indicated.)

	Raw Brine North		Raw Brine Combined		Raw Brine South		Filtered Brine	
	Dow	USEPA	Dow	USEPA	Dow	USEPA	Dow	USEPA
Sodium	2.6%	NA	2.6%	NA	2.5%	NA	2.4%	NA
Calcium	6.4%	NA	7.2%	NA	7.7%	NA	6.8%	NA
Magnesium	4.6%	NA	4.8%	NA	5.3%	NA	4.6%	NA
Chloride	17.6%	27.4%	18.0%	22.6%	20.2%	24.8%	17.6%	23.3%
Sulfate (ppm)	ND (50)	25	100	ND (5)	ND (50)	ND (5)	131	5.5
Antimony "	ND (.1)	ND (.02)	ND (.1)	ND (.02)	ND (.1)	ND (.02)	ND (.1)	ND (.02)
Arsenic "	ND (.01)	ND (.01)	ND (.01)	ND (.01)	ND (.01)	ND (.01)	ND (.01)	ND (.01)
Beryllium "	ND (1)	ND (.005)	ND (1)	ND (.005)	ND (1)	0.005	ND (1)	0.006
Cadmium "	0.01	0.01	0.02	0.01	ND (.01)	0.012	ND (.01)	0.015
Chromium "	ND (1)	ND (.01)	ND (1)	ND (.01)	ND (1)	ND (.01)	ND (1)	ND (.01)
Copper "	ND (.1)	ND (.05)	ND (.1)	ND (.05)	ND (.1)	ND (.05)	ND (.1)	ND (.05)
Lead "	ND (.6)	ND (.005)	ND (.6)	ND (.005)	ND (.6)	ND (.005)	ND (.6)	ND (.005)
Mercury "	ND (.05)	ND (.002)	ND (.05)	ND (.002)	ND (.05)	ND (.002)	ND (.05)	ND (.002)
Nickel "	0.05	0.154	ND (.05)	0.230	0.61	0.248	ND (.05)	0.290
Selenium "	ND (.001)	ND (.002)	ND (.001)	ND (.002)	ND (.001)	ND (.002)	ND (.001)	ND (.002)
Thallium "	0.30	0.026	0.35	ND (.01)	0.35	0.054	0.30	0.142
Zinc "	0.63	0.140	0.51	0.012	0.23	0.022	0.33	0.019
Boron "	38	NA	40	NA	36	NA	35	NA
Cobalt "	ND (.02)	ND (.05)	ND (.02)	ND (.05)	ND (.02)	ND (.05)	ND (.02)	ND (.05)
Iron "	25	ND (.05)	21	2.18	16	5.05	1.2	0.532
Molybdenum "	ND (.01)	NA	ND (.01)	NA	ND (.1)	NA	ND (.1)	NA
Tin "	ND (.2)	ND (.02)	ND (.2)	0.233	ND (.2)	0.068	ND (.2)	0.350
Lithium "	67	NA	62	NA	63	NA	59	NA
Methyl chloride	NQ (90)	NA	NQ (90)	NA	NQ (90)	NA	NA	NA
Methyl bromide	NQ (12)	NA	NQ (12)	NA	NQ (12)	NA	NA	NA
Vinyl chloride	NQ (12)	ND (10)	NQ (12)	ND (10)	NQ (12)	ND (10)	NA	ND (1)
Ethyl chloride	NQ (24)	NA	NQ (24)	NA	NQ (24)	NA	NA	NA

Split Sample Analytical Results
Dow Chemical Brine Operation

(Samples taken August 13-14, 1984)
(Analyses in parts per billion (ppb) unless otherwise indicated.)

	Production Well #29			TH-18		
	Dow	USEPA	MDNR	Dow	USEPA	MDNR
Sodium	2.3%	NA	NA	300,000	NA	NA
Calcium	7.7%	NA	NA	620,000	NA	NA
Magnesium	5.5%	NA	NA	118,000	NA	NA
Chloride	20.8%	27.1%	NA	1,917,000	2,850,000	NA
Sulfate (ppm)	ND (50)	ND (5)	NA	14	23.6	NA
Antimony "	ND (.1)	ND (.02)	ND (.05)	ND (.1)	ND (.02)	ND (.05)
Arsenic "	ND (.01)	ND (.01)	ND (.05)	ND (.01)	ND (.01)	ND (.05)
Beryllium "	ND (1)	ND (.005)	ND (.02)	0.02	0.012	ND (.02)
Cadmium "	ND (.01)	0.012	ND (.01)	0.08	ND (.001)	ND (.01)
Chromium "	ND (1)	ND (.01)	ND (.05)	0.5	0.015	0.070
Copper "	ND (.1)	0.083	0.160	0.09	ND (.05)	ND (.10)
Lead "	ND (.6)	ND (.005)	0.270	1.3	0.02	ND (.05)
Mercury "	ND (.05)	ND (.002)	ND (.0002)	ND (.002)	ND (.0002)	ND (.0002)
Nickel "	ND (.05)	0.273	ND (.10)	0.16	ND (.04)	ND (.10)
Selenium "	ND (.001)	ND (.002)	0.043	ND (.001)	ND (.002)	ND (0.01)
Thallium "	0.9	0.024	ND (.05)	0.075	ND (0.01)	ND (.05)
Zinc "	0.18	0.053	0.270	0.7	0.050	0.070
Boron "	40	NA	NA	3.6	NA	NA
Cobalt "	ND (.02)	ND (.05)	NA	0.14	ND (.05)	NA
Iron "	11	5.84	NA	20	18.8	NA
Molybdenum "	ND (.1)	NA	NA	0.57	NA	NA
Tin "	ND (.2)	0.175	NA	1.7	0.038	NA
Lithium "	73	NA	NA	0.16	NA	NA
Methyl chloride	NQ (90)	NA	NA	NQ (90)	NA	NA
Methyl bromide	NQ (12)	NA	NA	NQ (12)	NA	NA
Vinyl chloride	NQ (12)	ND (10)	ND (10)	NQ (12)	ND (1)	ND (10)
Ethyl chloride	NQ (24)	NA	NA	NQ (24)	NA	NA

Split Sample Analytical Results
Dow Chemical Brine Operation

(Samples taken August 13-14, 1984)
(Analyses in parts per billion (ppb) unless otherwise indicated.)

	Raw Brine North		Raw Brine Combined		Raw Brine South		Filtered Brine	
	Dow	USEPA	Dow	USEPA	Dow	USEPA	Dow	USEPA
Methylene chloride	10	59A*	5	32A*	8	49A*	NA	2A*
Acrylonitrile	NQ (6)	ND (100)	NQ (6)	ND (100)	NQ (6)	ND (100)	NA	ND (10)
1,1-Dichloroethene	NQ (2)	ND (10)	NQ (2)	ND (10)	NQ (2)	ND (10)	NA	ND (1)
1,1-Dichloroethane	NQ (2)	ND (10)	NQ (2)	ND (10)	NQ (2)	ND (10)	NA	ND (1)
1,2-t-Dichloroethene	NQ (3)	ND (10)	NQ (3)	ND (10)	NQ (3)	ND (10)	NA	ND (1)
Chloroform	NQ (1)	ND (10)	NQ (1)	ND (10)	NQ (1)	ND (10)	NA	ND (1)
1,2-Dichloroethane	NQ (12)	ND (10)	NQ (12)	ND (10)	NQ (12)	ND (10)	NA	ND (1)
1,1,1-Trichloroethane	NQ (2)	ND (10)	NQ (2)	ND (10)	NQ (2)	35A	NA	ND (1)
Carbon tetrachloride	NQ (2)	ND (10)	NQ (2)	ND (10)	NQ (2)	ND (10)	NA	ND (1)
Bromodichloromethane	NQ (2)	ND (10)	NQ (2)	ND (10)	NQ (2)	ND (10)	NA	ND (1)
1,2-Dichloropropane	NQ (3)	ND (10)	NQ (3)	ND (10)	NQ (3)	ND (10)	NA	ND (1)
1,3-t-Dichloropropene	NQ (2)	ND (10)	NQ (2)	ND (10)	NQ (2)	ND (10)	NA	ND (1)
Trichloroethene	NQ (2)	57A	NQ (2)	14A	NQ (2)	150	NA	ND (1)
Dibromochloromethane	NQ (2)	ND (10)	NQ (2)	ND (10)	NQ (2)	ND (10)	NA	ND (1)
Benzene	380	580	520	530	270	400	NA	ND (1)
1,1,2-Trichloroethane	NQ (3)	ND (10)	NQ (3)	ND (10)	NQ (3)	ND (10)	NA	ND (1)
1,3-c-Dichloropropene	NQ (3)	ND (10)	NQ (3)	ND (10)	NQ (3)	ND (10)	NA	ND (1)
Bromoform	NQ (18)	ND (10)	NQ (18)	ND (10)	NQ (18)	ND (10)	NA	3A
Tetrachloroethene	NQ (6)	71A	NQ (6)	ND (10)	NQ (6)	170	NA	3A
1,1,2,2-Tetrachloroethane	NQ (6)	ND (10)	NQ (6)	ND (10)	NQ (6)	ND (10)	NA	ND (1)
Toluene	140	270	150	130	83	280	NA	ND (1)
Chlorobenzene	NQ (2)	ND (10)	NQ (2)	ND (10)	NQ (2)	ND (10)	NA	ND (1)
Ethyl benzene	NQ (6)	16A	7	ND (10)	NQ (6)	25A	NA	ND (1)
Acenaphthylene	NQ (1)	ND (2)	NQ (1)	ND (4)	NQ (1)	ND (2)	NQ (1)	ND (10)
Acenaphthene	NQ (1)	ND (2)	NQ (1)	ND (4)	NQ (1)	ND (2)	NQ (1)	ND (10)
Fluorene	NQ (1)	ND (2)	NQ (1)	ND (4)	NQ (1)	ND (2)	NQ (1)	ND (10)
Phenanthrene	NQ (1)	ND (2)	NQ (1)	ND (4)	NQ (1)	ND (2)	NQ (1)	ND (10)
Anthracene	NQ (1)	ND (2)	NQ (1)	ND (4)	NQ (1)	ND (2)	NQ (1)	ND (10)

Split Sample Analytical Results
Dow Chemical Brine Operation

(Samples taken August 13-14, 1984)
(Analyses in parts per billion (ppb) unless otherwise indicated.)

	Production Well #29			TH-18		
	Dow	USEPA	MDNR	Dow	USEPA	MDNR
Methylene chloride	3	88A*	ND (10)	NQ (2)	24*	ND (10)
Acrylonitrile	NQ (6)	ND (100)	ND (100)	NQ (6)	ND (10)	ND (100)
1,1-Dichloroethene	NQ (2)	ND (10)	NA	NQ (2)	ND (1)	NA
1,1-Dichloroethane	NQ (2)	ND (10)	ND (10)	NQ (2)	ND (1)	ND (10)
1,2-t-Dichloroethene	NQ (3)	ND (10)	ND (10)	NQ (3)	ND (1)	ND (10)
Chloroform	NQ (1)	ND (10)	ND (10)	NQ (1)	ND (1)	ND (10)
1,2-Dichloroethane	NQ (12)	ND (10)	ND (10)	NQ (12)	ND (1)	ND (10)
1,1,1-Trichloroethane	NQ (2)	ND (10)	ND (10)	NQ (2)	ND (1)	ND (10)
Carbon tetrachloride	NQ (2)	ND (10)	ND (10)	NQ (2)	ND (1)	ND (10)
Bromodichloromethane	NQ (2)	ND (10)	ND (10)	NQ (2)	ND (1)	ND (10)
1,2-Dichloropropane	NQ (3)	ND (10)	ND (10)	NQ (3)	ND (1)	ND (10)
1,3-t-Dichloropropene	NQ (2)	ND (10)	ND (10)	NQ (2)	ND (1)	ND (10)
Trichloroethene	NQ (2)	39A	ND (10)	NQ (2)	ND (1)	ND (10)
Dibromochloromethane	NQ (2)	ND (10)	ND (10)	NQ (2)	ND (1)	ND (10)
Benzene	220	390	140	NQ (.6)	ND (1)	ND (10)
1,1,2-Trichloroethane	NQ (3)	ND (10)	ND (10)	NQ (3)	ND (1)	ND (10)
1,3-c-Dichloropropene	NQ (3)	ND (10)	ND (10)	NQ (3)	ND (1)	ND (10)
Bromoform	NQ (18)	ND (10)	ND (10)	NQ (18)	ND (1)	ND (10)
Tetrachloroethene	NQ (6)	64A	ND (10)	NQ (6)	12	ND (10)
1,1,2,2-Tetrachloroethane	NQ (6)	ND (10)	ND (10)	NQ (6)	ND (1)	ND (10)
Toluene	53	160	30	NQ (2)	ND (1)	ND (10)
Chlorobenzene	NQ (2)	ND (10)	ND (10)	NQ (2)	ND (1)	ND (10)
Ethyl benzene	NQ (6)	ND (10)	ND (10)	NQ (6)	ND (1)	ND (10)
Acenaphthylene	NQ (1)	ND (2)	ND (10)	NQ (1)	ND (2)	ND (10)
Acenaphthene	NQ (1)	ND (2)	ND (10)	NQ (1)	ND (2)	ND (10)
Fluorene	NQ (1)	ND (2)	ND (10)	NQ (1)	ND (2)	ND (10)
Phenanthrene	NQ (1)	ND (2)	ND (10)	NQ (1)	ND (2)	ND (10)
Anthracene	NQ (1)	ND (2)	ND (10)	NQ (1)	ND (2)	ND (10)

Split Sample Analytical Results
Dow Chemical Brine Operation

(Samples taken August 13-14, 1984)
(Analyses in parts per billion (ppb) unless otherwise indicated.)

	Raw Brine North		Raw Brine Combined		Raw Brine South		Filtered Brine	
	Dow	USEPA	Dow	USEPA	Dow	USEPA	Dow	USEPA
Fluoranthrene	NQ (1)	ND (2)	NQ (1)	ND (4)	NQ (1)	ND (2)	NQ (1)	ND (10)
Pyrene	NQ (2)	ND (2)	NQ (2)	ND (4)	NQ (2)	ND (2)	NQ (2)	ND (10)
Chrysene	NQ (2)	ND (2)	NQ (2)	ND (4)	NQ (2)	ND (2)	NQ (2)	ND (10)
Benzo(a) anthracene	NQ (1)	ND (2)	NQ (1)	ND (4)	NQ (1)	ND (2)	NQ (1)	ND (10)
Benzo(a) pyrene	NQ (6)	ND (2)	NQ (6)	ND (4)	NQ (6)	ND (2)	NQ (6)	ND (10)
3,4-Benzofluoranthrene	NQ (4)	NA	NQ (4)	NA	NQ (4)	NA	NQ (4)	NA
Benzo(g,h,i) perylene	NQ (20)	ND (2)	NQ (20)	ND (4)	NQ (20)	ND (2)	NQ (20)	ND (10)
Indeno(1,2,3-cd) pyrene	NQ (45)	ND (2)	NQ (45)	ND (4)	NQ (45)	ND (2)	NQ (45)	ND (10)
Dibenzo(a,h) anthracene	NQ (6)	ND (2)	NQ (6)	ND (4)	NQ (6)	ND (2)	NQ (6)	ND (10)
4,6-Dinitro-o-cresol	NQ (7)	NA	NQ (7)	NA	NQ (7)	NA	NQ (7)	NA
2,6-Dinitrotoluene	NQ (6)	ND (2)	NQ (6)	ND (4)	NQ (6)	ND (2)	NQ (6)	ND (10)
PCBs-dichloro	NQ (1)	NA	NQ (1)	NA	NQ (1)	NA	NQ (1)	NA
PCBs-trichloro	NQ (1)	NA	NQ (1)	NA	NQ (1)	NA	NQ (1)	NA
PCBs-tetrachloro	NQ (1)	NA	NQ (1)	NA	NQ (1)	NA	NQ (1)	NA
PCBs-pentachloro	NQ (2)	NA	NQ (2)	NA	NQ (2)	NA	NQ (2)	NA
PCBs-hexachloro	NQ (1)	NA	NQ (1)	NA	NQ (1)	NA	NQ (1)	NA
Alpha-BHC	NQ (6)	NR	NQ (6)	NR	NQ (6)	NR	NQ (6)	ND (.5)
Beta-BHC	NQ (6)	NR	NQ (6)	NR	NQ (6)	NR	NQ (6)	ND (.5)
Heptachlor	NQ (3)	NR	NQ (3)	NR	NQ (3)	NR	NQ (3)	ND (.1)
Aldrin	NQ (5)	NR	NQ (5)	NR	NQ (5)	NR	NQ (5)	ND (.1)
Heptachlor epoxide	NQ (3)	NR	NQ (3)	NR	NQ (3)	NR	NQ (3)	ND (.1)
4,4'-DDE	NQ (4)	NR	NQ (4)	NR	NQ (4)	NR	NQ (4)	ND (.1)
4,4'-DDD	NQ (3)	NR	NQ (3)	NR	NQ (3)	NR	NQ (3)	ND (.1)
DDT	NQ (3)	NA	NQ (3)	NA	NQ (3)	NA	NQ (3)	NA
Chlordane	NQ (24)	NR	NQ (24)	NR	NQ (24)	NR	NQ (24)	ND (1.0)
Dieldrin	NQ (6)	NR	NQ (6)	NR	NQ (6)	NR	NQ (6)	ND (.1)
Endrin	NQ (16)	NR	NQ (16)	NR	NQ (16)	NR	NQ (16)	ND (.1)
Endosulfan sulfate	NQ (9)	NR	NQ (9)	NR	NQ (9)	NR	NQ (9)	ND (.1)

Split Sample Analytical Results
Dow Chemical Brine Operation

(Samples taken August 13-14, 1984)
(Analyses in parts per billion (ppb) unless otherwise indicated.)

	Production Well #29			TH-18		
	Dow	USEPA	MDNR	Dow	USEPA	MDNR
Fluoranthrene	NQ (1)	ND (2)	ND (10)	NQ (1)	ND (2)	ND (10)
Pyrene	NQ (2)	ND (2)	ND (10)	NQ (2)	ND (2)	ND (10)
Chrysene	NQ (2)	ND (2)	ND (10)	NQ (2)	ND (2)	ND (10)
Benzo(a) anthracene	NQ (1)	ND (2)	ND (10)	NQ (1)	ND (2)	ND (10)
Benzo(a) pyrene	NQ (6)	ND (2)	ND (10)	NQ (6)	ND (2)	ND (10)
3,4-Benzofluoranthrene	NQ (4)	NA	NA	NQ (4)	NA	NA
Benzo(g,h,i) perylene	NQ (20)	ND (2)	ND (25)	NQ (20)	ND (2)	ND (25)
Indeno(1,2,3-cd) pyrene	NQ (45)	ND (2)	ND (25)	NQ (45)	ND (2)	ND (25)
Dibenzo(a,h) anthracene	NQ (6)	ND (2)	ND (25)	NQ (6)	ND (2)	ND (25)
4,6-Dinitro-o-cresol	NQ (7)	NA	ND (250)	NQ (7)	NA	ND (250)
2,6-Dinitrotoluene	NQ (6)	ND (2)	ND (10)	NQ (6)	ND (2)	ND (10)
PCBs-dichloro	NQ (1)	NA	NA	NQ (1)	NA	NA
PCBs-trichloro	NQ (1)	NA	NA	NQ (1)	NA	NA
PCBs-tetrachloro	NQ (1)	NA	NA	NQ (1)	NA	NA
PCBs-pentachloro	NQ (2)	NA	NA	NQ (2)	NA	NA
PCBs-hexachloro	NQ (1)	NA	NA	NQ (1)	NA	NA
Alpha-BHC	NQ (6)	NR	ND (10)	NQ (6)	ND (.1)	ND (10)
Beta-BHC	NQ (6)	NR	ND (10)	NQ (6)	ND (.1)	ND (10)
Heptachlor	NQ (3)	NR	ND (10)	NQ (3)	ND (.1)	ND (10)
Aldrin	NQ (5)	NR	ND (10)	NQ (5)	ND (.1)	ND (10)
Heptachlor epoxide	NQ (3)	NR	ND (10)	NQ (3)	ND (.1)	ND (10)
4,4'-DDE	NQ (4)	NR	ND (10)	NQ (4)	ND (.1)	ND (10)
4,4'-DDD	NQ (3)	NR	ND (10)	NQ (3)	ND (.1)	ND (10)
DDT	NQ (3)	NA	NA	NQ (3)	NA	NA
Chlordane	NQ (24)	NR	ND (10)	NQ (24)	ND (1.0)	ND (10)
Dieldrin	NQ (6)	NR	ND (10)	NQ (6)	ND (.1)	ND (10)
Endrin	NQ (16)	NR	ND (10)	NQ (16)	ND (.1)	ND (10)
Endosulfan sulfate	NQ (9)	NR	ND (10)	NQ (9)	ND (.1)	ND (10)

Split Sample Analytical Results
Dow Chemical Brine Operation

(Samples taken August 13-14, 1984)
(Analyses in parts per billion (ppb) unless otherwise indicated.)

	Raw Brine North		Raw Brine Combined		Raw Brine South		Filtered Brine	
	Dow	USEPA	Dow	USEPA	Dow	USEPA	Dow	USEPA
Endrin aldehyde	NQ (9)	NR	NQ (9)	NR	NQ (9)	NR	NQ (9)	ND (.1)
Hexachloroethane	NQ (7)	ND (2)	NQ (7)	ND (4)	NQ (7)	ND (2)	NQ (7)	ND (10)
Isophorone	NQ (2)	ND (2)	NQ (2)	ND (4)	NQ (2)	ND (2)	NQ (2)	ND (10)
N-Nitrosodiphenylamine	NQ (3)	ND (2)	NQ (3)	ND (4)	NQ (3)	ND (2)	NQ (3)	ND (10)
N-Nitroso-n-propylamine	NQ (3)	ND (2)	NQ (3)	ND (4)	NQ (3)	ND (2)	NQ (3)	ND (10)
Phenol	7	27	22	16A	14	35	NQ (3)	ND (10)
Bis(2-chloroisopropyl)ether	NQ (4)	ND (2)	NQ (4)	ND (4)	NQ (4)	ND (2)	NQ (4)	ND (10)
2(Chloroethoxy) methane	NQ (3)	NR	NQ (3)	NR	NQ (3)	NR	NQ (3)	NR
Bis(2-chloroethyl) ether	NQ (2)	ND (2)	NQ (2)	ND (4)	NQ (2)	ND (2)	NQ (2)	ND (10)
2-Chlorophenol	NQ (3)	ND (2)	NQ (3)	ND (4)	NQ (3)	ND (2)	NQ (3)	ND (10)
Naphthalene	NQ (1)	ND (2)	NQ (1)	ND (4)	NQ (1)	ND (2)	NQ (1)	ND (10)
2-Nitrophenol	NQ (6)	ND (2)	NQ (6)	ND (4)	NQ (6)	ND (2)	NQ (6)	ND (10)
4-Nitrophenol	NQ (4)	ND (2)	NQ (4)	ND (4)	NQ (4)	ND (2)	NQ (4)	ND (10)
1,2-Dichlorobenzene	NQ (3)	ND (2)	NQ (3)	ND (4)	NQ (3)	ND (2)	NQ (3)	14A
1,4-Dichlorobenzene	NQ (3)	ND (2)	NQ (3)	ND (4)	NQ (3)	ND (2)	NQ (3)	ND (10)
1,3-Dichlorobenzene	NQ (3)	ND (2)	NQ (3)	ND (4)	NQ (3)	ND (2)	NQ (3)	ND (10)
Nitrobenzene	NQ (2)	ND (2)	NQ (2)	ND (4)	NQ (2)	ND (2)	NQ (2)	ND (10)
2,4,6-Trichlorophenol	NQ (3)	ND (2)	NQ (3)	ND (4)	NQ (3)	ND (2)	NQ (3)	ND (10)
2,4-Dimethylphenol	NQ (2)	ND (2)	NQ (2)	ND (4)	NQ (2)	ND (2)	NQ (2)	ND (10)
1,2,4-Trichlorobenzene	NQ (3)	ND (2)	NQ (3)	ND (4)	NQ (3)	ND (2)	NQ (3)	ND (10)
2,4-Dichlorophenol	NQ (4)	ND (2)	NQ (4)	ND (4)	NQ (4)	ND (2)	NQ (4)	ND (10)
Hexachlorobutadiene	NQ (1)	ND (2)	NQ (1)	ND (4)	NQ (1)	ND (2)	NQ (1)	ND (10)
2-Chloronaphthalene	NQ (1)	ND (2)	NQ (1)	ND (4)	NQ (1)	ND (2)	NQ (1)	ND (10)
Dimethylphthalate	NQ (3)	ND (2)	NQ (3)	ND (4)	NQ (3)	ND (2)	NQ (3)	ND (10)
4-Chloro-3-methylphenol	NQ (4)	ND (2)	NQ (4)	ND (4)	NQ (4)	ND (2)	NQ (4)	ND (10)
Pentachlorophenol	NQ (3)	ND (2)	NQ (3)	ND (4)	NQ (3)	ND (2)	NQ (3)	ND (10)
2,4-Dinitrotoluene	NQ (3)	ND (2)	NQ (3)	ND (4)	NQ (3)	ND (2)	NQ (3)	ND (10)
1-Chloro-4-phenoxybenzene	NQ (1)	NA	NQ (1)	NA	NQ (1)	NA	NQ (1)	NA

Split Sample Analytical Results
Dow Chemical Brine Operation

(Samples taken August 13-14, 1984)
(Analyses in parts per billion (ppb) unless otherwise indicated.)

	Production Well #29			TH-18		
	Dow	USEPA	MDNR	Dow	USEPA	MDNR
Endrin aldehyde	NQ (9)	NR	ND (10)	NQ (9)	ND (.1)	ND (10)
Hexachloroethane	NQ (7)	ND (2)	ND (10)	NQ (7)	ND (2)	ND (10)
Isophorone	NQ (2)	ND (2)	ND (10)	NQ (2)	ND (2)	ND (10)
N-Nitrosodiphenylamine	NQ (3)	ND (2)	ND (10)	NQ (3)	ND (2)	ND (10)
N-Nitroso-n-propylamine	NQ (3)	ND (2)	ND (10)	NQ (3)	ND (2)	ND (10)
Phenol	21	24	ND (25)	NQ (3)	ND (2)	ND (25)
Bis(2-chloroisopropyl)ether	NQ (4)	ND (2)	ND (10)	NQ (4)	ND (2)	ND (10)
2(Chloroethoxy) methane	NQ (3)	NR	NA	NQ (3)	NR	NA
Bis(2-chloroethyl) ether	NQ (2)	ND (2)	ND (10)	NQ (2)	ND (2)	ND (10)
2-Chlorophenol	NQ (3)	ND (2)	ND (25)	NQ (3)	ND (2)	ND (25)
Naphthalene	NQ (1)	ND (2)	ND (10)	NQ (1)	ND (2)	ND (10)
2-Nitrophenol	NQ (6)	ND (2)	ND (25)	NQ (6)	ND (2)	ND (25)
4-Nitrophenol	NQ (4)	ND (2)	ND (25)	NQ (4)	ND (2)	ND (25)
1,2-Dichlorobenzene	NQ (3)	ND (2)	ND (10)	NQ (3)	ND (2)	ND (10)
1,4-Dichlorobenzene	NQ (3)	ND (2)	ND (10)	NQ (3)	ND (2)	ND (10)
1,3-Dichlorobenzene	NQ (3)	ND (2)	ND (10)	NQ (3)	ND (2)	ND (10)
Nitrobenzene	NQ (2)	ND (2)	ND (10)	NQ (2)	ND (2)	ND (10)
2,4,6-Trichlorophenol	NQ (3)	ND (2)	ND (25)	NQ (3)	ND (2)	ND (25)
2,4-Dimethylphenol	NQ (2)	ND (2)	ND (25)	NQ (2)	ND (2)	ND (25)
1,2,4-Trichlorobenzene	NQ (3)	ND (2)	ND (10)	NQ (3)	ND (2)	ND (10)
2,4-Dichlorophenol	NQ (4)	ND (2)	ND (25)	NQ (4)	ND (2)	ND (25)
Hexachlorobutadiene	NQ (1)	ND (2)	ND (10)	NQ (1)	ND (2)	ND (10)
2-Chloronaphthalene	NQ (1)	ND (2)	ND (10)	NQ (1)	ND (2)	ND (10)
Dimethylphthalate	NQ (3)	ND (2)	ND (10)	NQ (3)	ND (2)	ND (10)
4-Chloro-3-methylphenol	NQ (4)	ND (2)	NA	NQ (4)	ND (2)	NA
Pentachlorophenol	NQ (3)	ND (2)	ND (25)	NQ (3)	ND (2)	ND (25)
2,4-Dinitrotoluene	NQ (3)	ND (2)	ND (10)	NQ (3)	ND (2)	ND (10)
1-Chloro-4-phenoxybenzene	NQ (1)	NA	NA	NQ (1)	NA	NA

Split Sample Analytical Results
Dow Chemical Brine Operation

(Samples taken August 13-14, 1984)
(Analyses in parts per billion (ppb) unless otherwise indicated.)

	Raw Brine North		Raw Brine Combined		Raw Brine South		Filtered Brine	
	Dow	USEPA	Dow	USEPA	Dow	USEPA	Dow	USEPA
1-Bromophenoxybenzene	NQ (1)	NA	NQ (1)	NA	NQ (1)	NA	NQ (1)	NA
Diethylphthalate	NQ (3)	ND (2)	NQ (3)	ND (4)	NQ (3)	ND (2)	188	ND (10)
Dibutylphthalate	NQ (1)	NA	NQ (1)	NA	NQ (1)	NA	6	NA
Butylbenzylphthalate	NQ (4)	ND (2)	NQ (4)	ND (4)	NQ (4)	ND (2)	NQ (4)	ND (10)
Di-n-octylphthalate	NQ (5)	ND (2)	NQ (5)	ND (4)	NQ (5)	ND (2)	NQ (5)	ND (10)
Hexachlorobenzene	NQ (1)	ND (2)	NQ (1)	ND (4)	NQ (1)	ND (2)	NQ (1)	ND (10)
Hexachlorocyclopentadiene	NQ (1)	ND (2)	NQ (1)	ND (4)	NQ (1)	ND (2)	NQ (1)	ND (10)
2,4-Dinitrophenol	NQ (8)	ND (2)	NQ (8)	ND (4)	NQ (8)	ND (2)	NQ (8)	ND (10)
Bis-ethylhexylphthalate	522	NA	514	NA	337	NA	129	NA
Silver	NA	36	NA	ND (10)	NA	ND (10)	NA	ND (10)
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	ND (10)	NA	ND (10)	NA	ND (10)	NA	ND (1)
Chloroethane	NA	ND (10)	NA	ND (10)	NA	ND (10)	NA	ND (1)
Bromomethane	NA	ND (10)	NA	ND (10)	NA	ND (10)	NA	ND (1)
Acrolein	NA	ND (100)	NA	ND (100)	NA	ND (100)	NA	ND (10)
Trichlorofluoromethane	NA	ND (10)	NA	ND (10)	NA	ND (10)	NA	ND (1)
1,1-Dichloroethylene	ND (2)	ND (10)	ND (2)	ND (10)	ND (2)	ND (10)	NA	ND (1)
1-Chloroethyl vinyl ether	NA	ND (100)	NA	ND (100)	NA	ND (100)	NA	ND (10)
Phenols (total)	NA	NA	NA	NA	NA	NA	NA	NA
P-chloro-m-cresol	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy) methane	NA	ND (2)	NA	ND (4)	NA	ND (2)	NA	ND (10)
4-Chlorophenyl phenyl ether	NA	ND (2)	NA	ND (4)	NA	ND (2)	NA	ND (10)
1,2-Diphenylhydrazine	NA	ND (2)	NA	ND (4)	NA	ND (2)	NA	ND (10)
4-Bromophenyl phenyl ether	NA	ND (2)	NA	ND (4)	NA	ND (2)	NA	ND (10)
Benzidine	NA	ND (2)	NA	ND (4)	NA	ND (2)	NA	ND (10)
3,3'-Dichlorobenzidine	NA	ND (2)	NA	ND (4)	NA	ND (2)	NA	ND (10)
Benzo(b) fluoranthene	NA	ND (2)	NA	ND (4)	NA	ND (2)	NA	ND (10)
Benzo(k) fluoranthene	NA	ND (2)	NA	ND (4)	NA	ND (2)	NA	ND (10)

Split Sample Analytical Results
Dow Chemical Brine Operation

(Samples taken August 13-14, 1984)
(Analyses in parts per billion (ppb) unless otherwise indicated.)

	Production Well #29			TH-18		
	Dow	USEPA	MDNR	Dow	USEPA	MDNR
1-Bromophenoxybenzene	NQ (1)	NA	NA	NQ (1)	NA	NA
Diethylphthalate	NQ (3)	ND (2)	ND (10)	NQ (3)	ND (2)	ND (10)
Dibutylphthalate	NQ (1)	NA	ND (10)	5	NA	ND (10)
Butylbenzylphthalate	NQ (4)	ND (2)	ND (10)	NQ (4)	ND (2)	ND (10)
Di-n-octylphthalate	NQ (5)	ND (2)	ND (10)	NQ (5)	ND (2)	ND (10)
Hexachlorobenzene	NQ (1)	ND (2)	ND (10)	NQ (1)	ND (2)	ND (10)
Hexachlorocyclopentadiene	NQ (1)	ND (2)	ND (10)	NQ (1)	ND (2)	ND (10)
2,4-Dinitrophenol	NQ (8)	ND (2)	ND (250)	NQ (8)	ND (2)	ND (250)
Bis-ethylhexylphthalate	158	NA	NA	182	NA	NA
Silver	NA	12	ND (50)	NA	ND (10)	ND (50)
Cyanide	NA	NA	ND (10)	NA	NA	22
Chloromethane	NA	ND (10)	ND (10)	NA	ND (1)	ND (10)
Chloroethane	NA	ND (10)	ND (10)	NA	ND (1)	ND (10)
Bromomethane	NA	ND (10)	ND (10)	NA	ND (1)	ND (10)
Acrolein	NA	ND (100)	ND (100)	NA	ND (10)	ND (100)
Trichlorofluoromethane	NA	ND (10)	ND (10)	NA	ND (1)	ND (10)
1,1-Dichloroethylene	ND (2)	ND (10)	ND (10)	ND (2)	ND (10)	ND (10)
1-Chloroethyl vinyl ether	NA	ND (100)	ND (10)	NA	ND (10)	ND (10)
Phenols (total)	NA	NA	6800	NA	NA	58
P-chloro-m-cresol	NA	NA	ND (25)	NA	NA	ND (25)
Bis(2-chloroethoxy) methane	NA	ND (2)	ND (10)	NA	ND (2)	ND (10)
4-Chlorophenyl phenyl ether	NA	ND (2)	ND (10)	NA	ND (2)	ND (10)
1,2-Diphenylhydrazine	NA	ND (2)	ND (10)	NA	ND (2)	ND (10)
4-Bromophenyl phenyl ether	NA	ND (2)	ND (10)	NA	ND (2)	ND (10)
Benzidine	NA	ND (2)	ND (10)	NA	ND (2)	ND (10)
3,3'-Dichlorobenzidine	NA	ND (2)	ND (10)	NA	ND (2)	ND (10)
Benzo(b) fluoranthene	NA	ND (2)	ND (10)	NA	ND (2)	ND (10)
Benzo(k) fluoranthene	NA	ND (2)	ND (10)	NA	ND (2)	ND (10)

Split Sample Analytical Results
Dow Chemical Brine Operation

(Samples taken August 13-14, 1984)
(Analyses in parts per billion (ppb) unless otherwise indicated.)

	Raw Brine North		Raw Brine Combined		Raw Brine South		Filtered Brine	
	Dow	USEPA	Dow	USEPA	Dow	USEPA	Dow	USEPA
Gamma-BHC	NA	NR	NA	NR	NA	NR	NA	NR
Delta-BHC	NA	NR	NA	NR	NA	NR	NA	NR
4,4'-DDT	NA	NR	NA	NR	NA	NR	NA	NR
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NR	NA	NR	NA	NR	NA	ND (1.0)
PCB-1242	NA	NR	NA	NR	NA	NR	NA	ND (1.0)
PCB-1254	NA	NR	NA	NR	NA	NR	NA	ND (1.0)
PCB-1221	NA	NR	NA	NR	NA	NR	NA	ND (1.0)
PCB-1232	NA	NR	NA	NR	NA	NR	NA	ND (1.0)
PCB-1248	NA	NR	NA	NR	NA	NR	NA	ND (1.0)
PCB-1260	NA	NR	NA	NR	NA	NR	NA	ND (1.0)
PCB-1016	NA	NR	NA	NR	NA	NR	NA	ND (1.0)
N-nitrosodimethylamine	NA	ND (2)	NA	ND (4)	NA	ND (2)	NA	ND (10)

Split Sample Analytical Results
Dow Chemical Brine Operation

(Samples taken August 13-14, 1984)
(Analyses in parts per billion (ppb) unless otherwise indicated.)

	Production Well #29			TH-18		
	Dow	USEPA	MDNR	Dow	USEPA	MDNR
Gamma-BHC	NA	NR	ND (10)	NA	NR	ND (10)
Delta-BHC	NA	NR	ND (10)	NA	NR	ND (10)
4,4'-DDT	NA	NR	ND (10)	NA	NR	ND (10)
Endosulfan I	NA	NA	ND (10)	NA	NA	ND (10)
Endosulfan II	NA	NA	ND (10)	NA	NA	ND (10)
Toxaphene	NA	NR	ND (10)	NA	ND (1.0)	ND (10)
PCB-1242	NA	NR	ND (10)	NA	ND (1.0)	ND (10)
PCB-1254	NA	NR	ND (10)	NA	ND (1.0)	ND (10)
PCB-1221	NA	NR	ND (10)	NA	ND (1.0)	ND (10)
PCB-1232	NA	NR	ND (10)	NA	ND (1.0)	ND (10)
PCB-1248	NA	NR	ND (10)	NA	ND (1.0)	ND (10)
PCB-1260	NA	NR	ND (10)	NA	ND (1.0)	ND (10)
PCB-1016	NA	NR	ND (10)	NA	ND (1.0)	ND (10)
N-nitrosodimethylamine	NA	ND (2)	ND (10)	NA	ND (2)	ND (10)

Split Sample Analytical Results
Dow Chemical Brine Operation

NOTES:

1. NA = Not analyzed.
2. ND = Not detected (detection limit).
3. NQ = Not quantifiable as defined by ACS in Anal Chem 1980, 52, 2242-2249.
4. NR = Not reported.
5. A = Detected below quantitation limit (quantitation limit is 10 x the detection limit).
6. ppb = parts per billion.
7. ppm = parts per million.
8. * = The analyte is found in the blank as well as the sample. This indicates possible/probable blank contamination.

Appendix I

Michigan Department of Natural Resources Analytical Results
Dow Chemical Brine System

Michigan Department of Natural Resources
Analytical Results
Dow Chemical Brine System

(Samples taken 8/13/84**; 2/27/85*)
(Analyses are in parts per billion (ppb) unless otherwise indicated.)

	Injection Well #20*	Injection Well #20**	Injection Well #35*	Production Well #12*	Production Well #29*
Chloromethane	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Vinyl chloride	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Chloroethane	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Bromomethane	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Acrolein	ND (10)	ND (100)	ND (10)	ND (50)	ND (50)
Acrylonitrile	ND (10)	ND (100)	ND (10)	ND (50)	ND (50)
Methylene chloride	ND B	ND (10)	ND B	7.9 BG	ND B
Trichlorofluoromethane	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
1,1-Dichloroethylene	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
1,1-Dichloroethane	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Trans-1,2-dichloroethylene	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Chloroform	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
1,2-Dichloroethane	2.6	ND (10)	2.5	ND (5)	ND (5)
1,1,1-Trichloroethane	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Carbon tetrachloride	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Bromodichloromethane	2.0	ND (10)	2.0	ND (5)	ND (5)
1,2-Dichloropropane	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Trans-1,3-dichloropropene	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Trichloroethylene	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Benzene	ND (1)	ND (10)	ND (1)	520	200
Cis-1,3-dichloropropene	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
1,1,2-Trichloroethane	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Dibromochloromethane	4.2	ND (10)	4.4	ND (5)	ND (5)
Bromoform	10	ND (10)	11	ND (5)	ND (5)
1,1,2,2-Tetrachloroethylene	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
1,1,2,2-Tetrachloroethane	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Toluene	ND (1)	ND (10)	ND (1)	120	37

	Injection Well #20*	Injection Well #20**	Injection Well #35*	Production Well #12*	Production Well #29*
Chlorobenzene	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Ethylbenzene	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
2-Chloroethyl vinyl ether	ND (1)	ND (10)	ND (1)	ND (5)	ND (5)
Phenol	ND (2.5)	ND (25)	ND (2.5)	ND (2.5)	5.8
2-Chlorophenol	ND (2.5)	ND (25)	ND (2.5)	ND (2.5)	ND (5)
2-Nitrophenol	ND (2.5)	ND (25)	ND (2.5)	ND (2.5)	ND (5)
2,4-Dimethylphenol	ND (2.5)	ND (25)	ND (2.5)	ND (2.5)	ND (5)
2,4-Dichlorophenol	ND (2.5)	ND (25)	ND (2.5)	ND (2.5)	ND (5)
p-Chloro-m-cresol	ND (2.5)	ND (25)	ND (2.5)	ND (2.5)	ND (5)
2,4,6-trichlorophenol	ND (2.5)	ND (25)	ND (2.5)	ND (2.5)	ND (5)
2,4-Dinitrophenol	ND (25)	ND (250)	ND (25)	ND (25)	ND (50)
4-Nitrophenol	ND (2.5)	ND (25)	ND (2.5)	ND (2.5)	ND (5)
4,6-Dinitro-o-cresol	ND (25)	ND (250)	ND (25)	ND (25)	ND (50)
Pentachlorophenol	ND (2.5)	ND (25)	ND (2.5)	ND (2.5)	ND (5)
N-nitrosodimethylamine	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Bis(2-chloroethyl) ether	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
1,3-Dichlorobenzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
1,4-Dichlorobenzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
1,2-Dichlorobenzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Bis(2-chloroisopropyl)ether	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Hexachloroethane	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
N-nitrosodi-n-propylamine	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Nitrobenzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Isophorone	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Bis(2-chloroethoxy) methane	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
1,2,4-Trichlorobenzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Naphthalene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Hexachlorobutadiene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Hexachlorocyclopentadiene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
2-Chloronaphthalene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Dimethylphthalate	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Acenaphthylene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
2,6-Dinitrotoluene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Acenaphthene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
2,4-Dinitrotoluene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)

	Injection Well #20*	Injection Well #20**	Injection Well #35*	Production Well #12*	Production Well #29*
Diethylphthalate	ND (1)	ND (10)	2.5	9.1	ND (1)
Fluorene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
4-Chlorophenyl phenyl ether	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Diphenylamine (N-nitroso)	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
1,2-Diphenylhydrazine	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
4-Bromophenyl phenyl ether	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Hexachlorobenzene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Phenanthrene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Anthracene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Di-n-butyl phthalate	ND B	ND (10)	ND B	8.4	ND B
Fluoranthene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Benzidine	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Pyrene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Butylbenzyl phthalate	ND (1)	ND (10)	1.8	ND (1)	ND (1)
Benzo(a) anthracene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
3,3'-Dichlorobenzidine	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Chrysene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Bis(2-ethylhexyl) phthalate	ND B	ND (10)	37 (BG)	ND (1)	ND B
Di-n-octylphthalate	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Benzo(b) fluoranthene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Benzo(k) fluoranthene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Benzo(a) pyrene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Indeno(1,2,3-c,d) pyrene	ND (2.5)	ND (25)	ND (2.5)	ND (2.5)	ND (2.5)
Dibenzo(a,h) anthracene	ND (2.5)	ND (25)	ND (2.5)	ND (2.5)	ND (2.5)
Benzo(g,h,i) perylene	ND (2.5)	ND (25)	ND (2.5)	ND (2.5)	ND (2.5)
Aldrin	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
Alpha-BHC	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
Beta-BHC	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
Gamma-BHC	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
Delta-BHC	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
Chlordane	ND (0.5)	ND (10)	ND (0.5)	ND (0.5)	ND (0.5)
4,4'-DDT	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
4,4'-DDE	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
4,4'-DDD	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
Dieldrin	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)

	Injection Well #20*	Injection Well #20**	Injection Well #35*	Production Well #12*	Production Well #29*
Alpha-endosulfan	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
Beta-endosulfan	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
Endosulfan sulfate	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
Endrin	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
Endrin aldehyde	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
Heptachlor	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
Heptachlor epoxide	ND (0.1)	ND (10)	ND (0.1)	ND (0.1)	ND (0.1)
PCB - 1242	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
PCB - 1254	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
PCB - 1221	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
PCB - 1232	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
PCB - 1248	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
PCB - 1260	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
PCB - 1016	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Toxaphene	ND (1)	ND (10)	ND (1)	ND (1)	ND (1)
Antimony (ppm)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Arsenic "	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Beryllium "	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Cadmium "	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
Chromium "	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Copper "	0.10	0.17	0.10	0.15	0.20
Lead "	0.26	0.24	0.21	0.21	0.22
Mercury "	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.0002)
Nickel "	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.10)	ND (0.1)
Selenium "	ND (0.01)	0.044	ND (0.01)	ND (0.01)	ND (0.01)
Silver "	ND (0.05)	ND (0.05)	0.06	0.32	ND (0.05)
Thallium "	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Zinc "	0.10	0.29	0.10	0.21	0.28
Cyanide "	0.014	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
Phenol, total "	ND (0.01)	6.8	ND (0.01)	ND (0.01)	ND (0.01)

Michigan Department of Natural Resources
Analytical Results
Dow Chemical Brine System

NOTES:

1. ND = Not detected (detection limit).

2. B = The concentration of a priority pollutant in the blank is greater than 1/2 the detection limit and is greater than 1/2 the concentration in the sample.

3. BG = The concentration in the blank is greater than 1/2 of the method detection limit and is less than or equal to 1/2 the concentration detected in a sample. The concentration in the blank is subtracted from the sample.

4. ppb = parts per billion.

5. * = Sample taken 2/27/85.

6. ** = Sample taken 8/13/84.