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FINAL

REMEDIAL INVESTIGATION REPORT

VOLUME 2A OF 2

CHEM-DYNE SITE

HAMILTON, OHIO

WA 21.5M10.0

W65310.C0

May 22, 1984

FINAL
Remedial Investigation Report
Volume 2A of 2
Chem-Dyne Site
Hamilton, Ohio
WA 21.5M10.0
W65310.C0

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GLT460/85-1

TECHNICAL MEMORANDUM

TO: File

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DATE: December 20, 1983

SUBJECT: Chem-Dyne Site Remedial Investigation
Review of Existing Studies Including Site Chronology
Task 1

JOB: W65310.C0

OBJECTIVE

The purpose of this technical memorandum (TM) is to summarize pertinent existing information on the Chem-Dyne site. This review of available information was done in accordance with Task 1 described in the final work plan for the Chem-Dyne RI/FS. The available data were obtained from several sources including U.S. EPA Region V files, Ohio EPA-SWDO files, and the U.S. Army Corps of Engineers who administered the site cleanup performed in 1983. Other sources of information included the Miami Conservancy District, Ohio Department of Natural Resources, and USGS. All data summarized in this TM were available as of May 1983 and were collected from April through December 1983.

Existing information is reviewed in three sections. First, the general background of the site is given. Second, the site setting is presented by discussing several aspects of the physical, biological, and socioeconomic environment in the Hamilton, Ohio, area. Third, previously developed data and site evaluations prepared by others are summarized.

The TM is concluded with four attachments: a site chronology, overall data summaries for each groundwater monitoring well, an inventory of existing production wells, and Roy F. Weston soil boring logs and well construction details. The site chronology attachment describes the major events which occurred at the Chem-Dyne site based on the documents in CH2M HILL files. The monitoring well data summaries include results of organic priority pollutant analysis of samples

from each monitoring well existing as of April 1983. The inventory of existing production wells includes descriptions of construction and usage for both active and abandoned wells in the vicinity of the Chem-Dyne site. The soil boring logs and well construction details concern the well installation effort performed by Roy F. Weston in 1982.

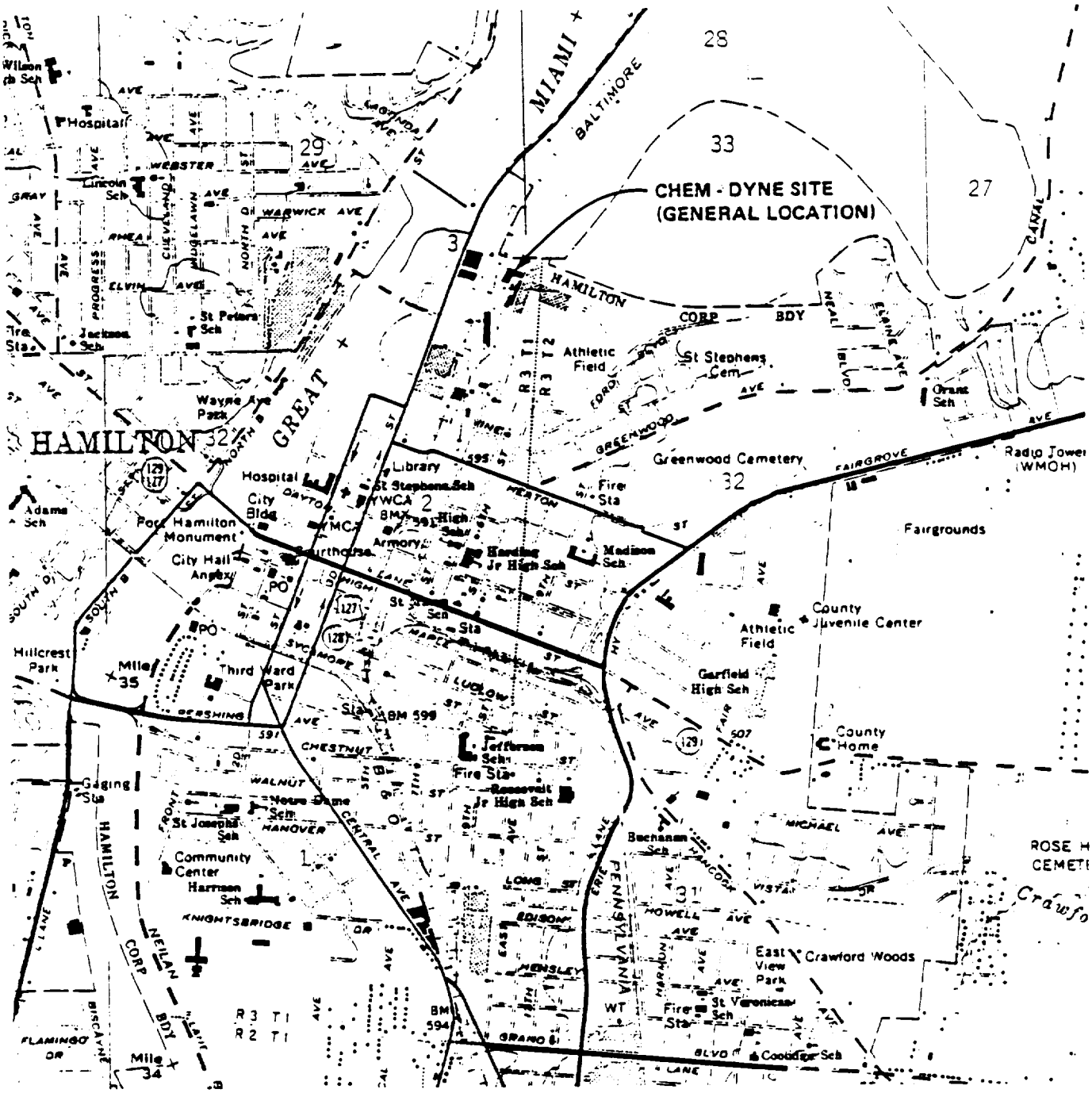
CHEM-DYNE SITE BACKGROUND

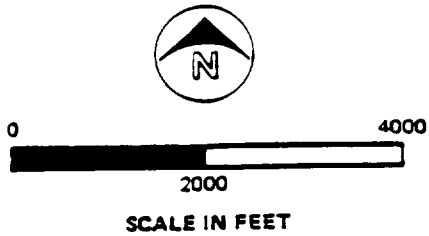
SITE DESCRIPTION

The Chem-Dyne hazardous waste site is within the corporate limits of the City of Hamilton, Butler County, Ohio, which had an estimated 1980 population of 66,400 (1). The site covers approximately 10 acres on the northern border of the city.

The site is bounded immediately on the south by a residential district. Farther to the south are the business district and additional residential districts. The site is bounded on the east by a municipal park whose facilities include six ballparks and a municipal swimming pool. Residential dwellings lie to the east of the park. The site is bounded on the north by the Ford Hydraulic Canal, which flows west to the Great Miami River. Immediately north of the canal is an agricultural field. Approximately 1,500 feet north of the site is one of Hamilton's two water treatment plants. The water treatment plant pumps groundwater from deep wells during the summer months. The site is bordered on the west by a B&O railroad right-of-way. Adjacent to the railroad tracks is the Ransohoff Company. Also to the west is the City of Hamilton Power Plant. Approximately 75 yards from the site are coal piles and a large petroleum storage tank for the power plant. Farther to the west are warehouses for Champion Paper and a small residential block. Site location and surroundings are illustrated in Figures 1 and 2.

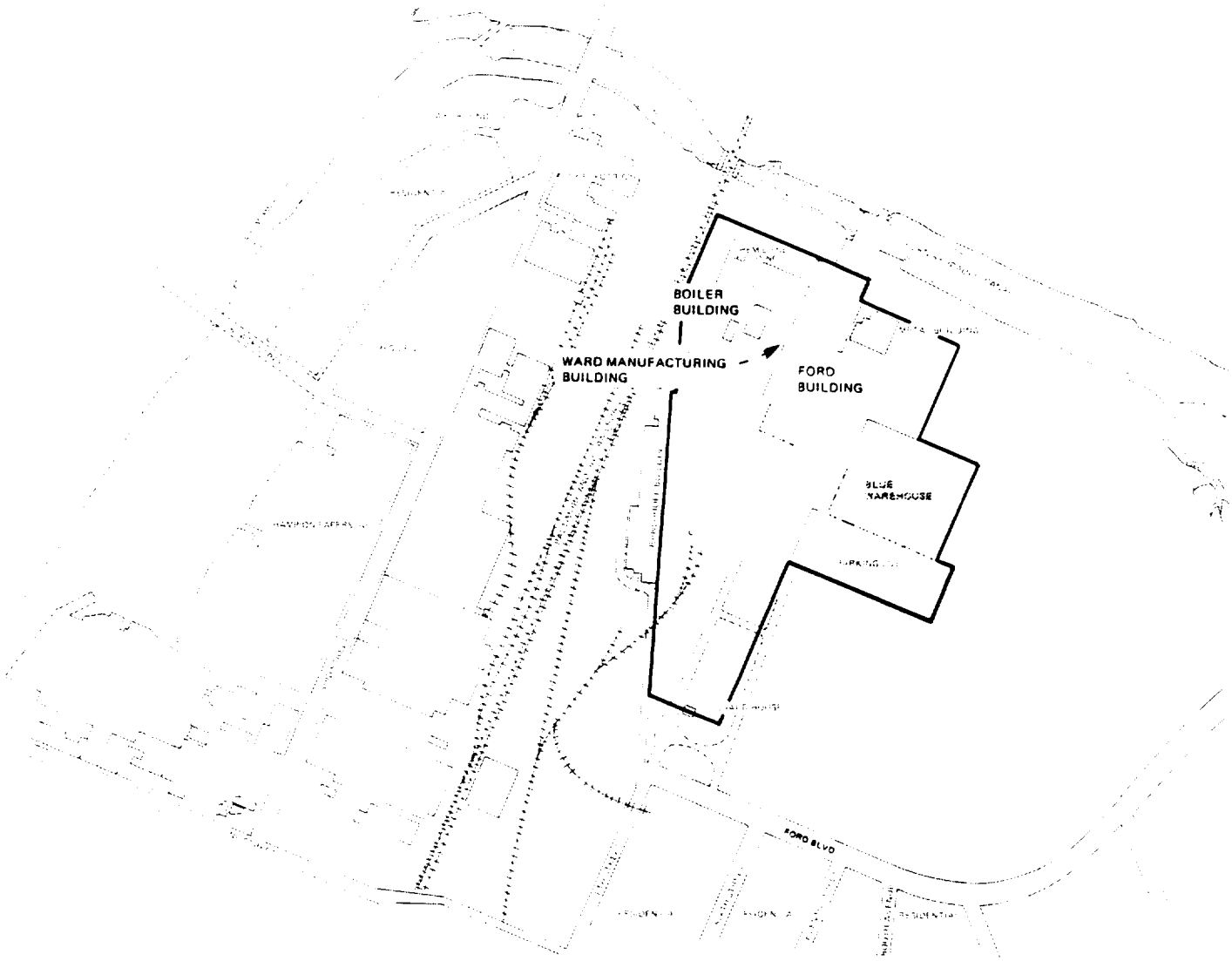
At the initiation of remedial activities in May 1983, there were approximately 8,600 drums, 30 abovegrade tanks, and 2 open top, belowgrade tanks onsite (2). The tanks and drums contained an estimated 463,100 gallons of fluid, 108,740 gallons of sludge, and 86,143 gallons of solids (2). Drums were stacked up to three high, frequently without pallets separating the layers of drums. Drums were generally in a badly deteriorated condition, many were leaking or uncovered. A 1982 survey of 268 drums by Roy F. Weston, Inc. reported that 44 percent of the drums were either deteriorated, leaking, or uncovered (3).





SOURCE: USGS Hamilton, Ohio 1974.

FIGURE 1
LOCATION MAP
TM TASK 1



LEGEND

HAZARDOUS WASTE
SITE BOUNDARIES

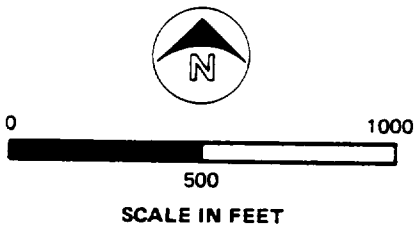


FIGURE 2
SITE MAP
TM TASK 1

Other potentially contaminated equipment included two tanker trucks (5,000 gal.), four semi-truck trailers, two flat beds, an empty fuel type tank (300 gal.), one outdoor reaction vessel (100 gal.), six reaction vessels (4,700 gal. each), and miscellaneous debris inside the Chem-Dyne building (3).

Five major buildings exist on or around the Chem-Dyne site (Figure 2). They are:

- Chem-Dyne building
- Boiler building
- Ward Manufacturing building
- Ford building (formerly a Ford tractor factory)
- The blue warehouse (prefabricated)

Chem-Dyne operations centered around the Chem-Dyne building, the only building previously included as part of the hazardous waste site. The building housed the Chem-Dyne offices, blending tanks, and other Chem-Dyne equipment. It is presently in a dilapidated state. The building was heavily damaged by a fire in April 1983. Most windows have been broken and the offices vandalized. Debris is scattered throughout and pools of liquid and sludge are on the floors.

The three nearby buildings, the boiler, Ward Manufacturing, and Ford building, are also in a dilapidated state. There is no evidence to indicate that they were used by the Chem-Dyne Corporation. A detailed inspection of the buildings in October 1983 by CH2M HILL did find evidence of contamination in the basement of the boiler building caused by seepage draining into the basement through conduit which penetrated the south wall. HNU readings of the airspace in the conduit were over 100 ppm.

The blue warehouse building and the parking lot to the south were previously used by the Chem-Dyne Corporation to store drums (4). The inspection conducted in October 1983 by CH2M HILL found signs of drum storage in the building and on the parking lot.

SITE HISTORY

Property Ownership

Unless otherwise indicated, information pertaining to property ownership was obtained from a title search conducted for the U.S. EPA by Lawyers Title of Cincinnati, Inc. (5).

The Chem-Dyne site is on a reclaimed wetland. The earliest found property records indicate that the wetland area was owned by the Miami Conservancy District (MCD) as early as 1916. In 1917 the MCD leased the property to the Hamilton and Rossville Hydraulic Company (HRH). HRH constructed levees and operated at least two canals, a reservoir, and a power plant on the property until 1919. The locations of the canals and the reservoirs are shown in Figure 3. Historical records do not identify the location of the power plant.

In 1919, MCD sold portions of the property to the Ford Motor Company and the HRH. In a joint effort by the three parties, the wetland area, reservoir, and west canal were filled and the south canal was relocated to the north end of the present site (5,6). Material for the new levees was excavated from the new channel area. The eastern portion of the site was used as a spoil area for the north end channel improvements. The remaining fill material for the site was excavated from the Great Miami River (6).

Ford constructed a hydroelectric plant adjacent to the canal and operated a tractor plant at the site starting around 1928. Operations at the plant lasted approximately 10 years (7).

Records indicate that in the early 1950's Bendix Aviation Corporation acquired all of the stock of the HRH (5). In June 1951, the Ford Motor Company sold its property to Bendix. Bendix conducted manufacturing operations at the site until 1959.

In 1959, the former Ford site was split. Ashley F. Ward and Eugene P. Ruehlmann jointly purchased approximately 4 acres shown as tract 7 in Figure 4. Ward conveyed his interest in the property to Ruehlmann, Trustee, in 1964. In 1972, the Hamilton Industrial Real Estate Company (HIRE) acquired a contractual interest in the property from Ruehlmann by signing a land contract (5,8). HIRE was a general partnership, members of which were: Bruce A. Whitten, William L. Kovacs, Paul Daleiden, Gerald L. Mestemaker, and the Chem-Dyne Corporation (8). HIRE leased the property to the Chem-Dyne Corporation. In 1978, Daleiden and Mestemaker conveyed their interest in the land contract to the Chem-Dyne Corporation. In 1979, Kovacs acquired additional interest in the property by limited warranty from Ruehlmann.

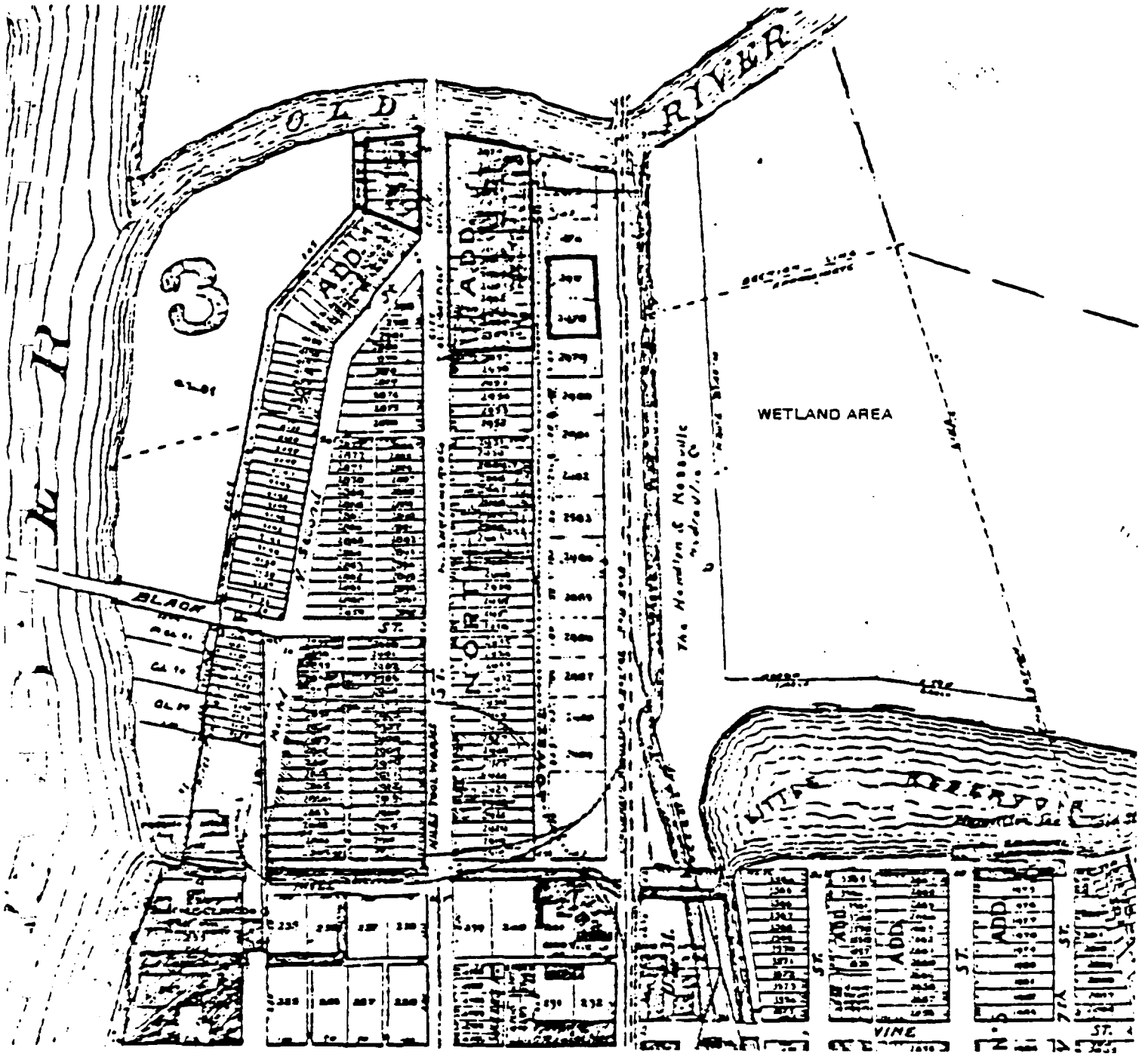
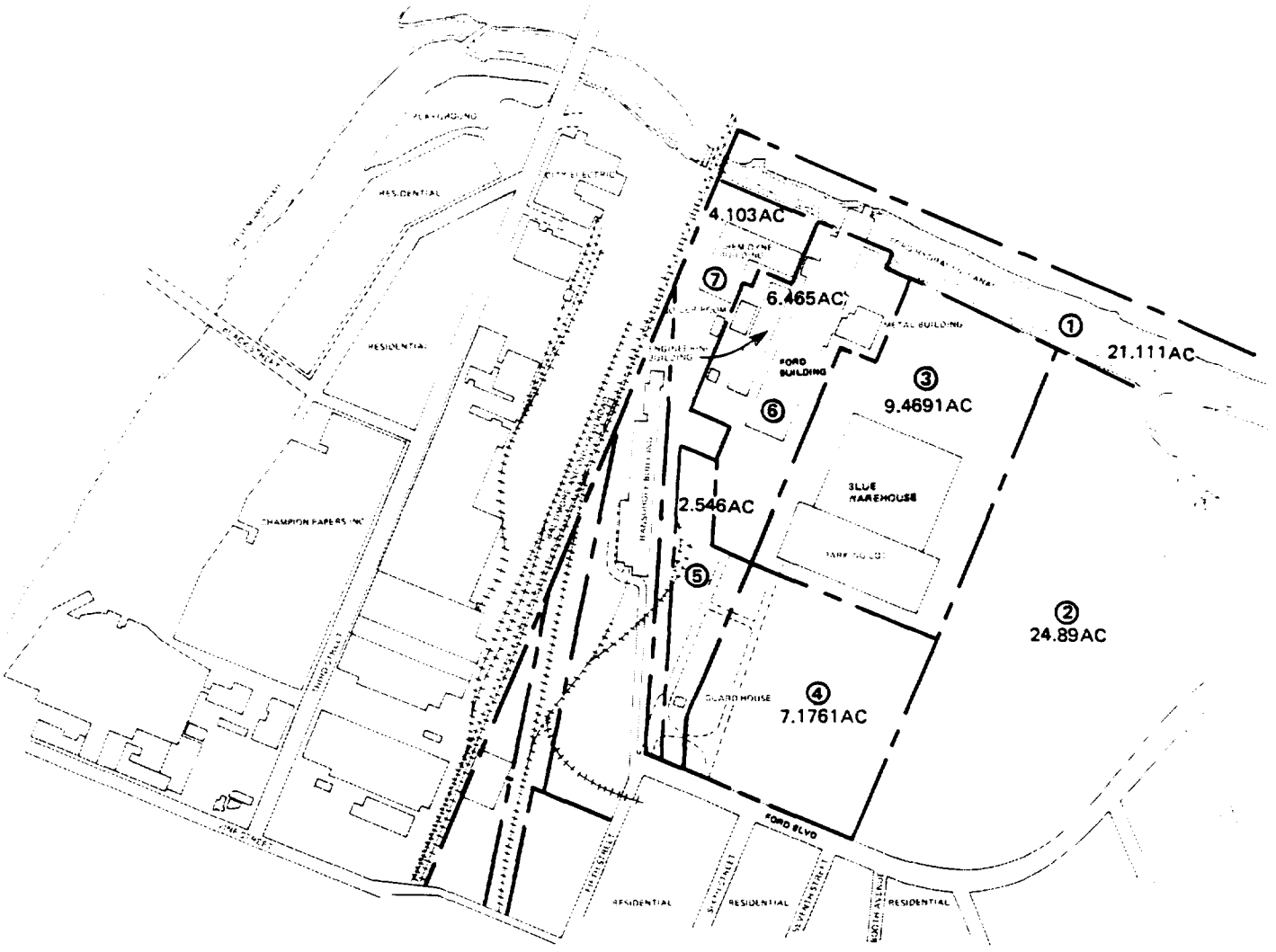


FIGURE 3
HISTORICAL SITE MAP
TM TASK 1



LEGEND

— - — PROPERTY LINES

0 TRACT NUMBERS

SOURCE: Examination of Title, Lawyers Title of Cincinnati, Inc. April 1983.

N

0 1000

500

SCALE IN FEET

FIGURE 4
PROPERTY DIVISIONS
TM TASK 1

The remaining Ford site property was sold to Ashley F. Ward in 1959. Sometime after 1959, Ward Manufacturing began operations at the site producing campers and recreational vehicles. In July 1967, Ward leased approximately 16 acres (tracts 3 and 6) of the property to Ward Manufacturing, which at that time was a solely owned subsidiary of Fuqua Industries, Inc. In October 1967, the same tracts of land were sold to Robert G. Robson, Herbert A. Middendorff, and Joseph G. Donohoo. Records do not clearly identify when Ward Manufacturing ceased operations on the property. Presently, the Baylor Trucking Company operates behind a building on tract 6 of this property. Ashley F. Ward conveyed the remaining approximately 10 acres (tracts 4 and 5) to O.E. Foster, Trustee, in 1972 (9). Foster transferred the deed to Robson, Middendorff, and Donohoo in 1976.

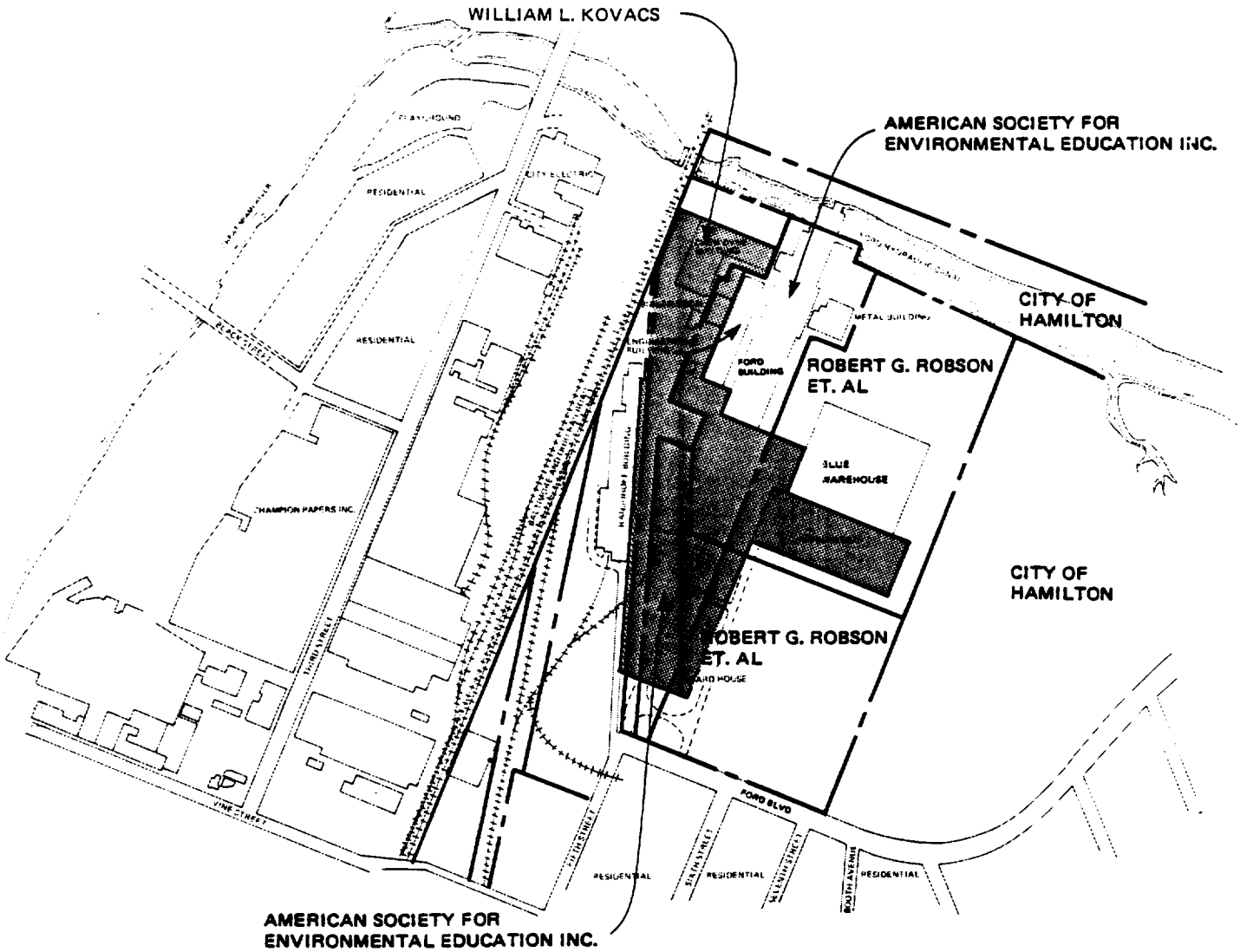
Parts of the tracts of land described above have been included within the boundaries of the Chem-Dyne hazardous waste site because of encroachment by Chem-Dyne operations onto these adjacent properties. Portions of the Robson, Middendorff, and Donohoo land that have been included in the hazardous waste site were conveyed to the American Society for Environmental Education in 1972. Other sections of land within the site boundaries are still owned by the three men. Present property ownership is illustrated in Figure 5.

The final tract of land, the Ford Hydraulic Canal (tract 1), is not within the hazardous waste site boundaries. However, as a receptor of stormwater runoff and discharges from the Chem-Dyne site, this property is a focal point in this investigation. Most of the canal was obtained by the HRH in the 1919 agreement with the MCD. The HRH conveyed the property to the City of Hamilton in 1963.

Hazardous Waste Site History

As early as 1974, chemical wastes and residues may have been trucked to the Chem-Dyne site (1). In the fall of 1975, Kovacs and Whitten formed Spray-Dyne which made antifreeze by recycling chemical wastes (10,11). In 1976, the operations were expanded and the Chem-Dyne Corporation was formed (11).

Chem-Dyne was a company formed to collect and dispose of industrial chemical wastes. Some effort was made to recycle



LEGEND

- - - PROPERTY LINES

APPROXIMATE AREA OF CHEM - DYNE SITE

SOURCE: Examination of Title, Lawyers Title of Cincinnati, Inc. April 1983.

N

0 500 1000

SCALE IN FEET

FIGURE 5
PRESENT PROPERTY OWNERSHIP
TM TASK 1

oil wastes as fuel. Wastes which were unsuitable for recycling were stored in drums and tanks on the site or shipped to other disposal sites.

The Chem-Dyne facility operated until February 1980. In approximately 5 years of operation, the facility accepted waste from nearly 300 generators (11). The materials handled included pesticides and pesticide residues, chlorinated hydrocarbons, solvents, waste oils, plastics and resins, PBB's, PCB's, TRIS, acids and caustics, heavy metal and some cyanide sludges, and packaged laboratory chemicals (1). In excess of 30,000 drums and 300,000 gallons of bulk materials were onsite when the facility was closed (12).

Operations of Chem-Dyne caused uncontrolled releases of hazardous materials. Mixing of liquid wastes was often done in open pits releasing noxious and possibly toxic vapors. Reportedly, 55-gallon drums were punctured with pickaxes and allowed to leak or were dumped onto the ground and/or into a trough or pit. Tank cars were emptied onto the ground, into troughs, and sewers. In one reported incident, a tank truck from Chem-Dyne emptied its contents onto the city streets (8). In that case, evidence indicated that the material was a solvent and flammable.

In its 5 years of operation, a number of environmental incidents were reported at the Chem-Dyne facility. From 1976 to 1979, there were at least five fish kills in the Great Miami River which were attributed to Chem-Dyne operations. One fish kill stretched for nearly 37 miles from the Ford Hydraulic Canal to the mouth of the Great Miami River (13). In 1976, a series of fires and a railroad tank car incident generated active public concern. In the railroad tank car incident, an unknown chemical was added to a bulk shipment of chlorinated hydrocarbons from the Shell Chemical Company to develop a "saleable" product (14). The heat of reaction apparently caused the tank car to overheat. The fire department was called and sprayed cooling water over the tank. However, the water spray could not reduce the heat enough to stop the reaction(s). The car fumed for 4 days, releasing unknown noxious vapors. Another series of fires occurred in 1979.

Legal Actions

Legal actions involving the Chem-Dyne Corporation began in June 1976, when Chem-Dyne filed a $30 million suit against

the City of Hamilton and its officials for harassment. On September 29, 1976, the State of Ohio filed a suit against Whitten, Kovacs, Chem-Dyne and its sister companies. The suit alleged that the companies were responsible for killing more than a million fish and water animals in the Great Miami River and for emitting offensive odors into the air. The suit sought penal, compensatory, and punitive damages totalling $340,000 and called for a permanent end to illegal discharges into Ohio waters and abatement of air pollution nuisances. Both suits were settled on July 19, 1979, when all parties agreed to a stipulation and judgment entry whereby Chem-Dyne agreed to prevent future pollution and to remove all inventory within 12 months. Chem-Dyne also agreed to drop its suit against the City of Hamilton and to pay $75,000 in fines.

By late 1979, it became apparent that Chem-Dyne was not adhering to the earlier agreement. As a result, the U.S. EPA filed suit against Chem-Dyne et al. under the provisions of RCRA on December 19, 1979. Two days later the City of Hamilton and the Ransohoff Corporation joined in the Federal suit against Chem-Dyne. The suit sought to force Chem-Dyne to stop operations, remove wastes from the site, and clean up any soil or groundwater contamination. On January 25, 1980, the District Court granted a preliminary injunction prohibiting the defendants from hauling into, receiving, or taking delivery of, any industrial wastes at its premises.

Also, as a result of noncompliance, on January 24, 1980, the Ohio Attorney General filed a motion in the state courts asking that a receiver be named to assume operations at Chem-Dyne. On February 4, 1980, the state court appointed Jack Zettler, a Hamilton lawyer and accountant, as receiver.

On August 26, 1982, the EPA reached agreement with over 100 companies for surface cleanup of the site. The generators agreed to pay 2.4 million dollars in cleanup costs. The government was to contribute an additional 1 million dollars toward cleanup efforts. The agreement also allowed the government to demand additional payments if unexpected costs arose. Simultaneously, the U.S. Department of Justice filed a suit to recover additional costs from owners, operators, and major generators who refused to participate. Litigation is still pending in this matter.

Waste Cleanup Actions

On July 18, 1979, Whitten and Kovacs entered into a consent decree requiring them to remove their inventory within 12 months. At the time of the consent decree, the Chem-Dyne inventory was estimated to be 850,000 gallons of liquid wastes and 4,000 barrels of solid or semisolid sludge, or 19,454 drum equivalents (16). According to the consent decree, inventory was to be reduced by 1/12 each month. However, waste inventories conducted by the Ohio EPA on November 19, 1979, and January 22, 1980, showed that the facility was in violation of the agreement (17). In the November inventory, 30,651 drum equivalents were counted and in the January inventory, 27,852 drum equivalents remained. As a result of noncompliance, the state courts placed the Chem-Dyne Corporation in receivership on February 4, 1980.

The receivership was charged with the duty of carrying out the court's order to remove all waste from the site. With technical assistance from the Ohio EPA, the receivership directed cleanup operations until it had exhausted all Chem-Dyne money and assets in November 1981. During receivership, about 20,000 drums were removed, mostly by persuading generators to remove their wastes (11,15). Additional cleanup operations were financed by selling assets of the company and by accepting and properly disposing of some industrial wastes. When the receivership became inactive, about 12,500 drums and 213,000 gallons of bulk wastes remained at the facility (15).

In December 1981, the State of Ohio submitted Chem-Dyne as Ohio's top priority Superfund project. In 1981 the site was included on the U.S. EPA's Interim Priority List as Ohio's highest priority.

In POLREP 1 on February 26, 1982, Greg Vanderlaan (U.S. EPA) requested Superfund money for fence repair and cleanup of the rail docks. On March 8, 1982, the U.S. EPA approved a $200,000 expenditure of Superfund money for this purpose. In April 1982, the U.S. EPA approved an additional $3.2 million expenditure of Superfund money. The grant allocated $2.5 million for actual waste removal and disposal, and $700,000 for a limited soils and groundwater study.

On March 16, 1982, a slight leak was discovered in Tank No. 6. About 50 gallons of material had leaked. The leak was temporarily repaired in anticipation of remedial actions. CECOS/CER

Company, the contractor for fence repair and cleanup of the loading docks, spent from March 22 to 25 cleaning up the spilled liquid. On April 15, 1982, the liquid contents of Tank No. 6 were hauled to an incineration facility.

On March 25 and 26, 1982, approximately 35,000 gallons of contaminated water was pumped from the loading docks and transported to the contractor's carbon adsorption system for treatment and discharge. On March 29, 1982, solidification and removal of the solid/semisolid material in the docks was initiated. The solidified material was shipped to the contractor's landfill for final disposal. Additionally, four storm drains on the site were plugged to prevent any future discharge of contaminated liquids to area surface waters.

By April 22, 1982, all of the work outlined in POLREP 1 and cleanup involving the leak in Tank No. 6 had been completed.

From November 1981 until May 1983, voluntary removal of waste by generators proceeded under the supervision of the Ohio EPA.

From May until November 1983, a cleanup contract for the removal of all remaining surface wastes from the Chem-Dyne site was undertaken and managed by the U.S. Army Corps of Engineers.

PRIOR SITE INVESTIGATIONS

From 1970 to 1980, the Ohio EPA and U.S. EPA conducted an intensive fish survey in the lower mainstream of the Great Miami River. Preliminary results from fish tissue analysis indicate contamination above and below the confluence with the Ford Hydraulic Canal (19).

On January 29, 1980, the potential hazardous waste identification and preliminary assessment was prepared by Marshall. On March 25, 1980, U.S. EPA investigators inspected the Chem-Dyne site. Participants were C. Grigalauski, J. Brossman, and I. Alexateos. Photographs taken during the inspection indicated poor housekeeping practices (18).

In February 1980, the Ohio EPA and U.S. EPA tested groundwater from Hamilton's south well field. In March, 1981, the Cincinnati Enquirer reported that these tests indicated that the groundwater was free of contaminants from the Chem-Dyne site (20).

In July 1980, the Ohio EPA sampled the liquid and solid/semisolid phases in the rail and truck loading docks (1). Subsequent analysis detected high levels of pesticides in both fractions. At the time of sampling it was estimated that 39,600 gallons of contaminated water and 750 cubic yards of contaminated soils, sludges, and debris existed within these docks.

From January through April 1981, the FIT contractor, Ecology & Environment, Inc. (E&E), conducted a soil and groundwater investigation (7). In all, 32 borings were made to determine groundwater flow and the nature and extent of subsurface contamination. Significant soil contamination was found onsite within the top 4 feet of soil. Groundwater contamination was found to stretch several hundred feet beyond the site boundaries. E&E recommendations included removal of the top 3 feet of soil from the site and the pumping of contaminated groundwater for discharge into a storm sewer.

In March 1981, E&E estimated cleanup costs to be $20 million (21). Included in the projected costs were: drum and bulk waste removal, surface and subsurface structures and soil removed, and groundwater cleanup.

In June 1981, the Ohio EPA conducted a waste and soil sampling program at the site. Approximately 40 samples were taken of several tanks, over 200 drums, and several local soils for analysis by gas chromatography/mass spectroscopy (GC-MS) (22). Sampling identified some additional drums and evidenced gross soil contamination in approximately the top meter of soil in various locations.

On August 21, 1981, E&E completed the evaluation for the hazardous waste site ranking model. The site received a Mitre model score of 51.86 (23).

On July 27, 1982, the U.S. EPA Zone Contractor at that time, Roy F. Weston, Inc., began the initial phase of investigation work for developing a remedial action plan (3,12,15). The

work plan included low level aerial photographs, a ground level inventory of the site, sampling about 200 drums to characterize waste materials onsite, air monitoring, and a limited hydrogeological investigation to characterize groundwater contamination and flow in the area. Final copies of all data and final reports of the effort are not available as of November 1983. Limited data from draft reports are discussed in other sections of this technical memorandum.

CHEM-DYNE SITE SETTING

PHYSIOGRAPHY

The Chem-Dyne site is located within the Great Miami River basin. This area is characterized by a broad, flat river valley composed of alluvial deposits and steep bluffs located away from the river. The area near the site is urban and industrial; therefore, natural land forms have been greatly altered.

GEOLOGY

Hamilton, Ohio, is located above a deep, buried bedrock valley, which has been made deeper and wider by glaciation. The bedrock consists of shales and limestones of Ordovician age. The Cincinnati Arch is the dominant structural feature in the area. The Great Miami River roughly parallels the axis of the arch, which trends slightly northeast through central Kentucky and western Ohio.

The Great Miami River Valley has an accumulation of glacial and alluvial deposits to a thickness of more than 200 feet. The depth to bedrock is generally greater near the river and less near the bluffs. Both Illinoian and Wisconsin age outwash deposits are found in the valley. The outwash deposits have been reworked considerably by alluvial processes and both the near surface outwash and alluvial deposits have been reworked by man's activities.

Subsurface exploration programs consisting of test drilling, soil sampling and installation of monitoring wells, were performed in the vicinity of the Chem-Dyne site by Ecology & Environment (FIT) in 1981 and by Roy F. Weston Consultants in 1982. According to data from these two programs, the soil thickness near the site ranges from 118 to 210 feet. Cross sections are presented in both reports and both studies generally agree on the soil conditions found at the site.

These two previous investigations found a surficial layer of black to reddish brown fill with cinders at thicknesses ranging from 0 to 20 feet. A 1- to 10-foot thick silty sand layer was usually found below the fill. Beneath this is generally sand and gravel to a depth of 30 to 40 feet. The sand and gravel varies vertically and horizontally to a fine sand or silty sand.

Small pockets and lenses of clayey sand or gravel occur sporadically throughout the sand and gravel deposits. A distinct, olive green to gray clay was found in some borings at depths of approximately 30 to 40 feet. This clay layer varies in thickness from 0 to over 10 feet. E&E theorized in the FIT report that this clay was a lacustrine deposit formed by a postglacial lake stage in the Great Miami Valley. The FIT report concludes that the clay was relatively thick and continuous when deposited, but was severely eroded later by alluvial processes. Cross sections in the FIT report indicate that the clay is very thick to absent at some boring locations. Later borings completed by Weston also show this clay to be discontinuous in the vicinity of the Chem-Dyne site (Roy F. Weston soil boring logs are presented in Appendix D). Beneath this clay, a thick sequence of sand and gravel exists to the top of rock at a depth of approximately 200 feet below the surface.

HYDROLOGY

The average annual precipitation rate in the vicinity of the Chem-Dyne site is approximately 40 inches. Of this total, it is estimated that 25 inches returns to the atmosphere by evapotranspiration, 8 inches contributes to surface runoff and 6 inches infiltrates the land surface (1).

The average annual precipitation rate for the Great Miami River basin as a whole is approximately 38 inches. The average annual runoff measured at Hamilton is reported to be about 12 inches (2).

The Great Miami River is the major surface water course in the Chem-Dyne area. The average annual discharge of the river in the study area is 3200 cubic feet per second (cfs) (1). The flow rate of the Great Miami River at Hamilton exceeds 490 cfs 90 percent of the time (3). This large base flow is sustained by flow from the sand and gravel aquifer in the valley.

GENERAL REGIONAL GEOHYDROLOGY

Regional Aquifer Character

The Chem-Dyne site is located in the lower Great Miami River valley which is one of the most productive sources of groundwater in the midwest. Groundwater occurs in highly permeable sand and gravel outwash deposited by glacial melt waters from receding continental ice sheets. These materials were deposited in channels cut deeply into bedrock by interglacial streams. The aquifer generally follows the course of the present Great Miami River. It is bounded on both sides by steep walls of bedrock. The aquifer is approximately 2 miles wide and has a thickness of 150-200 feet (3).

The bedrock underlying the sand and gravel outwash is a flat-lying shale with thin interbedded layers of limestone. These shales and limestones have very low permeability. Water does occur in erraticly distributed joints and cracks. Although the bedrock is not considered a water producing aquifer, it may contribute a significant amount of water to the overlying sand and gravel aquifer (3).

Glacial till of low permeability was deposited by the major glaciations that invaded the Great Miami River valley. This till consists of poorly sorted aggregate with a clay matrix containing pebbles, cobbles and boulders. The till, interstratified with the permeable outwash materials, forms confining layers of lower permeability (3).

Regional Aquifer Hydrology

The water surface in the aquifer trends downward toward the southwest at approximately 5-10 feet/mile, which is about the same as the gradient of the Great Miami River. Under natural conditions, the gradient is toward the river from the aquifer. Pumping has reversed the gradient in some small localized areas, and as a result the river acts as a source of recharge to the aquifer (3).

The groundwater surface in most of the valley is 15-50 feet below land surface. The groundwater surface fluctuates 5-15 feet annually (1). Several small cones of depression have formed around pumping centers. The only major cone of depression reported is around the Armco East works in southeast Middletown where the water level has been reported 132 feet below land surface at the end of 1964 (3).

In 1964, the rate of groundwater withdrawal from the aquifer was approximately 110 million gallons per day (MGD). This was estimated to be approximately double the rate of pumpage prior to World War II (3). If new groundwater supplies were properly located in the lower Great Miami River valley, it was estimated that an additional withdrawal rate of 300 MGD could be sustained (4).

Regional Groundwater Quality

Water in the Great Miami River valley is generally hard with high concentrations of calcium and bicarbonates. The concentration of total dissolved solids in both surface and groundwaters is approximately 400-450 mg/l. The water in some wells, where the aquifer is recharged by the river, has shown slight contamination by phenols and higher than normal concentrations of nitrates have been observed (3). Groundwater sampling conducted jointly by the Miami Conservancy District and the United States Geological Survey indicated that all constituents, for which analyses were performed, are within the limits recommended by the Environmental Protection Agency in its National Interim Primary Drinking Water Standards (5).

SITE SPECIFIC HYDROGEOLOGY

Site Specific Aquifer Character

The Chem-Dyne site is located in the hydrogeologic environment I-A-1 as classified by Spieker (3). This environment is characterized by sand and gravel deposits 150-200 feet or more in thickness with no significant retarding clay layers.

Previous investigations by the Field Investigation Team (FIT) determined that thick sequences of clay and silt are present locally in the vicinity of the Chem-Dyne site, but these sequences are discontinuous (1). The aquifer at the Chem-Dyne site, is considered to be unconfined because of the discontinuous nature of the clay and silt stratifications. Smith reports that a thick clay layer exists under the Great Miami River in this area. The eastern edge of this clay layer is just west of the Chem-Dyne site (9).

Site-Specific Aquifer Hydrology

Piezometric Surface. Water level data for several wells in the Hamilton, Ohio area have been collected and published by the United States Geological Survey (USGS) (3) and the Miami Conservancy District (MCD) (2,5,7). A regional piezometric surface map has been prepared by Spieker (3).

Site-specific groundwater level data were collected from 27 wells constructed in 1980 and 1981 during the FIT project (1). These data are presented in Table 1 and the well locations are shown in Figure 6. Piezometric surface maps were prepared for each set of elevation measurements. Only one map was published in the final FIT project report (1). This map, Figure 6, represented the averaged piezometric surface over the duration of the FIT project.

Additional groundwater monitoring, sometimes referred to as the Phase B Investigation, was conducted by Roy F. Weston, Inc., in 1982. New 4-inch diameter groundwater monitoring wells were constructed to supplement those installed for the FIT project. Several of the FIT project wells were found to have been damaged and could not be used for the Phase B Investigation. Data pertaining to the FIT project wells was summarized during the Phase B Investigation (6) and is presented in Table 2. Figure 7 shows the locations of all monitoring wells used in the Phase B study (6). Water level data for these wells are given in Table 3. Figure 8 is a piezometric surface map prepared during the Phase B Investigation (6).

The data assembled during the FIT project and the Phase B investigation show that the general direction of groundwater flow at the site is due west. The average water surface gradient is reported to be 0.0013 ft/ft by the FIT project investigators (1). The Phase B investigators (6) report a gradient equal to 0.0019 ft/ft computed between wells MW13 and MW18.

Surface Water Interaction. Figures 6 and 8 show that water flows from the Great Miami River to the aquifer in an area just west of the Chem-Dyne site, under the conditions represented by these figures. The east-west position of the axis of the water surface "valley" shown in these figures is most likely a function of the stage of the Great Miami River. As the river stage rises, the valley should move east and vice versa.

WATER LEVEL ELEVATIONS

DATE	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9
12/17/80	564.23								
18		564.20							
19	563.46		562.71						
21				562.40					
22				561.50	559.82				
23	563.36	563.90	562.86	561.50	559.82	557.13			
30							564.62	563.96	
31							-		563.05
01/01/81									
02	563.06		562.36				564.32		
03		563.50		561.40	559.32	560.53		563.96	563.96
08	562.96	563.30	562.26	560.90		560.53	564.12	563.46	563.71
19	562.76								
20	562.06	563.20	561.96		558.92	559.83	564.02	563.46	563.46
21	562.81				559.72	560.13		563.21	563.46
28									
29									
30									
31									
02/01/81	562.46	563.05	561.76	561.10	559.22	560.58	564.02	563.16	563.26
17	563.72	562.78	562.01	562.56	560.14	562.64		562.93	563.32
18							563.74		
24							563.92		
25									
26									
27									
28									
29									
03/01/81									
02									
03									
04	563.06	563.30	562.66	562.40	560.52	561.83	564.12	563.46	563.76
31			562.16	561.70	558.92	560.73	563.92		
04/01/81									
02									
03									
06									
07		562.64	562.12	561.81	559.94	561.48			562.98
08									
09									
10	562.63	562.74	562.14	561.83	559.94			562.82	562.92
20	563.49								
21				563.41					
22			563.29		561.36			563.68	
verage	562.98	563.17	562.33	561.86	559.77	560.90	564.02	563.35	563.43

TABLE 1
(SHEET 1 OF 3)
WATER LEVEL ELEVATIONS
P. 113
CHEM-DYNE SITE

OURCE: Ecology & Environment,
une 1982

WATER LEVEL ELEVATIONS

(continued)

DATE	B-10	B-11	B-12	B-13	B-14	B-15	B-16	B-17	B-19
12/17/80									
18									
19									
21									
22									
23									
30									
31	DRY								
01/01/81		563.39	563.75						
02									
03	DRY	563.19	563.15	588.25					
08	DRY	562.09	562.85	586.05					
19									
20	DRY	562.59	562.55	585.85					
21	DRY	562.69	562.55	585.65					
28					563.13				
29									
30							562.83	562.36	
31									
02/01/81	DRY	563.09	562.35	586.05					
17	DRY	562.44	562.47	586.98			563.03		
18									
24									
25									
26									
27					563.28	563.30	562.33	563.06	
28									
29									
03/01/81									
02									
03									
04	DRY	563.19	558.75	585.75					
31	DRY	562.89	562.55	586.45					
04/01/81									
02					562.95	562.74	563.20	562.82	
03									
06					562.88	562.65	563.20	564.17	
07	DRY	562.74	562.30						
08									
09									
10		562.70	562.42		562.78	564.94	562.95	564.24	
20									
21									
22	DRY	563.49	563.40		563.70	563.57	563.95	563.57	
Average		562.83	562.30	586.11	563.12	563.44	563.07	563.37	

TABLE 1
(SHEET 2 OF 3)
WATER LEVEL ELEVATIONS
P. 213
CHEM-DYNE SITE

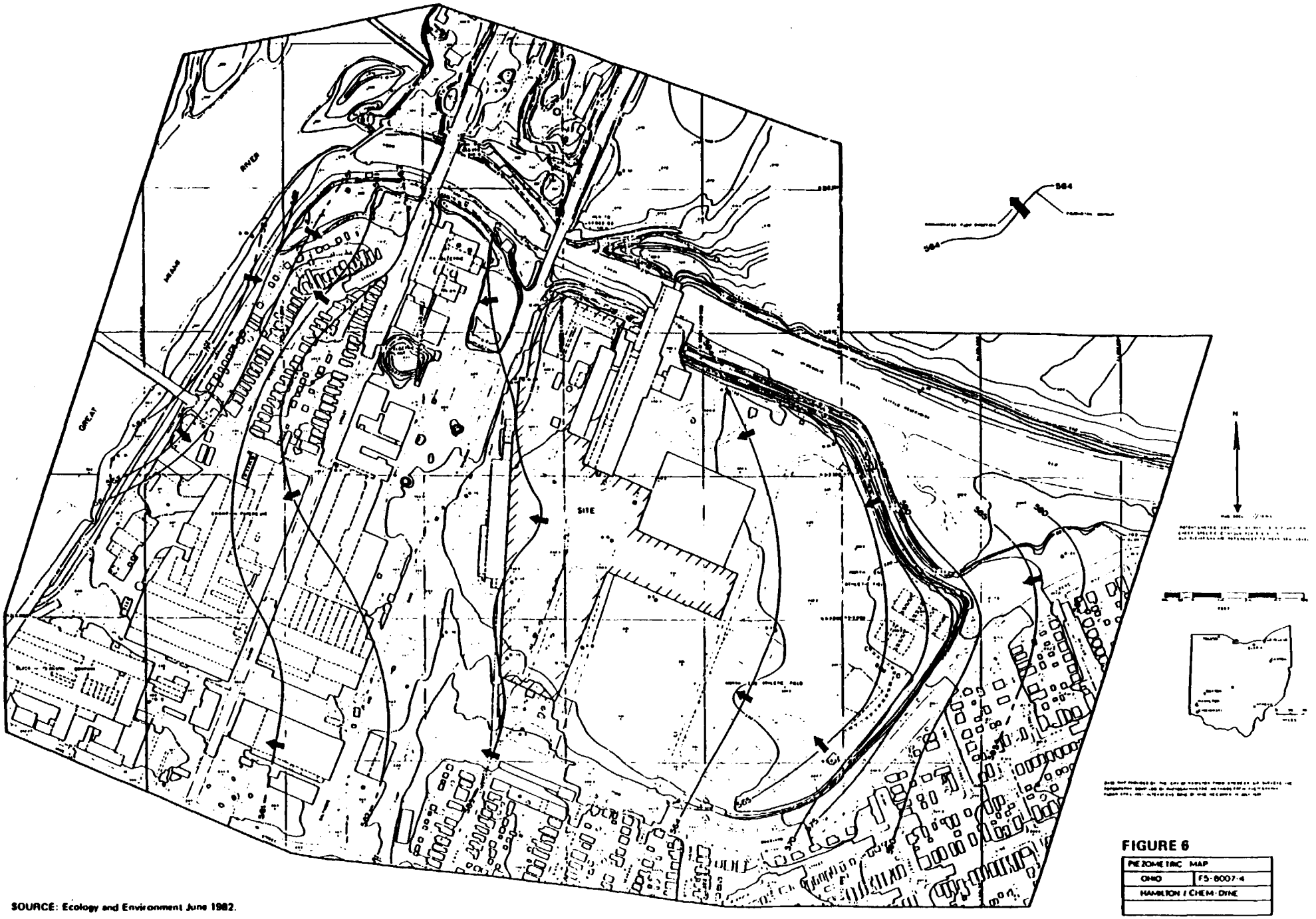
WATER LEVEL ELEVATIONS

(continued)

DATE	B-20	B-25	B-26	B-27	B-28	B-29	B-30	B-31	B-32
12/17/80									
18									
19									
21									
22									
23									
30									
31									
01/01/81									
02									
03									
08									
19									
20									
21									
28			566.98						
29									
30									
31									
02/01/81									
17									
18									
24									
25									
26		563.88							
27	DRY								
28									
29									
03/01/81				563.91					
02					563.14	590.68			
03							564.05	563.05	563.67
04		563.78	564.28	563.81	563.24	590.58	563.50	562.35	563.73
31	DRY	563.78	564.28		563.04		562.88	561.60	563.53
04/01/81									
02	DRY								
03									
06	DRY								
07		563.15		563.60		589.34	563.24	562.01	
08									
09								562.06	
10				563.56		589.69	562.82	561.89	
20							564.74	563.65	
21							564.14	563.41	
22	DRY								
Average		563.57	564.28	563.66	563.14	590.07	563.55	562.42	563.63

TABLE 1
(SHEET 3 OF 3)
WATER LEVEL ELEVATIONS
P. 313
CHEM-DYNE SITE

PIEZOMETRIC MAP OF CHEM-DYNE



SOURCE: Ecology and Environment June 1982.

FIGURE 6

PIEZOMETRIC MAP	
OHIO	F5-8007-4
HAMILTON / CHEM-DYNE	

FIELD SURVEY OF EXISTING MONITOR WELLS IN THE CHEM-DYNE SITE AND VICINITY - OCTOBER 1982

E&E Well Designation	WESTON Well Designation	Elevation Top of Casing (ft msl)	Well Depth (ft from TOC)	Well Casing Stickup (feet)	Depth to Water (ft from TOC)	Status of Well
B2	--	--	--	--	--	No cap, filled with debris, abandoned and replaced with Well MW8
B3	MW18	596.90	40.19	2.35	34.85	Locked cap
B4	--	593.51	36.75	2.18	33.06	No structural damage, locked cap, abandoned and replaced with MW20
B5	--	--	--	--	--	Surface casing bent, no cap, abandoned and replaced with Well MW17
B8	MW7	593.59	34.20	1.85	29.85	No lock on cap, incorrectly located in E & E report
B9	MW4	593.18	33.75	2.78	29.78	No structural damage, locked cap
B10	--	--	21.20	2.94	Dry	No structural damage, locked cap
B11	MW13	593.47	32.98	1.58	35.69	No structural damage, locked cap
B12	MW11	598.60	39.93	2.89	35.69	No structural damage, locked cap
B14	MW6	592.49	31.71	1.58	28.81	No structural damage, locked cap
B15	MW9	593.11	34.30	0.63	29.90	No structural damage, locked cap
B16	MW5	591.91	34.70	1.48	28.31	No structural damage, locked cap
B17	MW10	591.84	35.73	2.15	28.63	No strucrural damage, locked cap
B20	--	--	23.47	2.92	Dry	No structural damage, locked cap
B25	MW14	594.66	31.58	1.65	31.14	No structural damage, locked cap
B27	--	--	--	--	--	No cap, filled with debris, abandoned and replaced with Well MW2
B29	--	--	--	--	--	No cap, filled with debris
B31	--	--	9.38	0.73	8.56	Erosion around surface pipe, no lock on cap, totally submerged in high river stage.

Note: Wells B1, B6 and B20 could not be located during the field survey.

SOURCE: Weston, June 1983

TABLE 2
FIELD SURVEY OF EXISTING MONITOR WELLS IN THE CHEM-DYNE SITE AND VICINITY - OCTOBER 1982
CHEM-DYNE SITE

Water Levels Elevations

Chem-Dyne Site and Vicinity

17 December 1982

LOCATION	TIME OF MEASUREMENT (HRS)	ELEVATION TOP OF CASING (ft)	DEPTH TO WATER FROM TOC (ft)	ELEVATION OF WATER LEVEL (ft)
1W1	1038	591.09	27.50	563.59
1W2	1035	591.49	27.82	563.67
1W3	1030	591.15	27.20	563.95
1W4	1045	593.20	29.76	563.44
1W5	1109	591.91	28.31	563.60
1W6	1113	592.49	27.70	562.79
W7	1048	593.59	30.23	563.36
W8	1051	598.20	35.00	563.20
W9	1101	593.11	29.85	563.26
W10	1105	591.84	28.57	563.27
W11	0943	598.60	35.55	563.05
W12	1011	593.44	30.33	563.11
W13	1012	593.47	30.17	563.30
W14	1017	594.66	31.04	563.62
W15	1020	595.89	32.48	563.41
W16	1154	595.09	32.67	562.42
W17	1203	597.55	36.87	560.68
18	1207	596.90	34.48	562.42
19	1225	591.23	30.51	560.72
20	1223	591.80	29.91	561.89
21	1214	597.85	36.46	561.39
22	1216	597.35	37.04	560.31
ami River Bl ck Street dge	1300			563.49
ira lic al Impoundment acent to Well MW3	1330			593.69

TABLE 3
WATER LEVELS ELEVATIONS
CHEM-DYNE SITE AND VICINITY -
DECEMBER 17, 1982
CHEM-DYNE SITE

SOURCE: Weston, June 1983

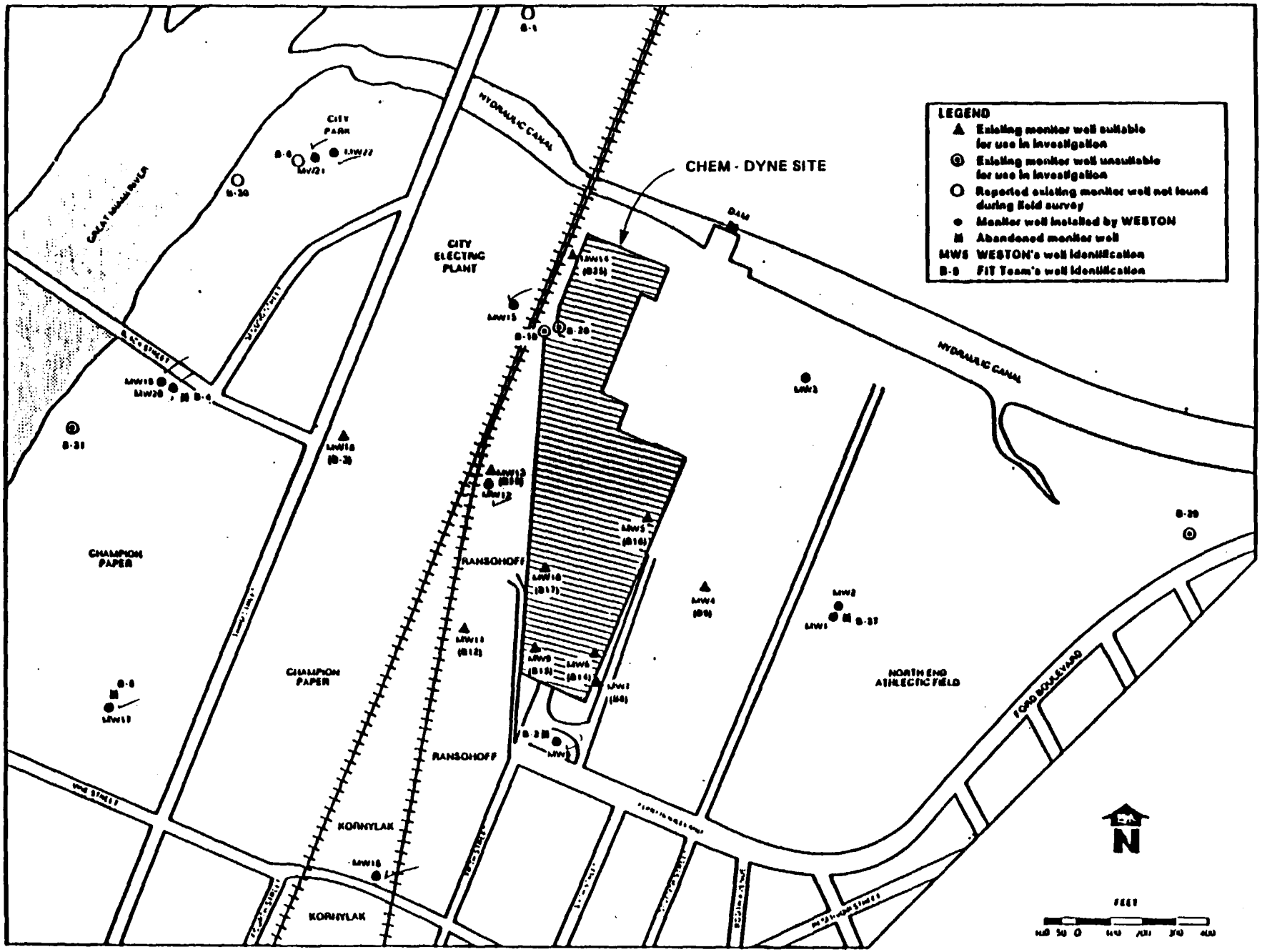


FIGURE 7 STATUS AND LOCATION OF FIT AND WESTON MONITOR WELLS

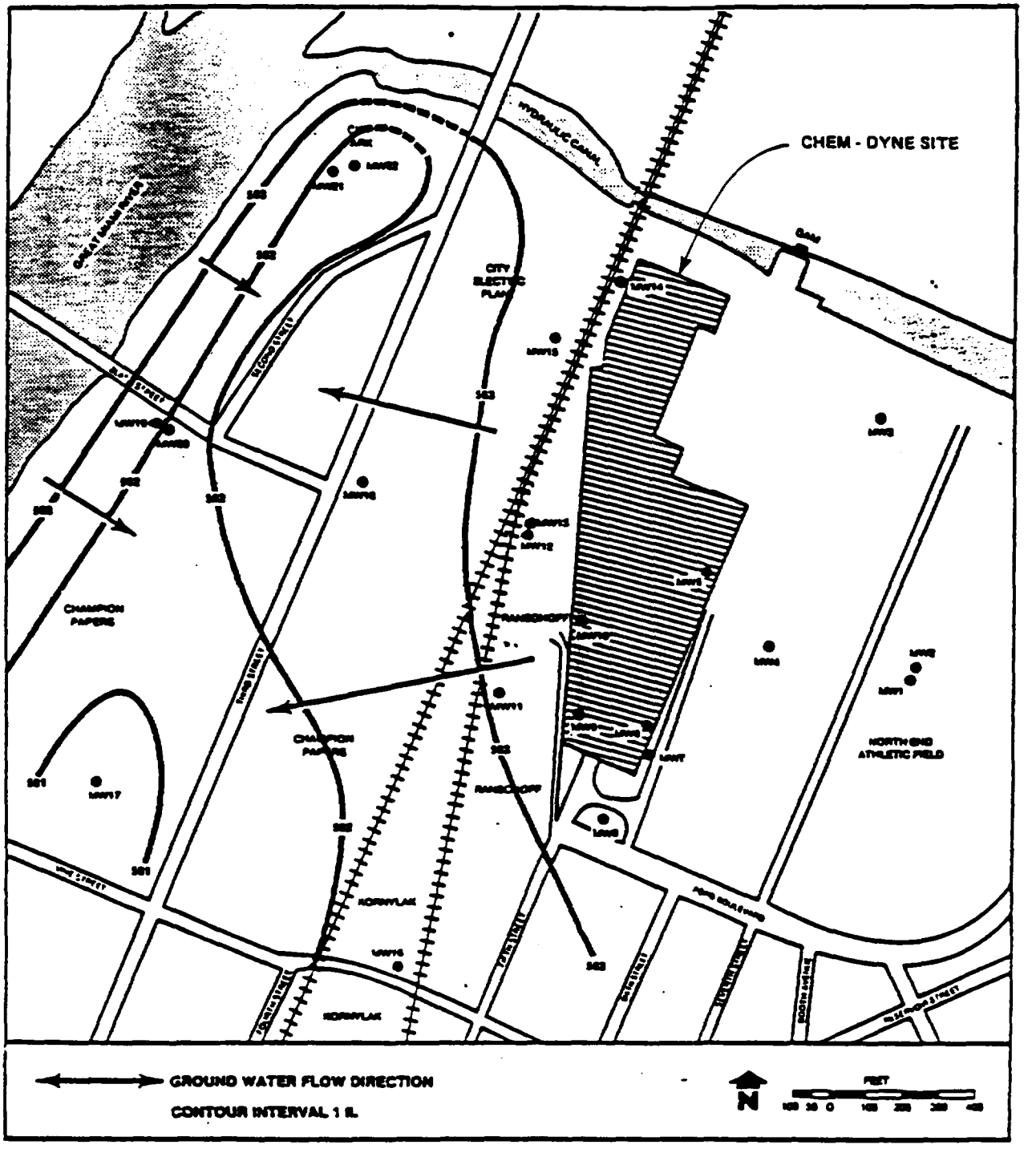


FIGURE 8 WATER TABLE CONTOUR MAP IN CHEM - DYNE VICINITY, DECEMBER 17, 1982

The FIT project investigators (1) indicated that infiltration is probably the major source of recharge to the aquifer at the Chem-Dyne site. However, they indicated that some recharge from the river may occur. They also suggested that there is seepage entering the site from the Ford Hydraulic Canal that parallels the north boundary of the site.

Production Well Influence. During the Phase B investigation, a survey was conducted to identify all wells within approximately a 1-mile radius of the Chem-Dyne site. Data pertaining to these wells are summarized in Table 4. The well locations are shown in Figure 9.

The Phase B investigators conclude that none of the production wells shown in Figure 9 has a very significant influence on the Chem-Dyne groundwater system. They suggest that the city electric plant wells may be the most influential because of their close proximity to the site. However, the investigators point out that the piezometric surface maps prepared during the FIT project do not indicate any such influence.

Aquifer Parameters. Spieker (3) estimates that the transmissivity, T, of the regional aquifer in the Chem-Dyne area is 300,000 to 500,000 gallons per day per foot (gpd/ft). He assigned a storage coefficient, S, of 0.2 based on the assumption of unconfined conditions.

Pump tests were conducted in the Hamilton area by Smith (8, 9) in 1960. The test conducted in a confined portion of the aquifer for Champion Papers, north of Hamilton, resulted in the following parameters (8):

Transmissivity, T = 521,000 gpd/ft
Hydraulic Conductivity, K = 5,800 gpd/ft^2
Storage Coefficient, S = 0.0003

Pump tests were conducted by Smith (9) at the North Well and Foundry Well shown in Figure 10. The North Well is apparently in a confined portion of the aquifer. The transmissivity is reported to be 161,000 gpd/ft. The Foundry Well is located in an unconfined portion of the aquifer. The transmissivity was computed to be 308,000 gpd/ft.

The maximum groundwater gradient in the vicinity of the Chem-Dyne site was reported to be 0.0019 by Weston. Calculations based on the values presented in the Weston

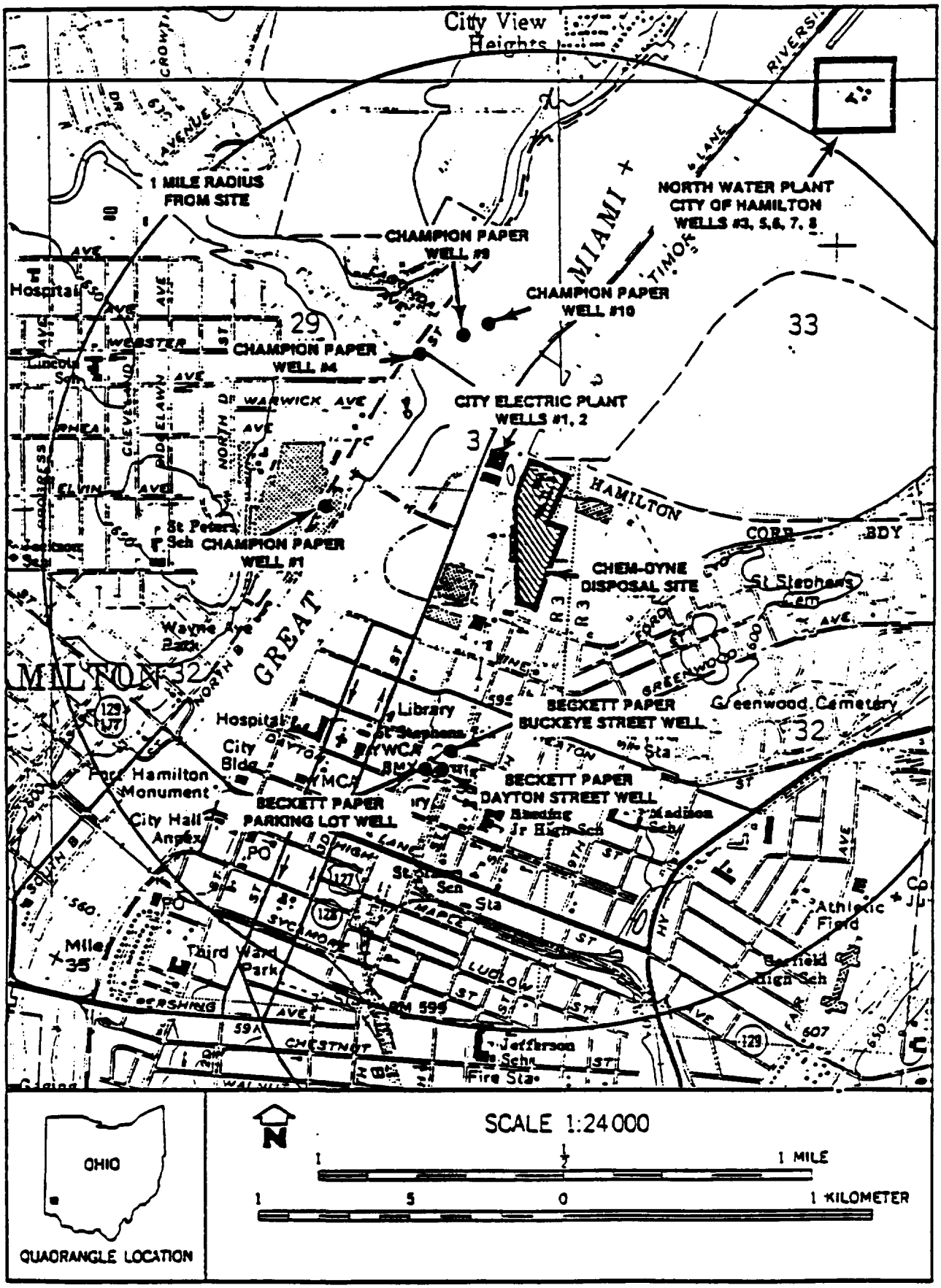
INFORMATION ON THE GROUND-WATER PRODUCTION WELLS
IN THE CHEM-DYNE VICINITY

Production Well	Date Installed	Depth of Well (ft)	Screen Length (ft)	Static Water Level (ft)	Well Performance - Water Level Drawdown With Given Discharge	Approximate Discharge (mgd)	Use
Beckett Paper Duckeye St. Well	1934	100	25	34 (1934)	N/A	(Total 3 Wells)	Process and drinking water
Beckett Paper Dayton St. Well	1937	116	25	25 (1937)	10 ft. @ 1600 gpm (1937)	1.4	
Beckett Paper Parking Lot Well	1964	175	30	30.5 (1980)	N/A		
Champion Paper Well No. 10	1956	135	10	33	N/A	1.15	
Champion Paper Well No. 9	1955	120	30	23	N/A	0.43	
Champion Paper Well No. 1	1935	111	20	43.5 (1935)	13.5 ft. @ 2500 gpm (1935)	0.29	Process water
Champion Paper Well No. 4	1923	101	30	N/A	N/A	1.15	
City Electric Plant - Well No. 1	1951	N/A	N/A	N/A	N/A	(Total 2 Wells)	Cooling systems
City Electric Plant - Well No. 2	1970	N/A	N/A	N/A	N/A	0.86	
North Water Plant Well No. 3	1941	142.5	20	36 (1941)	22 ft. @ 2200 gpm (1941)	--	
North Water Plant Well No. 5	1941	179.5	65	38 (1941)	32 ft. @ 3200 gpm (1941)	(Total 5 wells)	
North Water Plant Well No. 6	1941	138.5	40	35 (1941)	23 ft. @ 2200 gpm (1941)		
North Water Plant Well No. 7	1954	161	60	40 (1954)	13 ft. @ 1500 gpm (1954) 15 ft. @ 1700 gpm (1954)	2.0	Public water sup supply
North Water Plant Well Nol 8	1950	N/A	N/A	35 (1950)	N/A		

Note: (1937) Date of measurement or testing
N/A - Not Available

SOURCE: Weston, June 1983

TABLE 4
INFORMATION ON THE GROUNDWATER PRODUCTION WELLS IN THE CHEM-DYNE VICINITY
CHEM-DYNE SITE



SOURCE: Weston, June 1983

FIGURE 9 MUNICIPAL AND INDUSTRIAL SUPPLY WELLS IN CHEM - DYNE VICINITY

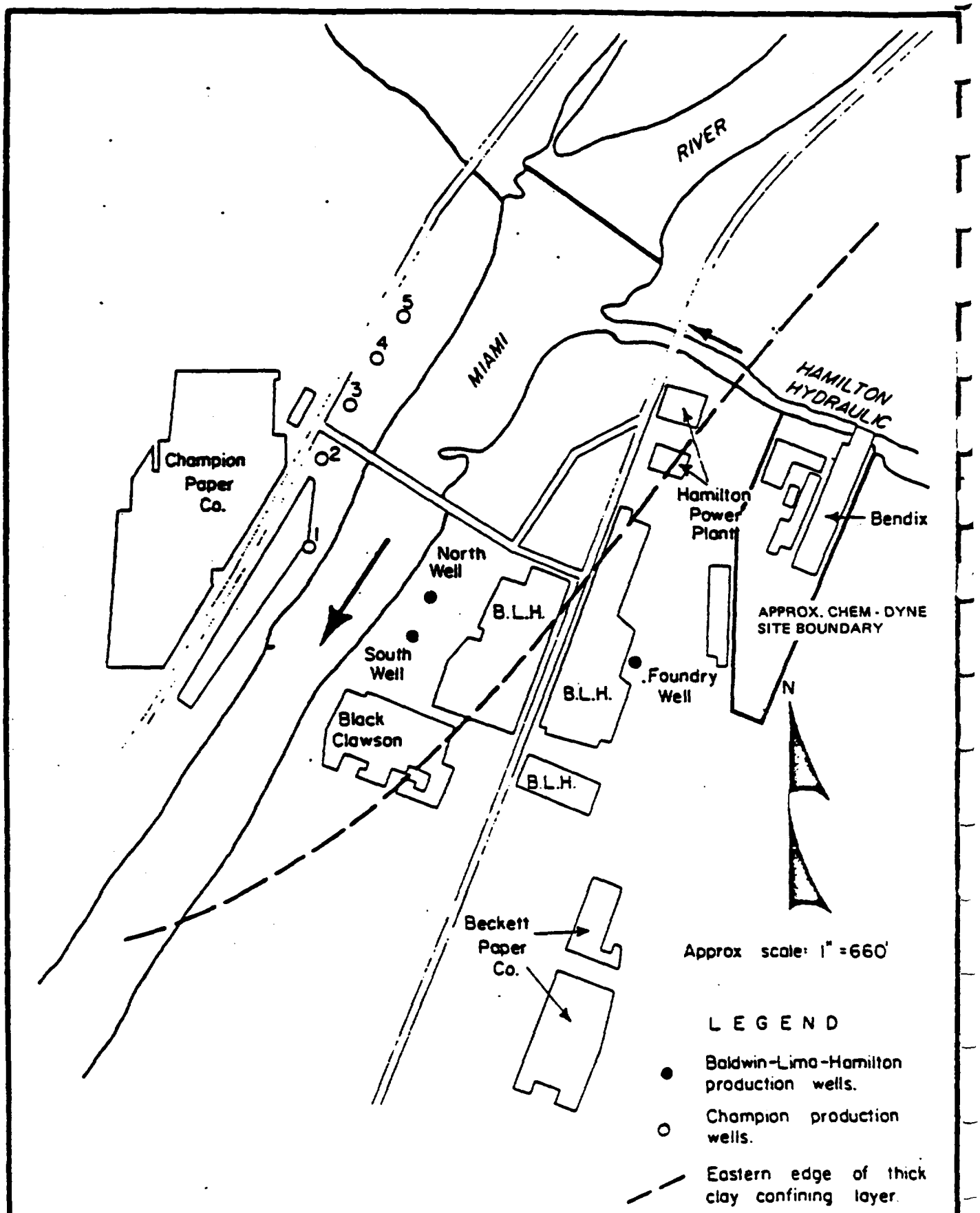


FIGURE 10

THE CHAMPION PAPER CO.

MAP OF BALDWIN-LIMA-HAMILTON AREA.

SOURCE: Smith, July 1960

report, i.e., an average hydraulic conductivity of 270 ft/day (2,020 gal/day-ft^2), derived from reported transmissivity values and an estimated porosity of 30 percent for sandy gravel deposits, indicate that the average linear velocity is 1.71 ft/day. A hydraulic conductivity value of 667 ft/day and a gradient of 0.0013 were used in the FIT report to estimate an average linear velocity of 2.8 ft/day. The Weston study documented a delayed response in monitoring wells close to the river to an increase in river stage. Both reports indicate groundwater flow is to the west across the site; however, near the river and Ford Hydraulic Canal, flow can be toward the site depending upon the river and canal stage.

General Site Specific Groundwater Quality

Sampling Data. Groundwater quality data are collected by the USGS for several wells in the Hamilton, Ohio area. Table 5, reproduced from Spieker (3), summarizes some of these data for sampling conducted through 1964. Plummer (10) cites various groundwater quality records for wells in Butler County collected between 1906 and the present. These data are not reproduced here.

More recent groundwater quality data are published by the Miami Conservancy District (2,5,10). Tables 6-12 summarize groundwater quality data for Well No. BU-36, also designated as Champion Papers Well No. 4, collected from 1965 through 1981. This well, shown in Figure 10, is northwest of the Chem-Dyne site, just west of the Great Miami River.

Well No. BU-50 is located approximately 3 miles southwest of the Chem-Dyne site as shown in Figure 11. Groundwater quality data collected for this well during 1974 are presented in Tables 13 and 14.

In 1982, the Miami Conservancy District (11) proposed a groundwater investigation for the region surrounding the Chem-Dyne site. This investigation was never begun by MCD because the U.S. EPA selected a REM/FIT contractor to perform the investigation as a part of the overall RI/FS work.

During the FIT project (1), groundwater samples were collected from monitoring wells installed in and around the

Selected analyses of water samples from wells in the lower Great Miami River valley, Ohio

[Data are in milligrams per liter except as indicated]

Owner	Location	Well	Date sample was collected	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Ammonia nitrogen as NH_4	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrite (NO_2)	Nitrate (NO_3)	Potential nitrate (NH_4, NO_2, and NO_3 as NO_3)	Phenols as C_6H_5OH	Alkyl benzene sulfonate (ABS)	Dissolved solids (residue at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color
Drinking water standards [1]						0.3	0.05							250	250	[2] 0.9		45		0.001	0.5	500					
Dayton Power & Light Co., O. H. Hutchings station.	South of Miamisburg	9	10-22-64	59	14	.25	.00	84	31	21	3.0	0.0	340	57	47	.5	0.00	.4	0.4	.000	.1	445	337	56	755	7.7	0
Middletown Water Works	Middletown	20	10-22-64	63	0.1	.41	.00	70	30	20	3.2	.0	300	70	30	.5	.00	1.0	1.0	.011	.0	417	321	74	701	7.5	5
Do	do	17	10-22-64	56	14	1.0	.02	94	27	0.2	1.2	.0	250	50	15	.5	.00	.0	.0	.002	.0	382	340	64	650	7.5	5
Armco Co., East Works	do	24	1-21-65	57	15	0.0	.02	133	66	16	1.5	.5	440	162	22	.5	.00	.2	1.0		.0	624	519	156	946	7.3	3
Do	do	23	10-21-64	61	16	0.2	.00	210	82	29	2.1	.0	500	424	48	.5	.00	.0	.0		.0	1,110	862	451	1,110	7.0	3
Do	do	22	1-21-65	58	14	4.7	.14	126	47	18	1.7	.0	428	144	30	.3	.00	.0	2.1		.0	617	508	150	956	7.3	10
Do	do	25	10-21-64	55	14	3.0	.00	102	33	10	1.3	.0	372	40	22	.5	.00	.0	.0		.0	306	340	35	588	7.6	12
Hickory Flat Church	Near Hamilton	40	10-20-64	53	0.5	.24	.06	83	30	2.6	1.3	.0	324	30	7.0	.3	.00	18			.0	345	331	65	600	7.6	3
Armco Co., New Miami plant.	New Miami	42	10-21-64	58	10	.46	.10	94	30	14	3.0	12	344	113	18	.4	.05	2.6	42.0	.000	.0	450	350	76	770	7.4	5
City of Hamilton, North well field.	Hamilton	44	10-21-64	56	13	.41	.36	101	34	12	1.9	.0	326	105	26	.3	.00	.0	.0	.000	.0	484	392	125	730	7.6	4
Champion Paper Co.	do	46	10-22-64	60	10	.02	.00	98	30	22	3.1	.0	318	94	36	.4	.00	3.5	3.5	.001	.0	475	360	108	764	7.5	3
Do	do	45	10-21-64	57	13	.16	.45	110	37	0.7	1.7	.0	402	87	16	.3	.00	.0	.0	.010	.0	482	427	97	706	7.4	5
Edward F. Miller	3070 Tylersville Road, Hamilton.	Spring	6-6-63	54.5	10	.02	.03	100	28	7.6	.9	.0	366	60	15	.2	.00	4.6	4.6		.0	406	357	73	667	7.4	3
City of Hamilton	Fairfield	61	6-5-63	54.5	11	.03	.03	90	28	4.0	1.3	.0	352	40	8.0	.2	.05	9.3	9.4	.005	.0	358	340	61	619	7.5	3
Do	do	53	6-5-63	54	0.3	.22	.06	87	26	4.2	1.7	.0	336	46	7.0	.3	.05	4.0	4.0	.004	.0	359	324	47	612	7.2	3
Do	do	55	6-5-63	55	10	.13	.17	92	27	4.4	1.5	.0	344	47	11	.2	.05	7.3	7.4	.000	.0	373	341	50	634	7.4	2
City of Cincinnati, pumping-test site.	Near Fairfield	63	6-28-62	55	12	.63	.26	80	24	3.0	1.1		328	34	6.0	.4		.2				310	296	29	553	7.5	0
Do	do	63	6-20-62		11	.45	.06	82	24	3.1	1.2		330	34	5.5	.1		.1				319	303	32	564	7.2	3
Southwestern Ohio Water Co.	Near Ross	77	7-17-52	54	11	.30	.25	83	30	2.5	1.5		310	36	5.5	.1		1.0				335	258		552	7.7	2
Do	do	77	1-29-54	58	12	.00	.00	94	25	0.4	2.0		330	64	12	.0		2.0				383	340	67	636	7.2	2
Do	do	77	11-7-56	56	13	.11	.42	96	24	13	1.7		320	72	16	.1		1.2				417	340	71	657	7.5	2
Do	do	77	3-27-57	54.5	11	.10	.42	90	26	12	2.1		334	75	21	.1		2.1				420	360	66	697	7.7	0
Do	do	77	6-4-58	56	10	.08	.24	88	29	12	1.0		315	70	16	.1		2.3				410	339	81	651	7.3	1
Do	do	77	6-4-63	59	0.2	.31	.63	96	29	14	2.1	.1	320	82	34	.2	.05	7.0	7.0	.004	.0	423	354	92	695	7.0	3
Do	do	77	2-16-65	63	0.2	.04	.13	90	33	25	2.1		294	121	38	.2		.4				486	380	129	782	7.0	3
Do	do	73	11-7-56	56	11	.04	.20	86	24	5.4	1.2		322	50	11	.1		2.0				356	313	49	580	7.4	2
Do	do	73	3-27-57	55.7	10	.00	.34	89	24	5.0	1.0		321	44	9.2	.1		3.7				368	321	58	607	7.7	0
Do	do	73	6-4-58	53	11	.16	.20	73	25	5.7	1.6		268	60	9.0	.1		7.7				321	285	66	550	7.4	1
Do	do	73	1-21-65	55	13	.00	.17	83	27	8.6	2.1	.1	324	64	16	.2	.05	5.3	5.7	.003	.0	397	343	78	651	7.4	3
U.S. Atomic Energy Comm.	Near Fernald	87	6-5-63	54	11	3.3	.44	93	24	10	1.1	.4	354	41	16	.2	.00	.3	1.9	.000	.0	389	331	40	635	7.5	4
E. I. DuPont DeNemours Corp.	North Bend	105	11-6-64		17	.01	.00	95	30	20	3.3		306	101	29	.0		.2				491	361	110	741	7.4	3

[1] U.S. Public Health Service (1962).
[2] For average annual maximum air temperature of 63.9°-70.6°F.

SOURCE: Spieker, 1968

TABLE 5
SELECTED ANALYSES OF WATER SAMPLES FROM WELLS IN THE LOWER GREAT MIAMI RIVER VALLEY, OHIO
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT

GROUNDWATER QUALITY DATA

LOCATION: LAT.39 24'45 , LONG.84 33'33 , T2N R3E,
SEC. 29, HAMILTON, O. AT E. END GRAY AVE
150' WEST OF GREAT MIAMI RIVER, 300'
SOUTH OF TWO MILE CREEK. CHAMPION
PAPERS WELL NO. 4.

WELL NO: BU 36
ID: HAMILTON 64
COUNTY: BUTLER
SOURCE: INDUSTRIAL WELL

PARAMETER	UNITS						
DATE		8-17-73	11-15-73	2- 7-74	5- 1-74	8- 9-74	11- 7-74
TIME		0	0	0	800	1145	900
SOURCE OF DATA		USGS	USGS	USGS	USGS	USGS	USGS
FIELD MEASUREMENTS							
AIR TEMPERATURE	C					37.0	3.0
WATER TEMPERATURE	C	16.5	16.5	14.5	15.5	20.0	15.0
PH						7.0	7.1
CONDUCTIVITY	MICROMHOS					850.	800.
DISSOLVED OXYGEN	MG/L						
HYDROGEN SULFIDE (H2S)	MG/L						
FREE CARBON DIOXIDE CO2	MG/L	9.	44.	36.	29.	60.	44.
DEPTH TO WATER	FEET						
SAMPLE DEPTH	FEET	180.0	180.0	180.0	180.0	180.0	180.0
FLOW	GPM						
LABORATORY ANALYSES							
ALKALINITY AS CACO3	MG/L	288.	294.	291.	295.	310.	299.
ALUMINUM (AL)	MG/L						
ARSENIC (AS)	MG/L	0.009	0.009				
BARIUM (BA)	MG/L						
BERYLLIUM (BE)	UG/L						
BICARBONATE (HCO3)	MG/L	351.	358.	355.	360.	378.	365.
BORON (B)	MG/L						
CADMIUM (CD)	MG/L						
CALCIUM (CA)	MG/L		76.	93.		97.	
CARBONATE (CO3)	MG/L	0.	0.	0.	0.	0.	0.
CHLORIDE (CL)	MG/L	43.	41.	42.	39.	38.	39.
CHROMIUM (CR)	MG/L						
COBALT (CO)	UG/L						
COLOR	UNITS						
CONDUCTIVITY - LAB	MICROMHOS	828.	834.	827.	794.		
COPPER (CU)	MG/L	0.005	0.012			0.000	
CYANIDE (CN)	MG/L						
FLUORIDE (F)	MG/L	0.100	0.200	0.200	0.300	0.300	0.300
HARDNESS,NONCARBONATE	MG/L						
HARDNESS,TOTAL AS CACO3	MG/L						

TABLE 6
(SHEET 1 OF 2)
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
P. 112
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT

TABLE A-8

GROUNDWATER QUALITY DATA

LOCATION: LAT.39 24'45 , LONG.84 33'33 , T2N R3E,
SEC. 29, HAMILTON, O. AT E. END GRAY AVE
150' WEST OF GREAT MIAMI RIVER, 300'
SOUTH OF TWO MILE CREEK. CHAMPION
PAPERS WELL NO. 4.

WELL NO: BU 36
ID: HAMILTON 24
COUNTY: BUTLER
SOURCE: INDUSTRIAL WELL

PARAMETER	UNITS						
DATE		8-17-73	11-15-73	2- 7-74	5- 1-74	8- 9-74	11- 7-74
TIME		0	0	0	800	1145	900
SOURCE OF DATA		USGS	USGS	USGS	USGS	USGS	USGS
LABORATORY ANALYSES, CONTINUED							
IRON (FE)	MG/L	0.100	0.100	0.050	0.060	0.010	0.030
LEAD (PB)	MG/L	0.000	0.006			0.004	
MAGNESIUM (MG)	MG/L		27.	30.		36.	
MANGANESE (MN)	MG/L	0.013	0.013	0.050	0.017	0.010	0.040
MERCURY (HG)	MG/L						
NICKEL (NI)	MG/L						
NITROGEN,AMMONIA (NH4-N)	MG/L						
NITROGEN,NITRATE (NO3-N)	MG/L	1.1	0.0	1.8	1.8	1.7	1.5
PH - LAB		7.8	7.1	7.2	7.3		
PHOSPHORUS, TOTAL AS P	MG/L						
POTASSIUM (K)	MG/L						
SELENIUM (SE)	MG/L						
SILVER (AG)	MG/L						
SODIUM (NA)	MG/L						
SOLIDS, DISSOLVED	MG/L						
SOLIDS SUSPENDED	MG/L						
SOLIDS, TOTAL	MG/L	533.	538.	564.	610.	596.	510.
STRONTIUM (SR)	MG/L						
SULFATE (SO4)	MG/L	93.	94.	88.	98.	93.	97.
TURBIDITY	JTU						
ZINC (ZN)	MG/L		0.030			0.020	
ORGANICS							
PHENOL (C6H5OH)	MG/L						
DETERGENTS AS METHYLENE BLUE ACTIVE SUBSTANCE	MG/L						
TOTAL ORGANIC CARBON(C)	MG/L						
OXYGEN DEMAND							
BOD 5-DAY	MG/L						
COD	MG/L						
BIOLOGICAL							
TOTAL COLIFORM	MF/100 ML						
FECAL COLIFORM	MF/100 ML						

SOURCE: Miami Conservancy District, May 1975.

TABLE 6
(SHEET 2 OF 2)
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
P. 212
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
GROUNDWATER QUALITY DATA ANALYSIS

LOCATION LAT.39 24'48 , LONG.84 33'33 , T2N R3E,
SEC. 29, HAMILTON, O. AT E. END UHAY AVE
180' WEST OF GREAT MIAMI RIVER, 300'
SOUTH OF TWO MILE CREEK. CHAMPION
PAPERS WELL NO. 4.
FROM 65/12/14 TO 74/11/ 7

PARAMETER	UNITS	MAXIMUM	DATE	MINIMUM	DATE	AVERAGE	STANDARD DEVIATION	PARAMETER COUNT
AIR TEMPERATURE	CENT.	37.000	74/ 8/ 9	3.0000	74/11/ 7	20.0000	17.000	2
WATER TEMPERATUR	CENT.	20.000	74/ 8/ 9	5.0000	73/ 2/27	15.6710	2.274	31
PH		7.100	74/11/ 7	7.0000	74/ 8/ 9	7.0500	0.050	2
CONDUCTIVITY	MICRO-MHO	850.000	74/ 8/ 9	800.0000	74/11/ 7	825.0000	25.000	2
FREE CARBON DIOX	MG/L	60.000	74/ 8/ 9	8.9000	73/ 8/17	37.4500	14.037	6
ALKALINITY AS CA	MG/L	310.000	74/ 8/ 9	288.0000	73/ 8/17	296.1666	7.058	6
ARSENIC (AS)	MG/L	0.009	73/ 8/17	0.0000	72/12/20	0.0011	0.003	18
BICARBONATE (HCO	MG/L	378.000	74/ 8/ 9	208.0000	67/11/ 6	332.0540	31.809	37
CADMIUM (CD)	MG/L	0.003	71/ 5/25	0.0000	69/ 8/18	0.0003	0.001	10
CALCIUM (CA)	MG/L	120.000	73/ 2/27	59.0000	67/11/ 6	94.5500	12.921	20
CARBONATE (CO3)	MG/L	18.000	68/ 5/15	0.0000	74/11/ 7	0.3243	1.944	37
CHLORIDE (CL)	MG/L	46.000	72/ 8/10	34.0000	70/11/27	38.9459	2.770	37
CHROMIUM (CR)	MG/L	0.040	72/12/20	0.0000	72/ 8/10	0.0130	0.012	14
COBALT (CO)	MICRO-G/L	0.200	66/ 8/ 8	0.0000	69/ 8/18	0.0022	0.063	9
COLOR		5.000	67/ 8/ 7	0.0000	69/ 5/21	2.1250	1.654	16
CONDUCTIVITY - L	MICRO-MHO	834.000	73/11/15	643.0000	67/11/ 6	790.3142	38.381	35
COPPER (CU)	MG/L	0.040	66/ 8/ 8	0.0000	74/ 8/ 9	0.0148	0.015	18
FLUORIDE (F)	MG/L	0.400	66/11/15	0.1000	73/ 8/17	0.2270	0.064	37
HARDNESS,NONCARB	MG/L	124.000	70/ 8/ 6	54.0000	71/ 5/25	109.9032	12.020	31
HARDNESS,TOTAL A	MG/L	410.000	73/ 2/27	287.0000	67/11/ 6	377.4945	24.331	29
IRON (FE)	MG/L	2.000	72/ 8/10	0.0100	74/ 8/ 9	0.1231	0.317	37
LEAD (PB)	MG/L	0.083	70/11/27	0.0000	73/ 8/17	0.0105	0.019	19
MAGNESIUM (MG)	MG/L	40.000	69/ 5/21	26.0000	73/ 2/27	31.8000	3.140	20
MANGANESE (MN)	MG/L	0.430	69/11/17	0.0000	72/ 8/10	0.0278	0.071	37
NITROGEN,NITRATE	MG/L	1.800	73/ 2/27	0.0000	73/11/15	1.0324	0.467	37
PH - LAB		8.500	68/ 5/15	7.0000	70/ 2/24	7.4800	0.280	35
POTASSIUM (K)	MG/L	3.400	67/11/ 6	2.5000	66/11/15	3.1042	0.277	16
SODIUM (NA)	MG/L	30.000	66/ 5/18	22.0000	69/ 8/18	24.0000	1.837	16
SOLIDS, DISSOLVE	MG/L	544.000	70/ 5/19	383.0000	67/11/ 6	486.5161	32.776	31
SOLIDS, TOTAL	MG/L	610.000	74/ 5/ 1	510.0000	74/11/ 7	558.5000	35.384	6
SULFATE (SO4)	MG/L	111.000	68/ 2/22	87.0000	71/ 8/18	100.4054	6.258	37
ZINC (ZN)	MG/L	0.110	71/11/24	0.0000	67/ 8/ 7	0.0253	0.024	18
BLUE ACTIVE SUB	MG/L	0.000	66/ 8/ 8	0.0000	67/ 5/15	0.0000	0.000	3

SOURCE: Miami Conservancy District, May 1975.

TABLE 7
THE MIAMI CONSERVANCY DISTRICT
GROUNDWATER QUALITY DATA ANALYSIS
CHEM-DYNE SITE

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
392445084333000 - BU-36 CHAMPION PAPER CO WELL 4 HAMILTON OH

WATER QUALITY DATA, WATER YEARS OCTOBER 1975 TO SEPTEMBER 1977

Date	Time	Temperature (DEG C)	Air Temperature (DEG C)	Specific Conductance (Micro-mhos)	pH (Units)	Carbon Dioxide (CO2) (mg/l)	Alkalinity as CACO3 (mg/l)	Bicarbonate (HCO3) (mg/l)	Carbonate (CO3) (mg/l)	Total Residue (mg/l)	Total Nitrite (N) (mg/l)	Total Nitrate (N) (mg/l)
12-03-75	1430	15.5		830	6.8	93	301	367	0	520	.01	1.50
02-25-76	0920	16.0		800	7.2	39	315	384	0	537	.01	1.40
05-20-76	1125	17.0		830	7.2	34	274	334	0	518	0	1.30
08-19-76	1400	17.0		830	7.2	38	308	376	0	530	.01	1.20
11-23-76	1500	14.5	4.0	900	7.2	38	312	380	0	540	.02	1.10
02-08-77	1600	16.0	-2.0	900	7.3	30	308	376	0	498	.01	.99
05-20-77	1030	19.0	32.0	940	7.2	38	310	380	0	592	0	.99

Date	Total Nitrite Plus Nitrate (N) (mg/l)	Hardness (CA, MG) (mg/l)	Noncarbonate Hardness (mg/l)	Dissolved Calcium (CA) (mg/l)	Dissolved Magnesium (MG) (mg/l)	Dissolved Chloride (CL) (mg/l)	Dissolved Sulfate (SO4) (mg/l)	Total Fluoride (F) (mg/l)	Total Iron (FE) (UG/L)	Total Manganese (MN) (UG/L)	Total Depth of Well (ft.)
12-03-75		420		100	42	40	99	.2	70	0	
02-25-76		390		100	34	41	97	.2	280	10	
05-20-76		-		-	-	36	96	.2	110	0	
08-19-76		410		110	34	-	-	.2	40	10	
11-23-76	1.10	410	100	110	34	41	96	.2	70	0	180
02-08-77	1.00	420	110	110	36	44	120	.2	40	10	180
05-20-77	.99	450	140	120	36	47	120	.2	560	40	

SOURCE: Miami Conservancy District, September 1977

TABLE 8
UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY 39244084333000 - BU-36 CHAMPION PAPER CO WELL 4 HAMILTON, OH WATER QUALITY DATA, WATER YEARS OCTOBER 1975 TO SEPTEMBER 1977
CHEM-DYNE SITE

MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA ANALYSIS

FOR HO 36.00 • HAMILTON NORTH FROM 65/12/14 TO 69/11/1 SOURCE

PARAMETER	UNITS	MAXIMUM	DATE	MINIMUM	DATE	AVERAGE	STANDARD DEVIATION	PARAMETER COUNT
WATER TEMP.	CENT.	17.400	66/ 8/ 8	13.6000	67/ 2/14	15.4461	0.925	13
CONDUCTIVITY LAB	MICRO-MHOS	813.000	69/ 2/ 6	643.0000	67/11/ 6	773.1174	48.398	17
PH LAB		8.500	68/ 5/15	7.2000	66/ 8/ 8	7.5882	0.325	17
HARDNESS	MG/L	396.000	69/11/17	287.0000	67/11/ 6	369.4706	28.012	17
CHLORIDES	MG/L	42.000	66/ 2/15	34.0000	69/ 8/18	37.8823	2.139	17
SULFATES	MG/L	111.000	68/ 2/22	101.0000	66/11/15	105.7647	2.510	17
DISSOLVED SOLIDS	MG/L	518.000	69/11/17	363.0000	67/11/ 6	468.2352	30.875	17
NITRATE NITROGEN	MG/L	1.400	69/11/17	0.0000	69/ 5/21	0.7824	0.320	17
IRON	MG/L	0.180	67/11/ 6	0.0200	69/ 8/18	0.0635	0.047	17
LEAD	MG/L	0.030	67/ 5/15	0.0000	69/11/17	0.0090	0.011	10
COPPER	MG/L	0.060	66/ 8/ 8	0.0000	66/11/15	0.0233	0.017	9
ZINC	MG/L	0.040	67/ 2/14	0.0000	67/ 8/ 7	0.0170	0.013	10
CHROMIUM	MG/L	0.030	68/ 8/ 8	0.0000	67/11/ 6	0.0140	0.010	10
CADMIUM	MG/L	0.000	66/ 8/ 8	0.0000	69/ 8/18	0.0000	0.000	9
ARSENIC	MG/L	0.000	66/ 8/ 8	0.0000	69/11/17	0.0000	0.000	10
BORON	MG/L	0.000	66/ 8/ 8	0.0000	67/ 5/15	0.0000	0.000	3
MANGANESE	MG/L	0.430	69/11/17	0.0000	69/ 8/18	0.0424	0.101	17
NICKEL	MG/L	0.010	67/11/ 6	0.0000	69/ 8/18	0.0033	0.005	9
SODIUM	MG/L	30.000	66/ 5/18	22.0000	69/ 8/18	24.0000	1.837	16
POTASSIUM	MG/L	3.400	67/11/ 6	2.5000	66/11/15	3.1062	0.277	16
CALCIUM	MG/L	105.000	68/ 8/ 8	59.0000	67/11/ 6	94.0625	12.080	16
MAGNESIUM	MG/L	40.000	69/ 5/21	28.0000	66/ 5/18	32.3125	2.686	16

SOURCE: Miami Conservancy District, Ground Water Quality Report, May 1982.

TABLE 9
MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA ANALYSIS
FROM 65/12/14 TO 69/11/1
CHEM-DYNE SITE

MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA ANALYSIS
FOR GU 36.00 , HAMILTON NORTH FROM 70/ 2/24 TO 79/11/ 5 SOURCE

PARAMETER	UNITS	MAXIMUM	DATE	MINIMUM	DATE	AVERAGE	STANDARD DEVIATION	PARAMETER COUNT
AIR TEMP.	CENT.	37.000	74/ 8/ 9	-0.6000	70/ 2/23	13.5538	13.426	13
WATER TEMP.	CENT.	20.000	74/ 8/ 9	12.0000	70/ 2/23	16.2949	1.275	39
PH FLD		7.900	79/ 2/15	6.8000	75/12/ 3	7.1583	0.153	24
CONDUCTIVITY FLD	MICRO-MHOS	990.000	70/ 8/ 2	800.0000	76/ 2/25	855.5000	51.225	24
CONDUCTIVITY LAB	MICRO-MHOS	834.000	73/11/15	707.0000	72/12/20	806.5554	14.150	18
PH LAB		7.800	73/ 8/17	7.0000	70/ 2/24	7.3778	0.175	18
ALKALINITY	MG/L	310.000	74/ 8/ 9	288.0000	73/ 8/17	295.6000	7.606	5
HARDNESS	MG/L	450.000	77/ 5/20	330.0000	74/11/ 7	402.5881	25.990	34
CHLORIDES	MG/L	50.000	78/11/30	34.0000	70/11/27	41.6829	3.923	41
SULFATES	MG/L	120.000	77/ 2/ 8	87.0000	71/ 8/18	99.4634	7.874	41
TOTAL SOLIDS	MG/L	642.000	77/11/15	497.0000	75/ 2/ 6	560.0369	40.696	27
DISSOLVED SOLIDS	MG/L	544.000	70/ 5/19	487.0000	70/11/27	508.7142	17.964	14
NITRATE NITROGEN	MG/L	1.800	73/ 2/27	0.0000	73/11/15	1.3072	0.380	40
NITRITE NITROGEN	MG/L	0.020	76/11/23	0.0000	79/11/ 5	0.0095	0.006	22
IRON	MG/L	2.000	72/ 8/10	0.0100	74/ 8/ 9	0.1538	0.317	41
LEAD	MG/L	0.083	70/11/27	0.0000	77/ 8/ 8	0.0063	0.020	15
COPPER	MG/L	0.020	70/ 8/ 6	0.0000	74/ 8/ 9	0.0067	0.005	15
ZINC	MG/L	0.410	79/11/ 5	0.0100	72/ 8/10	0.0747	0.098	14
CHROMIUM	MG/L	0.040	72/12/20	0.0000	72/ 8/10	0.0147	0.012	12
CADMIUM	MG/L	0.003	77/ 5/25	0.0030	77/ 5/25	0.0030	0.000	1
ARSENIC	MG/L	0.009	73/ 8/17	0.0000	78/ 8/ 2	0.0017	0.003	12
MANGANESE	MG/L	0.050	70/ 8/ 6	0.0000	79/ 2/15	0.0112	0.014	41
CALCIUM	MG/L	120.000	73/ 2/27	76.0000	73/11/15	96.5000	15.692	4
MAGNESIUM	MG/L	36.000	74/ 8/ 9	26.0000	73/ 2/27	29.7500	3.897	4

SOURCE: Miami Conservancy District, Ground Water Quality Report, May 1982.

TABLE 10
MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA ANALYSIS
FROM 70/2/24 TO 79/11/5
CHEM-DYNE SITE

MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA ANALYSIS

FOR ID 36.00 , HAMILTON NORTH FROM 80/ 2/11 TO 81/ 5/14 SOURCE TREATMENT PLANT

PARAMETER	UNITS	MAXIMUM	DATE	MINIMUM	DATE	AVERAGE	STANDARD DEVIATION	PARAMETER COUNT
AIR TEMP.	CENT.	25.000	80/ 8/ 6	14.0000	80/11/ 5	20.7500	4.323	4
WATER TEMP.	CENT.	16.000	80/ 8/ 6	14.0000	80/ 2/11	15.1667	0.624	6
PH FLD		7.500	81/ 2/ 9	7.0000	81/ 5/14	7.2667	0.180	6
CONDUCTIVITY FLD	MICRO-MHOS	860.000	81/ 5/14	835.0000	80/11/ 5	848.3333	9.866	6
CONDUCTIVITY LAB	MICRO-MHOS	893.000	80/11/ 5	860.0000	81/ 5/14	873.6665	14.059	3
PH LAB		7.500	81/ 2/ 9	7.4000	80/11/ 5	7.4667	0.048	3
ALKALINITY	MG/L	310.000	80/11/ 5	300.0000	81/ 5/14	303.3333	4.717	3
HARDNESS	MG/L	450.000	80/ 5/20	360.0000	80/11/ 5	428.3333	23.393	6
CHLORIDES	MG/L	48.000	80/ 2/11	44.0000	80/11/ 5	46.1667	1.344	6
SULFATES	MG/L	110.000	81/ 5/14	91.0000	80/11/ 5	99.5000	5.708	6
TOTAL SOLIDS	MG/L	612.000	80/ 5/20	559.0000	81/ 2/ 9	580.3333	18.016	6
NITRATE NITROGEN	MG/L	1.500	80/11/ 5	1.2000	81/ 5/14	1.3667	0.094	6
NITRITE NITROGEN	MG/L	0.000	80/ 2/11	0.0000	81/ 5/14	0.0000	0.000	6
IRON	MG/L	0.180	81/ 2/ 9	0.0300	80/ 2/11	0.0850	0.048	6
LEAD	MG/L	0.004	80/ 8/ 6	0.0040	80/ 8/ 6	0.0040	0.000	1
COPPER	MG/L	0.000	80/ 8/ 6	0.0000	80/ 8/ 6	0.0000	0.000	1
ZINC	MG/L	0.050	80/11/ 5	0.0100	80/ 8/ 6	0.0300	0.020	2
CHROMIUM	MG/L	0.030	80/ 8/ 6	0.0200	80/11/ 5	0.0250	0.005	2
MANGANESE	MG/L	0.020	81/ 2/ 9	0.0040	80/11/ 5	0.0107	0.005	6

SOURCE: Miami Conservancy District. Ground Water Quality Report, May 1982.

TABLE 11
MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA ANALYSIS
FROM 80/2/11 TO 81/5/14
CHEM-DYNE SITE

The Miami Conservancy District
Water Conservation Subdistrict

CHAMPION PAPERS - HAMILTON NORTH AREA

Time Period Parameter	1965-69	1970-79	1980-81
pH, Field	7.6*	7.2	7.3
Alkalinity, mg/l	-	296	303
Hardness, mg/l	369	402	428
Chlorides, mg/l	38	42	46
Sulphate, mg/l	106	99	100
Dissolved Solids, mg/l	468	509	-
Iron, mg/l	0.06	0.15	0.08
Manganese, mg/l	0.04	0.01	0.01
Sodium, mg/l	24.0	-	-
Calcium, mg/l	94.1	96.5	-
Magnesium, mg/l	32.3	29.7	-
Potassium, mg/l	3.1	-	-

*pH, Lab

SOURCE: Miami Conservancy District, Ground Water Quality Report, May 1982.

TABLE 12
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
CHAMPION PAPERS - HAMILTON
NORTH AREA
CHEM-DYNE SITE

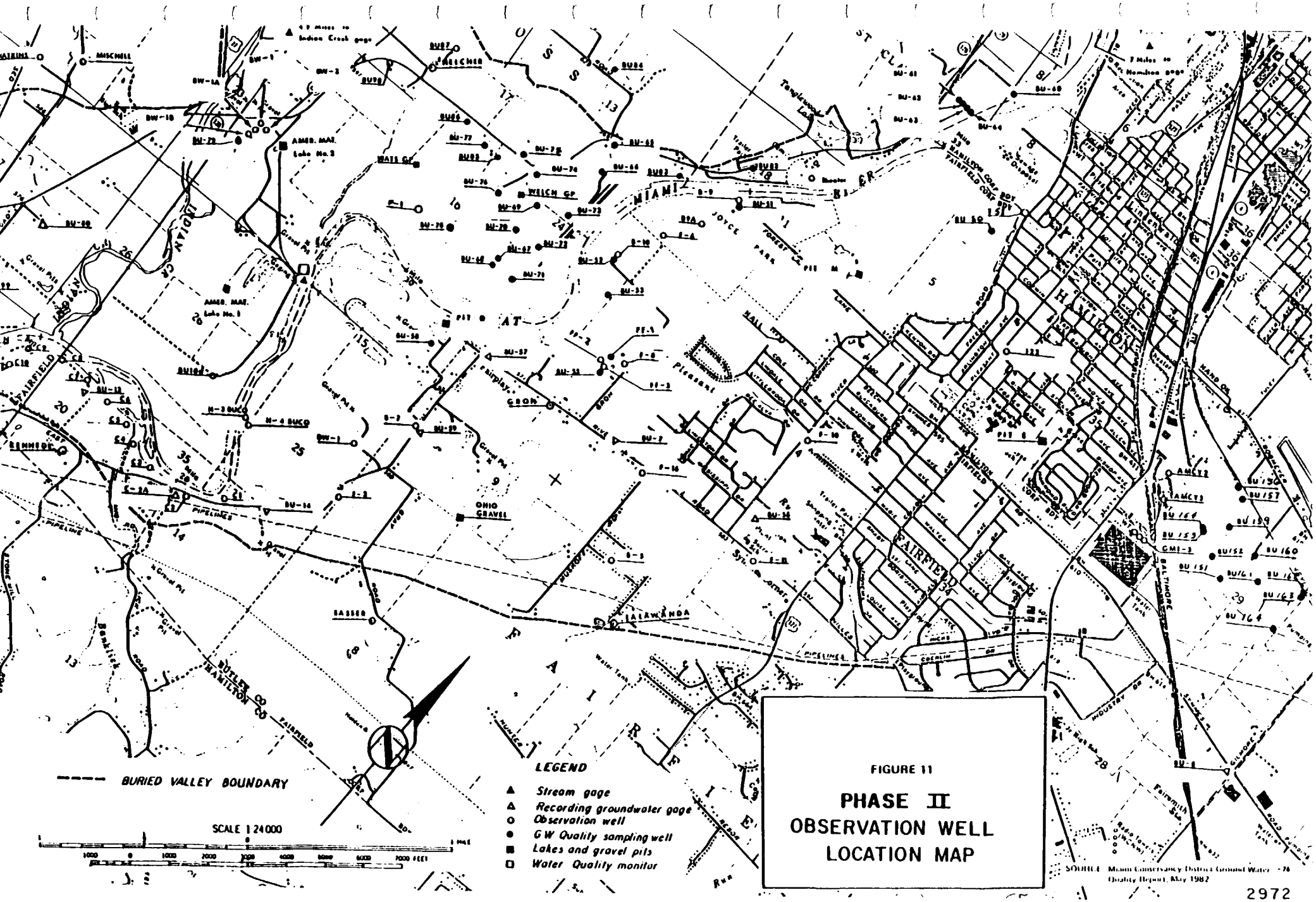


FIGURE 11

PHASE II OBSERVATION WELL LOCATION MAP

THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT

GROUNDWATER QUALITY DATA

LOCATION: LAT 39 21 56, LONG 84 33 59, IN SEC. 5, R2, T1, FAIRFIELD TWP., BUTLER CO., OHIO ON S. SIDE FARM LANE, 500 FT W. OF 3121 RIVER RD., HAMILTON. 1800 SE OF HAMILTON STP ON J. SCHRIEVER PROPERTY. BU 50

WELL NO: BU 50
ID: SCHRIEVER
COUNTY: BUTLER
SOURCE: DOMESTIC WELL

PARAMETER	UNITS								
DATE		1-30-74	3-28-74	4-29-74	6-28-74	7-17-74	9- 3-74	9-26-74	10-18-74
TIME		1145	925	855	940	930	940	945	1013
SOURCE OF DATA		MCD	MCD	MCD	MCD	MCD	MCD	MCD	MCD
FIELD MEASUREMENTS									
AIR TEMPERATURE	C	4.2	3.0	8.2	19.8	24.8	11.2	15.0	10.0
WATER TEMPERATURE	C	13.0	13.0	13.5	13.0	13.8	13.0	13.0	13.2
PH		7.0	7.0	7.0	7.0	7.1	6.8	7.3	7.0
CONDUCTIVITY	MICROMHOS	710.	750.	750.	675.	700.	750.	760.	740.
DISSOLVED OXYGEN	MG/L								
HYDROGEN SULFIDE (H2S)	MG/L								
FREE CARBON DIOXIDE CO2	MG/L								
DEPTH TO WATER	FEET								
SAMPLE DEPTH	FEET	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
FLOW	GPM	5.00	4.00	5.00	5.00	4.00	5.00	5.00	4.30
LABORATORY ANALYSES									
ALKALINITY AS CACO3	MG/L	280.							
ALUMINIUM (AL)	MG/L								
ARSENIC (AS)	MG/L								
BARIUM (BA)	MG/L								
BERYLLIUM (BE)	UG/L								
BICARBONATE (HCO3)	MG/L								
BORON (B)	MG/L								
CADMIUM (CD)	MG/L								
CALCIUM (CA)	MG/L								
CARBONATE (CO3)	MG/L	0.	0.	0.	0.	0.	0.	0.	0.
CHLORIDE (CL)	MG/L	18.	76.	30.	28.	41.	48.	38.	37.
CHROMIUM (CR)	MG/L								
COBALT (CO)	UG/L								
COLOR	UNITS								
CONDUCTIVITY - LAB	MICROMHOS	589.	715.	688.	635.	690.	625.	740.	520.
COPPER (CU)	MG/L								
CYANIDE (CN)	MG/L								
FLUORIDE (F)	MG/L								
HARDNESS,NONCARBONATE	MG/L								
HARDNESS,TOTAL AS CACO3	MG/L	360.	270.	190.	236.	240.	224.	336.	180.

SOURCE: Miami Conservancy District, May 1975.

TABLE 13
SHEET (1 OF 4)
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
GROUNDWATER QUALITY DATA
P. 114
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT

GROUNDWATER QUALITY DATA

LOCATION: LAT 39 21 56, LONG 84 33 59, IN SEC. 5, R2, T1, FAIRFIELD TWP., BUTLER CO., OHIO ON S. SIDE FARM LANE, 500 FT W. OF 3121 RIVER RD., HAMILTON. 1800 SE OF HAMILTON STP ON J. SCHRIEVER PROPERTY. BU 50

WELL NO: BU 50
ID: SCHRILVER
COUNTY: BUTLER
SOURCE: DOMESTIC WELL

PARAMETER	UNITS								
DATE		1-30-74	3-28-74	4-29-74	5-28-74	7-17-74	9- 3-74	9-26-74	10-15-74
TIME		1145	925	855	940	930	940	945	1010
SOURCE OF DATA		MCD	MCD	MCD	MCD	MCD	MCD	MCD	MCD
LABORATORY ANALYSES, CONTINUED									
IRON (FE)	MG/L								
LEAD (PB)	MG/L								
MAGNESIUM (MG)	MG/L								
MANGANESE (MN)	MG/L								
MERCURY (HG)	MG/L								
NICKEL (NI)	MG/L								
NITROGEN, AMMONIA (NH4-N)	MG/L								
NITROGEN, NITRATE (NO3-N)	MG/L								
PH - LAB		7.5	7.2	6.9	7.3	7.6	7.9	7.5	7.4
PHOSPHORUS, TOTAL AS P	MG/L								
POTASSIUM (K)	MG/L								
SELENIUM (SE)	MG/L								
SILVER (AG)	MG/L								
SODIUM (NA)	MG/L								
SOLIDS, DISSOLVED	MG/L	442.	450.	439.	456.	427.	492.	423.	453.
SOLIDS SUSPENDED	MG/L	6.	1.	11.	10.	0.	7.	19.	10.
SOLIDS, TOTAL	MG/L	448.	451.	450.	466.	427.	499.	442.	463.
STRONTIUM (SR)	MG/L								
SULFATE (SO4)	MG/L	50.							
TURBIDITY	JTU								
ZINC (ZN)	MG/L								
ORGANICS									
PHENOL (C6H5OH)	MG/L								
DETERGENTS AS METHYLENE BLUE ACTIVE SUBSTANCE	MG/L								
TOTAL ORGANIC CARBON(C)	MG/L						2.3	1.5	8.5
OXYGEN DEMAND									
BOD 5-DAY	MG/L								
COD	MG/L	0.0	5.0	5.7	6.7	1.0	0.0	21.0	9.5
BIOLOGICAL									
TOTAL COLIFORM	MF/100 ML								
FECAL COLIFORM	MF/100 ML								

TABLE 13
SHEET (2 OF 4)
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
GROUNDWATER QUALITY DATA
P. 214
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT

GROUNDWATER QUALITY DATA

LOCATION: LAT 39 21 56, LONG 84 33 59, IN SEC. 5, R2, T1, FAIRFIELD TWP., BUTLER CO., OHIO ON S. SIDE FARM LANE, 500 FT W. OF 3121 RIVER RD., HAMILTON. 1800 SE OF HAMILTON STP ON J. SCHRIEVER PROPERTY. BU 50

WELL NO: BU 50
ID: SCHRIEVER
COUNTY: BUTLER
SOURCE: DOMESTIC WELL

PARAMETER	UNITS		
DATE		11-18-74	12-19-74
TIME		930	1000
SOURCE OF DATA		MCD	MCD
FIELD MEASUREMENTS			
AIR TEMPERATURE	C	2.5	0.0
WATER TEMPERATURE	C	13.0	13.0
PH		7.0	7.0
CONDUCTIVITY	MICROMHOS	740.	710.
DISSOLVED OXYGEN	MG/L		
HYDROGEN SULFIDE (H2S)	MG/L		
FREE CARBON DIOXIDE CO2	MG/L		
DEPTH TO WATER	FEET		
SAMPLE DEPTH	FEET	25.0	25.0
FLOW	GPM	4.00	4.00
LABORATORY ANALYSES			
ALKALINITY AS CACO3	MG/L		274.
ALUMNIUM (AL)	MG/L		
ARSENIC (AS)	MG/L		
BARIUM (BA)	MG/L		
BERYLLIUM (BE)	UG/L		
BICARBONATE (HCO3)	MG/L		
BORON (B)	MG/L		
CADMIUM (CD)	MG/L		
CALCIUM (CA)	MG/L		
CARBONATE (CO3)	MG/L	0.	0.
CHLORIDE (CL)	MG/L	29.	28.
CHROMIUM (CR)	MG/L		
COBALT (CO)	UG/L		
COLOR	UNITS		
CONDUCTIVITY - LAB	MICROMHOS	710.	715.
COPPER (CU)	MG/L		
CYANIDE (CN)	MG/L		
FLUORIDE (F)	MG/L		
HARDNESS,NONCARBONATE	MG/L		
HARDNESS,TOTAL AS CACO3	MG/L	342.	198.

TABLE 13
SHEET (3 OF 4)
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
GROUNDWATER QUALITY DATA
P. 314
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT

GROUNDWATER QUALITY DATA

LOCATION: LAT 39 21 56, LONG 84 33 59, IN SEC. 5, A2, T1, FAIRFIELD TWP., BUTLER CO., OHIO ON S. SIDE FARM LANE, 500 FT W. OF 3121 RIVER RD., HAMILTON. 1800 SE OF HAMILTON STP ON J. SCHRIEVER PROPERTY. BU 50

WELL NO: BU 50
ID: SCHRIEVER
COUNTY: BUTLER
SOURCE: DOMESTIC WELL

PARAMETER	UNITS		
DATE		11-18-74	12-19-74
TIME		930	1000
SOURCE OF DATA		MCD	MCD
LABORATORY ANALYSES, CONTINUED			
IRON (FE)	MG/L		
LEAD (PB)	MG/L		
MAGNESIUM (MG)	MG/L		
MANGANESE (MN)	MG/L		
MERCURY (HG)	MG/L		
NICKEL (NI)	MG/L		
NITROGEN,AMMONIA (NH4-N)	MG/L		
NITROGEN,NITRATE (NO3-N)	MG/L		
PH - LAB		7.4	7.3
PHOSPHORUS, TOTAL AS P	MG/L		
POTASSIUM (K)	MG/L		
SELENIUM (SE)	MG/L		
SILVER (AG)	MG/L		
SODIUM (NA)	MG/L		
SOLIDS, DISSOLVED	MG/L	437.	442.
SOLIDS SUSPENDED	MG/L		
SOLIDS, TOTAL	MG/L	466.	458.
STRONTIUM (SR)	MG/L		
SULFATE (SO4)	MG/L		
TURBIDITY	JTU		
ZINC (ZN)	MG/L		
ORGANICS			
PHENOL (C6H5OH)	MG/L		
DETERGENTS AS METHYLENE BLUE ACTIVE SUBSTANCE	MG/L		
TOTAL ORGANIC CARBON(C)	MG/L		25.0
OXYGEN DEMAND			
BOD 5-DAY	MG/L		
COD	MG/L	55.0	6.7
BIOLOGICAL			
TOTAL COLIFORM	MF/100 ML		
FECAL COLIFORM	MF/100 ML		

TABLE 13
SHEET (4 OF 4)
THE MIAMI CONSERVANCY DISTRICT
WATER CONSERVATION SUBDISTRICT
P. 414
CHEM-DYNE SITE

THE MIAMI CONSERVANCY DISTRICT
GROUNDWATER QUALITY DATA ANALYSIS

LOCATION LAT 39 21 56, LONG 84 33 59, IN SEC. 5, R2, T1, FAIRFIELD TWP., BUTLER CO., OHIO ON S. SIDE FARM LANE, 500 FT W. OF 3121 RIVER RD., HAMILTON. 1800 SE OF HAMILTON STP ON J. SCHRIEVER PROPERTY. BU 50
FROM 74/ 1/30 TO 74/12/19

PARAMETER	UNITS	MAXIMUM	DATE	MINIMUM	DATE	AVERAGE	STANDARD DEVIATION	PARAMETER COUNT
AIR TEMPERATURE	CENT.	24.800	74/ 7/17	0.0000	74/12/19	10.9700	7.023	10
WATER TEMPERATURE	CENT.	13.800	74/ 7/17	13.0000	74/12/19	13.1500	0.266	10
PH		7.300	74/ 9/26	6.8000	74/ 9/ 3	7.0200	0.117	10
CONDUCTIVITY	MICRO-MHO	760.000	74/ 9/26	675.0000	74/ 5/28	728.5000	26.465	10
ALKALINITY AS CACO3	MG/L	280.000	74/ 1/30	274.0000	74/12/19	277.0000	3.300	2
CARBONATE (CO3)	MG/L	0.000	74/ 1/30	0.0000	74/12/19	0.0000	0.000	10
CHLORIDE (CL)	MG/L	76.000	74/ 3/28	18.0000	74/ 1/30	37.0000	15.159	10
CONDUCTIVITY - LAB	MICRO-MHO	760.000	74/ 9/26	520.0000	74/10/15	662.7000	65.615	10
HARDNESS,TOTAL AS CACO3	MG/L	360.000	74/ 1/30	180.0000	74/10/15	257.5999	63.213	10
PH - LAB		7.900	74/ 9/ 3	6.9000	74/ 6/29	7.4000	0.249	10
SOLIDS, DISSOLVED	MG/L	492.000	74/ 9/ 3	423.0000	74/ 9/26	446.0999	18.259	10
SOLIDS SUSPENDED	MG/L	19.000	74/ 9/26	0.0000	74/ 7/17	8.0000	5.657	8
SOLIDS, TOTAL	MG/L	499.000	74/ 9/ 3	427.0000	74/ 7/17	457.0000	18.042	10
SULFATE (SO4)	MG/L	50.000	74/ 1/30	50.0000	74/ 1/30	50.0000	0.000	1
TOC	MG/L	25.000	74/12/19	1.5000	74/ 9/26	9.3250	9.447	4
COD	MG/L	55.000	74/11/18	0.0000	74/ 9/ 3	11.0600	15.752	10

SOURCE: Miami Conservancy District, May 1975.

TABLE 14
THE MIAMI CONSERVANCY DISTRICT
GROUNDWATER QUALITY DATA ANALYSIS
CHEM-DYNE SITE

Chem-Dyne site. The results of the analyses of these samples are shown in Tables 29-31 presented later in this TM. Groundwater sampling was also conducted on and around the site during the Phase B Investigation (6). The data from this investigation were not available in final form as of November 1983.

Surface water quality data are also valuable for evaluating the contamination around the Chem-Dyne site. Tables 15-17 present data published by the Miami Conservancy District (2) for the sampling locations on the Great Miami River near Hamilton.

Contaminant Transport. The FIT project investigators (1) concluded in 1982 that the groundwater in the Chem-Dyne area is significantly contaminated from approximately 300 feet east of the site to 200 feet west of the site. They suggest that contamination as far as 650 feet west of the site is probable. The Phase B investigators (6) report the Phase B sampling indicates that contaminants have migrated below the clay layer that is present to the west of the site. The FIT project investigators hypothesize that the contaminated soil on the site acts as a reservoir for spilled contaminants which are subsequently released to the aquifer.

The FIT project investigators (1) estimated the rate of groundwater movement across the site to be 2.8 feet per day and Weston's data indicated the average groundwater velocity to be 1.7 feet per day. Plummer (10) computed groundwater velocities for several reaches from Middletown to New Baltimore. Velocities outside of the immediate drawdown cones near production wells ranged from 0.2 to 2.0 feet per day.

AIR QUALITY

The Chem-Dyne site is within the City of Hamilton in Butler County. The air quality status of this area according to National Ambient Air Quality Standards as reported in 40 CFR Part 8 (July 1982 revised) is as follows:

The Miami Conservancy District

Water Quality Data 1976
MIA 29.30 American Materials Bridge

	Dissolved Oxygen mg/l		pH	Temperature °F	Conductivity micro-mhos			Dissolved Solids[1] mg/l	Discharge[2] cfs
	Monthly Average	No. Days, Average Below 4.0 mg/l	Monthly Average	Monthly Average	Monthly Average	Maximum	Minimum	Monthly Mean	Monthly Mean
January	12.6	0	7.77	37.6	610	1060	300	395	6157
February	11.3	0	8.57	44.4	442	724	175	313	7981
March	10.3	0	8.29	52.9	546	650	311	364	4095
April	8.8	1	8.23	65.1	633	708	370	406	1657
May	8.3	3	8.22	70.5	707	777	510	443	1066
June	6.9	6	8.24	78.5	631	740	460	405	2201
July	6.6	8	7.89*	83.8	624	680	529	402	1308
August	5.1	18	7.83	81.2	636	840	340	408	783
September	5.2	24	7.77	74.3	760	829	600	468	580
October	6.0	10	7.71	61.9	690	820	360	434	628
November	8.1	0	7.91	49.9	817	900	720	497	669
December	9.3	0	8.11	43.6	889	975	800	532	549
Yearly Average	8.2		8.05	62.0	665			422	2270

[1]Computed from conductivity
*Less than 15 days of record
[2]Great Miami River at Hamilton

SOURCE: Miami Conservancy District, September 1977

TABLE 15
THE MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA 1976
MIA 29.30 AMERICAN MATERIALS BRIDGE
CHEM-DYNE SITE

The Miami Conservancy District

Water Quality Data 1977
MIA 29.30 American Materials Bridge

	Dissolved Oxygen mg/l		pH	Temperature °F	Conductivity micro-mhos			Dissolved Solids[1] mg/l	Discharge[2] cfs
	Monthly Average	No. Days, Average Below 4.0 mg/l	Monthly Average	Monthly Average	Monthly Mean	Maximum	Minimum	Monthly Mean	Monthly Mean
January	9.9	0	8.28	37.9	928	1022	450	551	456
February	11.5	0	8.00	41.5	688	1218	270	433	2052
March	10.6	0	7.95	51.3	491	736	325	337	3369
April	9.7	0	8.04	62.1	491	750	277	337	4138
May	7.5	7	7.90	74.4	528	795	271	355	2083
June	5.2	16	7.67	77.7	597	852	350	389	753
July	4.0	21	7.73	86.3	575	910	335	378	659
August									
September									
October									
November									
December									
Yearly Average									

[1]Computed from conductivity
[2]Great Miami River at Hamilton

SOURCE: Miami Conservancy District, September 1977

TABLE 16
THE MIAMI CONSERVANCY DISTRICT
WATER QUALITY DATA 1977
MIA 29.30 AMERICAN MATERIALS BRIDGE
CHEM-DYNE SITE

03274600 GREAT MIAMI RIVER AT NEW BALTIMORE, OH--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

DATE	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	TOTAL NITRITE PLUS NITRATE (N) (MG/L)	TOTAL AMMO-NIA + ORGA-NIC NITROGEN (N) (MG/L)	TOTAL NITRO-GEN (N) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	TOTAL ORTHO-PHOSPH (P) (MG/L)	TOTAL ORGANIC CARBON (C) (MG/L)	TOTAL COLIFORM (COLONIES PER 100 ML)	UNCORR-ECTED FECAL COLIFORM (COLONIES PER 100 ML)	UNCORR-ECTED FECAL COLIFORM (COLONIES PER 100 ML)	FECAL COLIFORM 4D DIS-CHARGE (CFS)
OCT.												
06...	552	478	4.1	1.9	10	45	.60	2.0	6700	--	--	--
NOV.												
04...	--	--	6.3	1.7	8.0	35	.59	--	5500	2.20	10.6	2.0
DEC.												
03...	--	--	3.7	1.2	4.9	22	.42	--	14000	--	--	--
JAN.												
29...	214	190	3.8	.00	3.8	13	.51	13	750	--	--	--
FEB.												
11...	--	--	3.4	1.7	5.1	23	.62	--	2000	--	--	--
MAR.												
04...	--	--	3.9	1.6	5.5	24	.35	--	2400	--	--	--
APR.												
08...	474	417	5.6	1.2	6.8	38	.36	11	40000	.400	27.3	100
MAY												
05...	--	--	2.8	1.5	4.3	19	.39	--	80000	.281	4.96	11.5
JUNE												
03...	--	--	10	2.0	12	55	.64	--	21000	--	--	--
JULY												
07...	--	--	5.8	1.9	6.9	31	.54	--	20000	--	--	--
AUG.												
14...	504	442	1.5	1.7	3.2	14	.78	9.2	110000	--	--	--
SEP.												
15...	--	--	6.2	2.8	9.0	40	.60	--	70000	1.10	30.8	35.0

ANALYSES OF MINOR ELEMENTS

DATE	TIME	TOTAL ARSENIC (AS) (UG/L)	DIS-SOLVED ARSENIC (AS) (UG/L)	TOTAL CAD-MIUM (CD) (UG/L)	DIS-SOLVED CAD-MIUM (CD) (UG/L)	TOTAL CHRO-MIUM (CR) (UG/L)	DIS-SOLVED CHRO-MIUM (CR) (UG/L)	TOTAL COBALT (CO) (UG/L)	DIS-SOLVED COBALT (CO) (UG/L)	TOTAL COPPER (CU) (UG/L)	DIS-SOLVED COPPER (CU) (UG/L)	TOTAL IRON (FE) (UG/L)
OCT.												
06...	1230	2	2	1	0	10	0	0	0	0	0	520
JAN.												
29...	1500	0	2	2	1	10	<10	20	0	10	10	5000
APR.												
08...	1130	0	0	1	1	20	<10	2	2	10	0	610
AUG.												
14...	0900	2	1	0	2	30	10	1	0	20	20	1000

DATE	DIS-SOLVED IRON (FE) (UG/L)	TOTAL LEAD (PB) (UG/L)	DIS-SOLVED LEAD (PB) (UG/L)	TOTAL MANGA-NESE (MN) (UG/L)	DIS-SOLVED MANGA-NESE (MN) (UG/L)	TOTAL MER-CURY (HG) (UG/L)	DIS-SOLVED MER-CURY (HG) (UG/L)	TOTAL SELE-NIUM (SE) (UG/L)	DIS-SOLVED SELE-NIUM (SE) (UG/L)	TOTAL ZINC (ZN) (UG/L)	DIS-SOLVED ZINC (ZN) (UG/L)
OCT.											
06...	10	7	0	70	50	<.5	<.5	3	2	50	10
JAN.											
29...	40	15	0	110	20	<.5	<.5	1	1	60	20
APR.											
08...	40	10	2	50	30	<.5	<.5	0	0	30	20
AUG.											
14...	30	51	10	120	0	<.5	<.5	1	1	120	10

TABLE 17
(SHEET 1 OF 2)
GREAT MIAMI RIVER BASIN
03274600 GREAT MIAMI RIVER
AT NEW BALTIMORE, OH
P. 112
CHEM-DYNE SITE

03274000 GREAT MIAMI RIVER AT NEW BALTIMORE, OH
(National stream-quality accounting network station)

LOCATION.--Lat [illegible], long [illegible], in [illegible] 1/2 sec. 30, T.1, T.2, Hamilton County, Hydrologic Unit 05090002, on Blue Rock Road bridge at New Baltimore, 6.0 mi (10.3 km) downstream from Indian Creek, and 19.3 mi (23.0 km) upstream from discharge station at Hamilton.

DRAINAGE AREA.--3,610 mi² (9,878 km²).

WATER-QUALITY RECORDS

PERIOD OF RECORD.--July 1966 to current year.

INSTRUMENTATION.--Water-quality monitor.

REMARKS.--Interruptions in the daily records were due to malfunctions of the instrument. Dissolved oxygen concentrations listed as 15.0 mg/L represent concentrations of 15.0 mg/L or higher due to instrument limitations. Samples were collected each month as part of the National Stream Quality Accounting Network. See records of daily discharge for station at Hamilton (station 03274000).

COOPERATION.--Pesticide analyses furnished by Environmental Protection Agency.

WATER QUALITY DATA, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

DATE	TIME	INSTANTANEOUS DISCHARGE (CFS)	SPECIFIC CONDUCTANCE (µmho/cm)	pH (units)	TEMPERATURE AIR (deg C)	TURBIDITY (JTU)	DISSOLVED OXYGEN (mg/L)	PERCENT SATURATION	FECAL COLIFORM (col. per 100 mL)	FECAL STREPTOCOCCI (col. per 100 mL)	NITROGEN, NO2+NO3 (as N) (mg/L)	NITROGEN, AMMONIA (as N) (mg/L)
OCT.												
09...	1230	810	830	7.7	18.5	7	7.6	80	2900	100	300	130
NOV.												
06...	1230	1100	700	7.6	17.5	--	6.7	70	7500	270	--	--
DEC.												
03...	1230	2000	970	7.8	7.5	--	10.3	90	5000	1000	--	--
JAN.												
29...	1300	13000	350	7.3	1.5	90	12.0	89	8300	13000	190	--
FEB.												
11...	1400	12000	750	7.9	6.0	--	10.5	88	1600	1100	--	--
MAR.												
04...	1200	4000	550	7.8	6.0	--	10.2	89	11000	970	--	--
APR.												
09...	1130	2020	705	8.3	15.0	1	10.3	100	460	73	330	95
MAY												
05...	1300	1200	770	8.1	17.5	--	6.4	80	2600	200	--	--
JUNE												
03...	1130	4310	411	7.8	21.0	--	6.2	69	3700	900	--	--
JULY												
07...	1100	1400	740	8.3	29.0	--	7.7	90	14000	1200	--	--
AUG.												
14...	0930	842	790	7.8	25.5	2	6.2	75	6000	800	310	90
SEP.												
15...	1000	510	610	8.4	20.5	--	6.9	82	3900	1400	--	--

DATE	DISSOLVED CALCIUM (Ca) (mg/L)	DISSOLVED MAGNESIUM (Mg) (mg/L)	DISSOLVED SODIUM (Na) (mg/L)	DISSOLVED POTASSIUM (K) (mg/L)	BICARBONATE (HCO3) (mg/L)	CARBONATE (CO3) (mg/L)	ALKALINITY AS CACO3 (mg/L)	SULFATE DIGESTION (SO4) (mg/L)	DISSOLVED SULFATE (SO4) (mg/L)	DISSOLVED CHLORIDE (Cl) (mg/L)	DISSOLVED FLUORIDE (F) (mg/L)	DISSOLVED SILICA (SiO2) (mg/L)
OCT.												
09...	92	30	38	5.4	305	0	250	9.7	60	59	.8	7.6
NOV.												
06...	--	--	--	--	--	--	--	--	--	--	--	--
DEC.												
03...	--	--	--	--	--	--	--	--	--	--	--	--
JAN.												
29...	42	14	3.3	4.1	145	0	119	12	32	20	.3	4.8
FEB.												
11...	--	--	--	--	--	--	--	--	--	--	--	--
MAR.												
09...	--	--	--	--	--	--	--	--	--	--	--	--
APR.												
09...	84	33	24	3.5	306	0	251	2.5	80	39	.4	2.0
MAY												
05...	--	--	--	--	--	--	--	--	--	--	--	--
JUNE												
03...	--	--	--	--	--	--	--	--	--	--	--	--
JULY												
07...	--	--	--	--	--	--	--	--	--	--	--	--
AUG.												
14...	71	32	44	4.7	262	0	215	11	93	64	.6	5.8
SEP.												
15...	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 17
(SHEET 2 OF 2)
GREAT MIAMI RIVER BASIN
032746000 GREAT MIAMI RIVER
AT NEW BALTIMORE, OH
P. 212
CHEM-DYNE SITE

SOURCE: Miami Conservancy District, September 1977

Criteria Pollutant	Status
Total suspended particulates	Nonattainment
Sulfur dioxide	Attainment
Ozone (oxidants)	Nonattainment
Carbon monoxide	Not classified
Nitrogen dioxide	Not classified

Some local site-specific ambient air quality monitoring was performed by Roy F. Weston on July 31 and August 1, 1982, prior to waste removals by O.H. Materials in 1983 (12). These air samples were taken at stations 5 feet above the ground along the fence line. Both samples were 8-hour composites taken with Tenax tubes. Results of downwind samples indicated benzene, 1,1,1-trichlorethane, and tetrachloroethylene at significant concentrations. Other organics components identified were acetone, hexane, trichlorotriflouroethane, and trichloroethylene (TCE).

ECOLOGY

The following discussion of the ecology of the Chem-Dyne vicinity is based in part on the draft Phase B Report by Roy F. Weston (6).

The Chem-Dyne site is in a residential and industrial area. There are no major natural areas in the immediate vicinity. A small backwater marsh is in a portion of the Ford Hydraulic Canal northeast of the site, directly north of the public swimming pools off Ford Boulevard. Immediately northeast of the site across the Ford Canal the land is cultivated and planted as part of an agricultural operation.

The site affords a marginal habitat. Vegetation is limited to pioneering and early successional species. The site is almost treeless. Ground cover is patchy and consists of assorted grasses, goldenrod and Queen Anne's lace.

Although they have not been observed, the site is possibly inhabited by typical field rodents such as cottontail rabbits, meadow voles, mice, shrews, woodchucks, and possibly muskrats along the canal bank. This type of habitat provides hunting grounds for a variety of birds such as sparrow hawks and owls. Songbirds have been observed at times onsite.

The aquatic ecology of the Great Miami River in the site vicinity is stressed. The river is currently influenced by sewage treatment plant discharges. The river does support a variety of fish species including game fish which are taken by local fishermen.

The Ford Hydraulic Canal also supports a variety of fish species including northern pike, largemouth bass, black and white crappie, white bass, carp, gizzard shad, and numerous panfish (13).

SOCIOECONOMICS

The following discussion of socioeconomic conditions in the vicinity of the Chem-Dyne site is based on information from Roy F. Weston (6).

The Chem-Dyne site is entirely within the City of Hamilton whose current estimated population is approximately 70,000.

Industry and manufacturing are the major components of the area's economy, supplemented by construction, trade, finance and government activities.

The Chem-Dyne site area is served by a well-developed transportation network. Interstate 75, running north and south, passes within 10 miles of the site. Locally, there are several two-lane highways that traverse the area between I-75, I-275 and the site.

CHEM-DYNE SITE DATA AND PREVIOUS EVALUATION SUMMARIES

The data and evaluations in this section are from previously published site-specific studies. Primary sources of this information are documents by the Ohio EPA, E and E, Inc., and Roy F. Weston, Inc.

SITE WASTE CHARACTERISTICS

Chemical wastes at the Chem-Dyne site have been investigated by several agencies. The site records include numerous reports on the chemical analysis of both drummed and bulk materials. This section summarizes the major findings of the previous waste characterization studies. This summary is based primarily on the data presented by Ken Harsh/OEPA

(1,2) and data contained in the U.S. Army Corps of Engineers bidding documents for Drum, Bulk, and Other Waste Removal, Chem-Dyne, Hamilton, Ohio (3).

Ken Harsh/OEPA prepared an "Emergency Action Plan" for Chem-Dyne (1). In this plan he summarized the types and volumes of wastes removed from and remaining onsite as of March 4, 1981. His listing is mostly generic, but also includes some specific compounds. The summary by Harsh is shown in Table 18.

Drum Waste Characteristics

Harsh/OEPA also prepared an extensive review of analytical results from a variety of drum and bulk waste samples, called "Interpretation of Chem-Dyne Sample Results," undated (2). The data presented in this report are too extensive to be completely summarized in this technical memorandum. Therefore, selected data from drum sample and tank sample analysis will be summarized. Selected results from drum samples are presented in Table 19. These data indicate some of the components of the drummed chemical waste found onsite.

The drum waste inventory indicates a wide variety of base/neutral organic compounds. The volatile organic fraction appears to consist mainly of methylene chloride. With the exception of methylene chloride, very few chlorinated solvents were identified.

In the review of the GC/MS data, Harsh also identified two pesticide-related compounds which have strong unique odors and which probably contribute to the characteristic "Chem-Dyne" site smell (2). The smelly compounds are:

- MIDT hydrochloride
- Diethyl dithiophosphoric acid

Both compounds were reported in drum waste from a generator described as "Lakeway."

A summary of drummed waste characteristics was presented in the U.S. Army Corps of Engineers waste cleanup bidding documents (3). This summary was based on sampling of a representative subset of 200 the total estimated 8,600 drums onsite. The drum summary data are reproduced in Table 20.

Table 18
SUMMARY OF WASTE TYPES AND VOLUMES AT
CHEM-DYNE AS OF MARCH 3, 1981[a]
CHEM-DYNE SITE
W65310.C0
(SOURCE: HARSH, OEPA, EMERGENCY ACTION PLAN)

Waste Description	Approximate Number of Drums Removed	Approximate Number of Drums Remaining
Amino Resins	500	300
Alkyd Resins	500	200
Polyester Resins	600	200
Urethane	100	50
Isocyanate	100	20
Acrylates	1,050	50
Silicones	950	20
Polysulfones	100	10
Styrene	30	60
Other Plastics Waste	2,000	500
Phenoloic UV Stabilizers	3,000	10
Brightners	300	30
Other Plastics Waste (bulk)	--	15,000 gals.
Glues	100	5
Urethane catalysts (curene)	200	700
Nitrocellulose Based Lacquer	130	10
Phenolics/Polyproplylene	50	250
Synthetic Rubber Wastes	0	300
Nylon Wastes	100	20
Arsenic Wastes	200	20
Mercurial Wastes	10	30
Antibiotic Wastes	60	10
Solvent Waste	10	70
Others	0	350
Asbestos	100	0
Zinc/Antimony Sludges	60	5
Chromates; Sludges	0	20
Acids/Bases (bulk)	100	400
Acids/Bases Catalysts		10,000 gals.
Vanadium Penoxide	--	--
Vanadium Oxytrichloride	200	5
Titanium Tetrachloride	--	--
Zirconium	30	10
Phosphoric Acid	70	1
Dithane/Kelthane	400	5
Parachloronitrobenzene	--	--
Captan/Folpet	0	120
C56 and Chlorinated Pesticides Intermediates (bulk)	10,000 gals.	100,000 + gals.
Other Pesticide Waste	100	10

Table 18 (continued)

Waste Description	Approximate Number of Drums Removed	Approximate Number of Drums Remaining
Organophosphates	0	100
Paint/Printing/Solvents/Sludges	600	400
Pigments	0	10
Other Paint Wastes	50	300
Cyanides/Cyanates	0	40
Bismuth/Lead Pigments	160	50
Greases/Oils	300	300
Benzoyl Chloride	0	60
Benzyl Chloride (bulk)	-	9,000 gals.
Chlorinated Organic Solvents	450	100
Flavorings	20	60
Other Solvents	400	800
Formaldehyde	0	40
Labortory Chemicals	0	150
Hexachlorobenzene Still Bottoms	120	5
Bottoms	250	40
Phenolics	200	30
Other Materials	2,000	-
Unknown Wastes	--	6,000
Textile Softners	100	0
PCB Contaminated Bulk Liquids	-	38,000 gals.

[a]Waste descriptions given in this table are not exhaustive but rather general in nature. Listing is to present the range of potential soil and groundwater contamination.

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Table 19
SUMMARY OF SELECTED DRUMMED WASTE IDENTIFICATIONS[a]
CHEM-DYNE SITE
W65310.CO
(SOURCE: HARSH, OEPA, INTERPRETATION OF CHEM-DYNE SAMPLE RESULTS)

Goodyear Drum Composite (Sample 300-41B)	Schell Drum Composite (Sample 300-73.1)	Albany International Composite (Sample 300-73.2)	Diamond International Composite (Sample 300-73.3)
2-methyl 2-Propen-1-ol	Dichloromethane	Oxybis ethane	Dichloromethane
Dichloromethane	Methyl benzene	Tetrahydrofuran	Methyl pentene
1,1-Dimethyl Cyclopropane	4-Methyl-2-pentanone	2,5-Dimethyl Cyclopentanone	Methyl cyclohexane
Dimethylhydrazone Formaldehyde	Butoxy ethanol	Dichlorfluorinated compound	Trimethyl decane
2-Pyrrolidinone	Ethoxy ethanol	Trichlorofluorinated hydrocarbon	Butyl acetate
Heptane	Diisooctyl phthalate	Trichloroinated hydrocarbon	Ethyl cyclohexane
Methylcylcohexane	Ethyl acetate	Dimethyl hexane	2-propyl-1-heptanol
6-Nitro 2-Picoline	Methyl benzene	Trimethyl octane	Dimethyl heptane
2-propyl heptanol		Dimethyl heptane	Methyl octane
1-Ethyl -2,4-Dimethyl Cyclohexane		Dimethyl pentane	Dimethyl benzene
1,4-Dimethyl Benzene		Tetramethyl pentane	Monare
		Methyl dodecane	Trimethyl cyclohexane
		Trimethyl decane	Methyl aniline
		Hexamethyl heptane	Diisooctyl phthalate
		Ethyl acetate	Ethyl acetate

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Table 19 (Continued)

Rohm and Haas Composite (Sample 300-73-6)	Kemper/Tappan Composite (Sample 300-73-7)	Formica Composite (Sample 300-73-11)	Egyptian Lacquer Composite (Sample 300-74-7)
Propyleneimine (2-methyldzidrine)	Methylene chloride	Isopropyl alchohol	Methylene chloride (very large fraction)
Methylene chloride	Hexane	Methyl pentane	Methoxy propanol?
Dimethyl cyclopentane	Methyl isobutyl ketone	Methylene pentane	Methyl propanol
Trimethyl pentene	(methyl pentanone)	Dichloropropane	Methyl isobutyl ketone
dimethyl benzene	Methyl benzene	Butoxy ethanol	Toluene (large)
Nonane	Dimethyl hexanol	Phenol	Dimethyl heptane
Trimethyl octane	Butyl acetate	2,6-Bis (1,1-dimethylethyl)-phenol	Butyl acetate
4-(1-methyl ethyl)-heptane	Xylene	Heptadecane	Xylene
Ethyl methyl benzene	Dimethyl benzene	Heneicosane	Dimethyl benzene (large)
Methyl nonane	2-Heptanone		Nonane
Methyl propyl cyclohexane	Butoxyl ethanol		Butoxy ethanol (ethylene glycol)
Trimethyl benzene	Propyl benzene		monobutyl ether (large)
Decane	Ethyl-methyl benzene		Methylnonane
Dimethyl nonane	Trimethyl benzene		Styrene
Ethyl methyl heptane	Decane		Decane
Butoxy butyric acid			Dimethyl nonane
1,6 Dioxacyclododecane-7,12 Dione			O-decyl hydroxylamine
Dioctyl sorbic acid			Undecane
2-methyl 1-hexadecanol			Dadecane
			Pentyl cyclohexane
			Diisoctyl phthalate

[a]Compounds listed here are reproduced directly from interpretations of GC/MS data by Harsh/OEPA. This list is not exhaustive, but rather shows selected results to indicate the range of compounds identified by OEPA.

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Table 20
DRUM WASTE DISTRIBUTION
CHEM-DYNE SITE
W65310.CO
(SOURCE: U.S. ARMY CORPS OF ENGINEERS BIDDING DOCUMENT FOR CHEM-DYNE WASTE REMOVAL, PAGE 1T-135)

Waste Description	Number of Drums	Sample Volume, Gal.	Total Estimated Number of Drums	Total Estimated Volume, Gal.
Lab packs, explosives	1	35	32	1,380
Solids	30	1,100	1,023	43,990
Semi-solids				
Volatile	17	679	632	27,170
Nonvolatile	33	1,146	1,063	45,710
PCB's	-	-	40[a]	1,720[a]
Water reactive	6	280	264	11,350
Cyanides	3	105	96	4,130
Acids	3	109	104	4,470
Bases	1	55	48	2,060
Acidic Solutions				
Volatile	21	820	759	32,640
Nonvolatile	30	1,547	1,439	61,880
Alkaline Solutions				
Nonvolatile	11	473	439	18,880
Volatile	1	15	16	690
Organic Liquids				
Volatile halogenated	8	362	319	13,720
Nonvolatile halogenated	11	482	424	18,230
Nonvolatile nonhalogenated	12	527	487	20,940
Volatile nonhalogenated	20	879	815	35,040
Empty Drums	-	-	600	
TOTALS	208[b]	8,614	8,600	344,000

[a] PCB not found in any drums sampled. However, a small number of drums included as contingency because Tank 15 reportedly filled from drums and Tank 15 was found to have 1,500 ppm PCB.

[b] Liquids and solids classified separately if found in some drums. Therefore, drum total is greater than 200.

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Bulk Waste Characteristics

The analytical review report by Harsh (2) identified the major components in the following bulk tanks: Nos. 4, 16, 17, 100A, "red tank truck," and the "other tank truck." These data are presented in Table 21.

Results of the bulk tank analysis indicate major quantities of chlorinated organics in Tank No. 4 only. The materials in tank No. 4 are all associated with synthesis of endrin and chlordane-type pesticides. Wastes identified in the other bulk tanks include a variety of base/neutral and volatile organics.

The major waste components of every bulk tank were reported in the bidding documents for the Chem-Dyne waste removal IRM prepared by the U.S. Army Corps of Engineers (1). These data were compiled from several sampling efforts and several laboratories including NUS, Finnegan Institute, O.H. Materials, and Monsanto.

To illustrate the general arrangement of bulk wastes stored onsite, the major organic waste compounds of the larger bulk storage tanks are listed in several figures as follows:

- Figure 12 - Bulk tank Nos. 1, 2, 3 and 4
- Figure 13 - Bulk tank Nos. 5, 6, 7 and 13
- Figure 14 - Bulk tank Nos. 15, 16 and 17
- Figure 15 - Bulk tank Nos. 100A, 200A, 300A, tanker No. 1 and tanker No. 2

Table 21
SUMMARY OF BULK TANK WASTE IDENTIFICATION BY HARSH[a]
CHEM-DYNE SITE
W65310.CO
(SOURCE: HARSH, OEPA, INTERPRETATION OF CHEM-DYNE SAMPLE RESULTS)

Tank No. 4 Liquid Top Layer[b]	Tank No. 4 Sludge Bottom Material[b]	Tank No. 16 (Formerly "Pit C")	Tank No. 17 (Formerly "Pit D")	Tank 100A[c]	Trailer Tank No. 1 (Red Tank Truck)	Trailer Tank No. 2 (Other Tank Truck)
C-56	C-56	Methyl pentane	Hexane ?	Methylene chloride	Isopropyl alcohol	Amine (?)
Hexachloronorborna-diene	Hexachloronorborna-diene	Methyl pentene	Amine	Ethyl acrylate	Dimethyl cyclopenta-none	Dimethyl heptane
Octachlorocyclopentene	Pentachloroethane	Trichloroethene	Methyl benzene	Dichloropropanoic acid, butyl ester	Cyclohexane	N-2-propynyl-2 Propyn-lamine (?)
	Tetrachloropropene	Methyl methacrylate	Dimethyl benzene	Heptane	Methyl benzene	Tetrachloroethene
	Pentachlorocyclopro-pane	Methyl benzene	Phenyl benzonitrile	Dimethyl Cyclohexane	Dimethyl benzene	Pyridine (?)
	Endrin	Dimethyl benzene		Trimethyl Cyclohexane	Cyclooctatetraene	Phenol
	Octachlorocyclopentane	Cycloocatetrane		4-methyl -1 (1-methy-ethyl)	Butoxy ethanol	2-heptanol
				3-cyclohexen-1-ol acetate	Trimethyl benzene	Propyl heptanol
				Dimethyl Heptadiene -5yne	Ethyl hexanol	Dimethyl nonane
				Ethyl pentenal	Dichlorobenzene	Octane
				Methyl decane	Undecane	Methyl decane
				Undecane	2 hydroxy-benzoic acid, methyl ester	Dimethyl heptane
				Decamethyl cyclopenta-siloxane	polymer (nitrile)	Dimethyl undecane
				Dodecane	1,1 -Biphenyl (large)	
				1,4-Dihydro-1-propyl nicotrinnitrile	1-Dodeconethiol	
				1,1 Diphenyl (very large)		
				Dodecanethiol ($C_{12}H_{26}S$)		
				Octadecane		

[a]Compounds listed in this table are reproduced directly from interpreations of GC/MS data by Harsh/OEPA.
[b]Concentration of most compounds listed are on the order of several percent.
[c]Harsh also reported several chlorinated benzenes and PCB's at 280 ppm.

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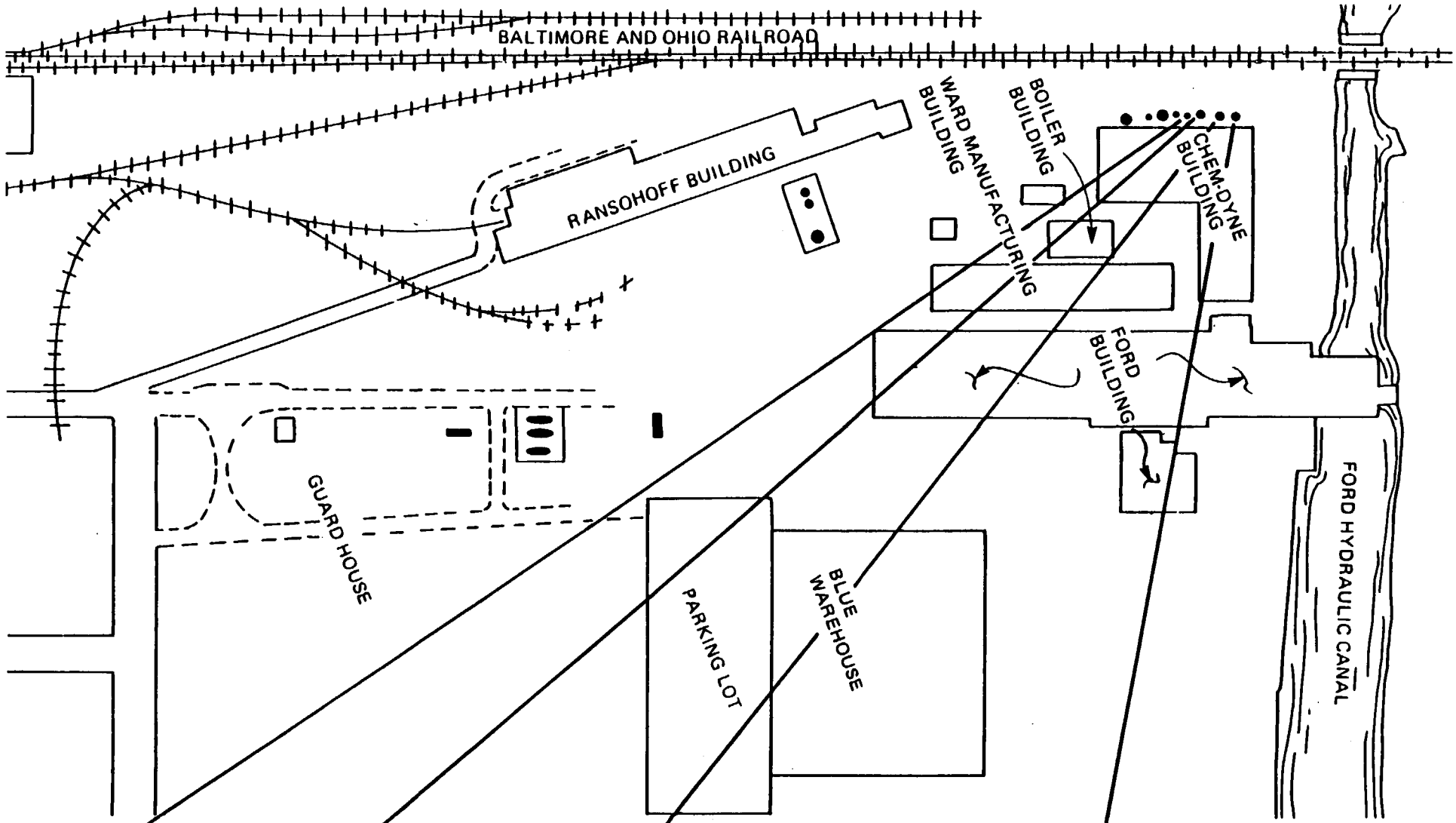


TANK NO. 4

Dicyclopentadiene[b]
Hex-BCH[b]
Hex-VCL[b]
Isodrin[b]

TANK NO. 3

Chlorobenzene[a]
1,2-Dichloroethane[a]
Ethylbenzene[a]
Toluene[a]
Ethylbenzene[a]
Aldrin[a]
Endrin[a]
Dieldrin[a]
Chlordane[a]
Zylene[b]
Trimethyl benzene isomers[b]

TANK NO. 2

Toluene[a]
1,2-dichlorobenzene[a]
Tetrachloroethane[a,b]
Trichloroethane[a]
Tetrachloroethylene[a]
Chlorinated benzenes[a]
Chloroform[a]
Phenol[a]
Dieldrin[a]
Heptachlor[a]
Endrin[a]
Chlordane[a]
Hexachlorobutadiene[d]
Naphthalene[d]
Methylnaphthalene[d]
Dimethylnapthalene[d]
Biphenyl[d]
Hexachloronorbondadiene[d]
Pentachlorobenzene[d]
Trimethylnapthalene[d]
Heptachloronorbornane[d]
Hexachlorobenzene[d]
Pthalate ester[d]
Isodrin[d]

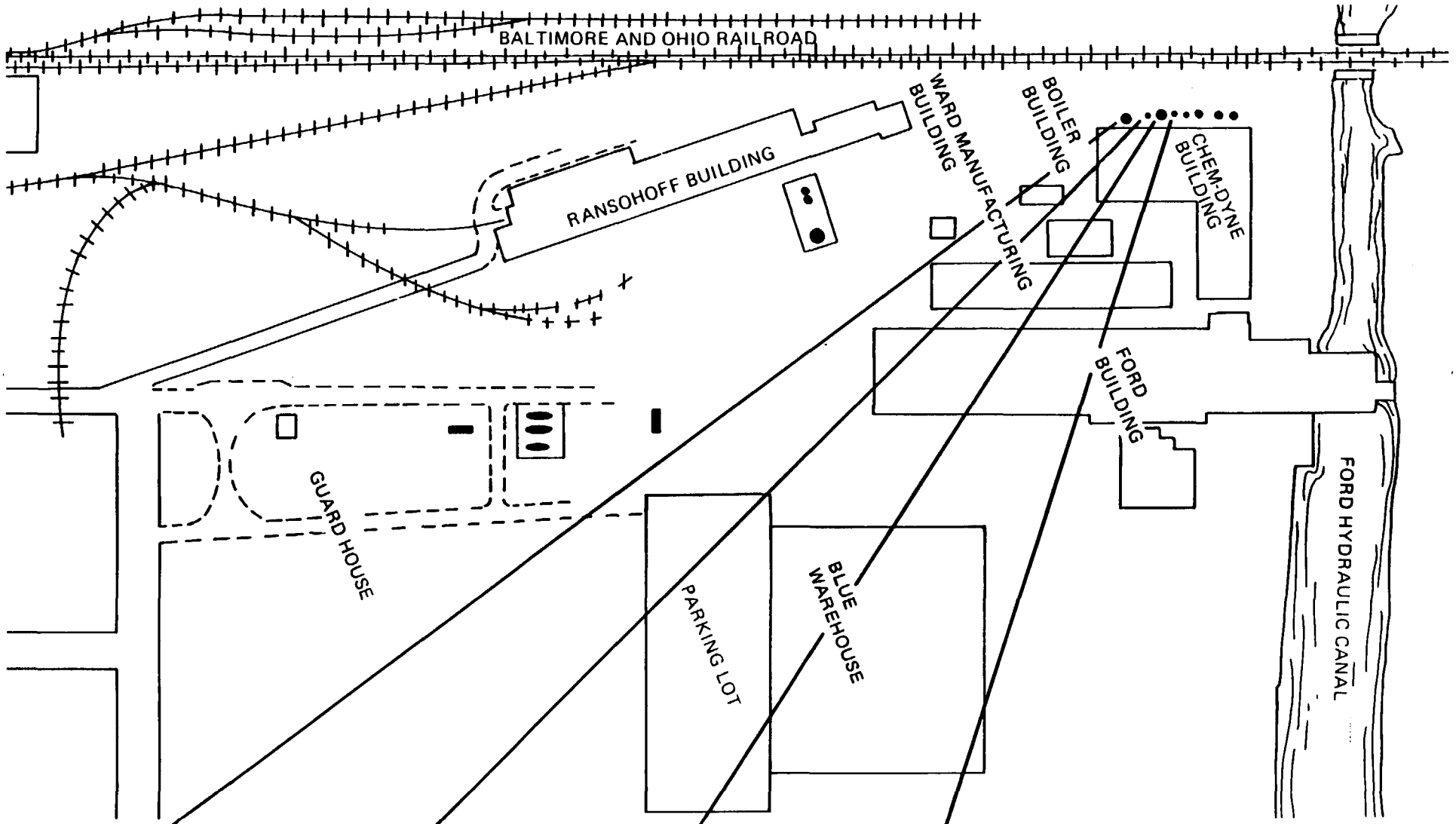
TANK NO. 1

Endrin[a]
Dieldrin[a]
Heptachlor[a]
Dicyclopentadiene[b]
Hex-BCH[b]
Hex-VCL[b]
Isodrin[b]
Styrene[b]
Trimethyl benzene isomers[b]
Tetrachloroethane[b]
PAH compounds[b]

KEY TO LABORATORIES

a - NUS
b - MONSANTO
c - O.H. MATERIALS
d - FINNEGAN INSTITUTE

FIGURE 12
REPORTED BULK TANK WASTE COMPONENTS
TM TASK 1



TANK NO. 13

Xylene*
PAH's*
Chlorinated compounds*

*Total concentrations less than 0.1 percent. OEPA identified waste as possible HC1 solution.

TANK NO. 7

Benzene[a]
Toluene[a]
1,2-Dichloroethane[a]
Tetrachloroethylene (PCE)[a]
Phenol[a]
Ethyl benzene[a]
Chlorobenzene[a]
Dichlorobenzenes[a]
Endrin[a]
Chlordane[a]
Sytrene[b]

TANK NO. 6

Benzene[a]
Chlorobenzene[a]
Carbon tetrachloride[a]
1,2-Dichloroethane[a]
1,1,2-Trichloroethane[a]
Chloroform[a]
1,1,2,2-Tetrachloroethane[a]
Toluene[a]
Chlordane[a]

TANK NO. 5

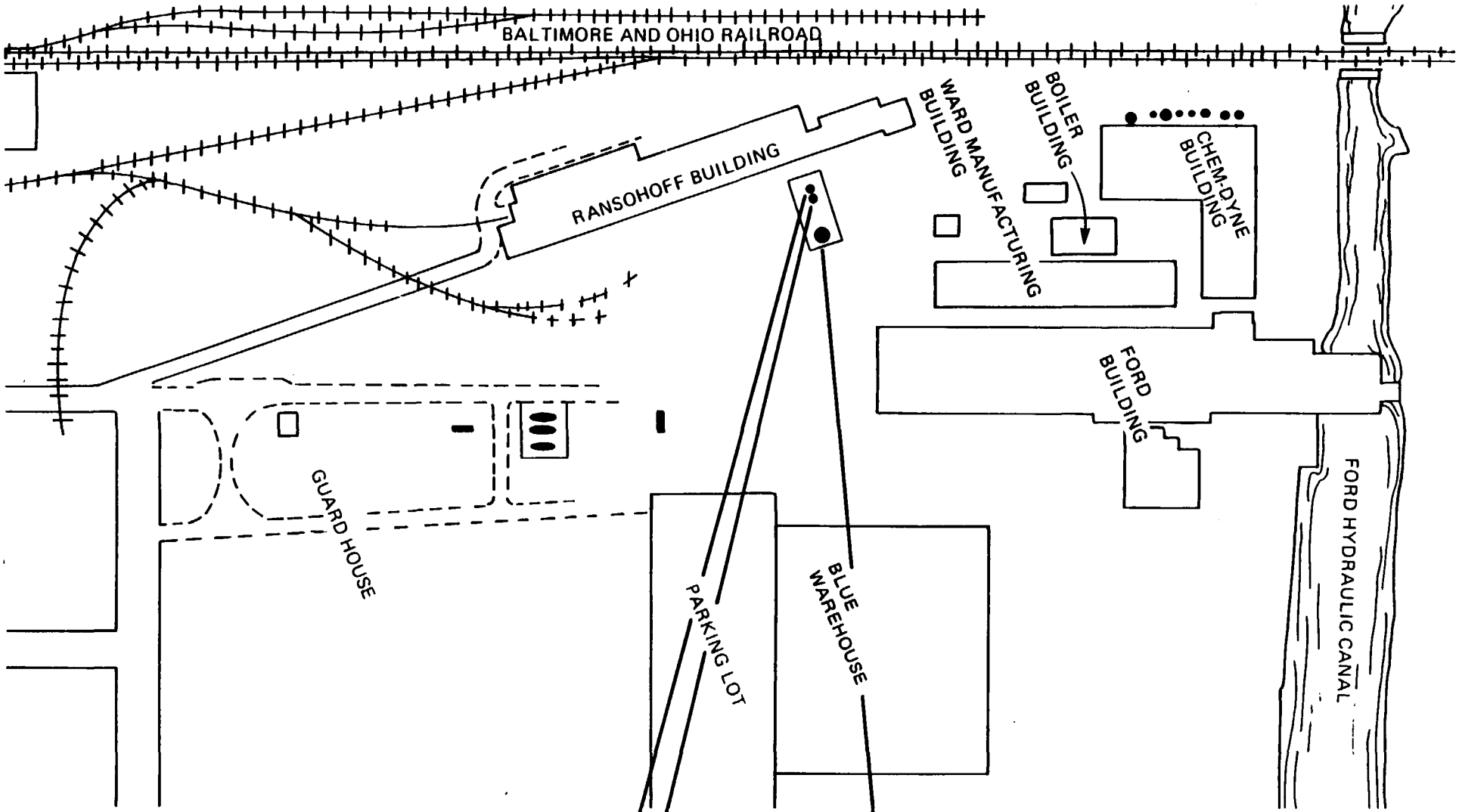
Chlorobenzene[a]
Hexachlorobenzene[a]
1,4-Dichlorobenzene[a]
Naphthalene[a]
Toluene[a]
1,2-Dichloroethane[a]
1,1,2-Trichloroethane[a]
Chloroform

SOURCE: Harsh, Interpretation of Chem - Dyne sample results.

KEY TO LABORATORIES

a - NUS
b - MONSANTO
c - O.H. MATERIALS
d - FINNEGAN INSTITUTE

FIGURE 13
REPORTED BULK TANK WASTE COMPONENTS
TM TASK 1



TANK NO. 17 (PIT D)

Hexane (?)
Unknown amine
Methyl benzene
Dimethyl benzene
Trace pesticides

TANK NO. 16 (PIT C)

Methyl pentane[c]
Methyl pentene[c]
Trichloroethene[c]
Methyl methacrylate[c]
Methyl benzene[c]
Dimethyl benzene[c]

TANK NO. 15*

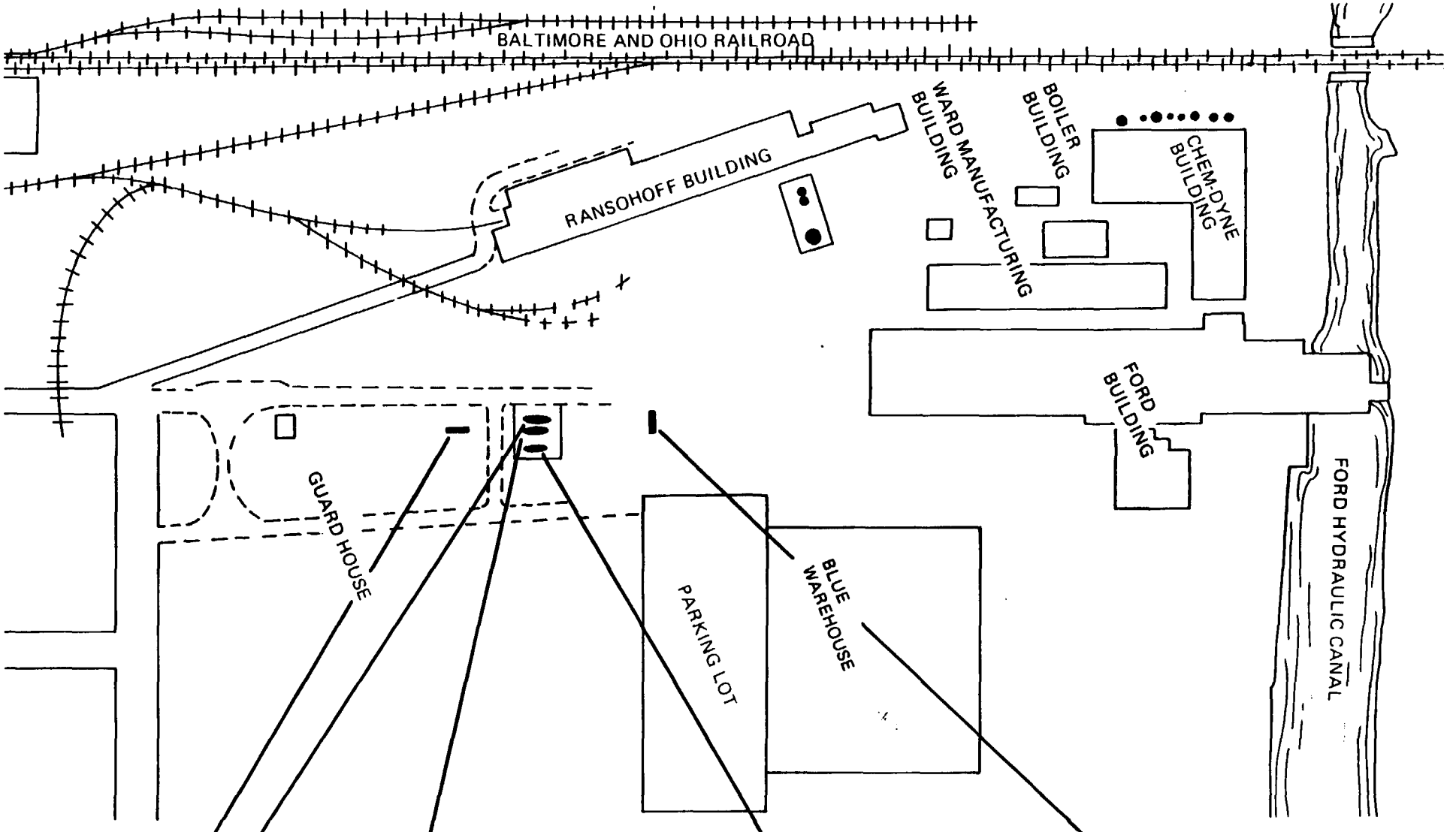
PCB[a,b,c]
Methylene chloride[c]
Tetrachloroethene[c]
Chlorobenzene[c]
Trimethyl benzene[c]
Dichlorobenzene[c]
Trichlorobenzenes[c]
*Tank 15 reportedly filled from drummed waste.

KEY TO LABORATORIES

a - NUS
b - MONSANTO
c - O.H. MATERIALS
d - FINNEGAN INSTITUTE

SOURCE: Harsh, Interpretation of Chem - Dyne sample results.

FIGURE 14
REPORTED BULK TANK WASTE COMPONENTS
TM TASK 1



TRUCK TANKER NO. 1

Reported as oily liquids and tar-like solids. No analytical data presented.

TANK NO. 100A

Benzene[a]
Toluene[a]
Xylene[a]
Chlorobenzene[a]
1,1,1-Trichloroethane[a]
Chloroform[a]
O-chlorobenzene[a]
Ethyl benzene[a]
Phenol[a]
Tetrachloroethylene[a]
Trichloroethylene[a]

TANK NO. 200A

Two chambered tank:

- o Paint sludge
- o Liquid waste with benzene and phenol identified[a]

TANK NO. 300A

Not sampled
Reported to contain polymer-like solids.

TRUCK TANKER NO. 2

Toluene[d]
Propanol[d]
2-Butanone[d]
Trichloroethylene[c]
Several substituted benzenes[c]

KEY TO LABORATORIES

a - NUS
b - MONSANTO
c - O.H. MATERIALS
d - FINNEGAN INSTITUTE

SOURCE: Harsh, Interprepation of Chem - Dyne sample results.

FIGURE 15
REPORTED BULK TANK WASTE COMPONENTS
TM TASK 1

SURFACE WATER

Surface water in the Chem-Dyne vicinity occurs in the Ford Hydraulic Canal immediately north of the site and in the Great Miami River approximately 1,300 feet west of the site.

During Chem-Dyne operations in 1976-1979, several water samples were taken from both streams in response to the fish kills which occurred (1). Several of these samples reportedly contained endrin, a chlorinated pesticide which is acutely toxic to most fish species at low concentrations. These specific data are not available for this technical memorandum.

Since the limited sampling efforts related directly to the fish kills, the canal and river have been sampled in 1981 by Ecology & Environment, Inc., the FIT contractor. E&E, Inc., reported that aluminum and iron were the only inorganic constituents found above background levels and these could be attributed to the breakdown of soil materials being transported in the canal and river (4). The only organic priority pollutant identified was butyl benzyl phthalate (4). Several nonpriority organic compounds were identified with a 90 percent certainty or better using mass spectroscopy techniques. None of these compounds corresponded to known wastes at the Chem-Dyne site. E&E, Inc., concluded that these compounds were probably from other sources than the site (4).

SOIL

Onsite soil contamination was initially investigated by the OEPA and reported by Harsh/OEPA (2). The OEPA soil sampling was focused on the main area of Chem-Dyne operations, the rail and truck docks and the bulk storage tanks west of the operations building. A map showing the exact sampling locations is not available. However, soil sample location descriptions are given with the data summary in Table 22.

Harsh concluded his evaluation with the recommendation that all of the soil in the area around the railroad tracks must be removed. The compounds identified in the soil from this area indicated that pesticide waste was included in the soil contamination.

Table 22
SUMMARY OF ONSITE SOIL ANALYSIS BY HARSH/OEPA
CHEM-DYNE SITE
W65310.CO
(SOURCE: HARSH, OEPA, INTERPREATATION OF CHEM-DYNE SAMPLE RESULTS)

Railroad Dock A (Sample 300-30)	Truck Dock B (Sample 300-31)	Near RR Tracks/Loading Dock[a,b] (300-75-5)	North of Tank No. 15[a] (300-75-6)	South of Tank No. 15[a] (300-75-7)	Soil Near Anderson[a] Drums at the Rear of Site (300-75-8)
Tetrahydrofuran	1,2 Proplyene glycol	Methylenechloride	Freon	4-Methyl-3-penten-2-one	Butane
Heptane	Dimethyl hexane	4-Hydroxy-4-Methyl-2-Pentane	2-Chloroaniline	4-Hydroxy-4-Methyl-2-Pentanone	2-2-Dimethyl-3-Pentanol
Trichloroethane	Furan derivative	Phenol	Methylene Chloride	Dichlorobenzene	4-Octanol
Methyl nitropyridine	Pentanone	Dichlorobenzene	4-Methyl-3-pent-2-one	1-(1,1-Dimethylethyl) Phenol	Bisdichlorobenzoyl Peroxide
Tetrachloroethene	Tetramethyl cyclobutanane	1,2,3-Trichlorobenzene	4-Hydroxy-4-Methyl-2-Pentanone	2-4 Bis (1,1-Dimethyl ethyl) Phenol	Chloroaniline
Chorobenzene	Ethoxy ethanol	Hexachlorobutadiene	Isopherone	2,4,6-Tris (1,1-Dimethyl ethyl) Phenol	Trichlorobenzene
Dimethylbenzene	Chloraniline	Trimethyl Octane	Endrin	Octachlorocyclopentene	4-Hydroxy-4-Methyl-2-Pentanone
Cyclooctatetraene	Phenethyl Benzonitrile	C-56	Octachlorocyclopentene	1-Chloro-2,3-Dihydro-1H-Indene	6-Ethyl-2-Methyl Decane
Pentachloroethane		2-Bromo-1,2-Dichloropropane	Iodo-Octane	Diisooctyl Phthalate	4-7-Dimethyl Undecane
Dichlorobenzene		Hexachloronorbornadiene	2-Phenoxy-1,1'-Biphenyl		10-Methyl Eicosane
Hexachlorobenzene		Pentachlorobenzene	Diiosooctyl phthalate		4-Methyl 1'1' Biphenyl
Chloroaniline		Octachlorocyclopentene	PCB		N-Phenyl Aniline
Naphthalene		Heptadecane			Methyl Hexandecanoic Acid
Methyl naphthalene		Tetrachlorocyclopentadiene			Traicontanoic Acid
Oxybis Benzene		Endrin			Heneicosane
Hexachloronorbornadiene		Heptachlor			Diisooctyl Phthalate
Phthalic acid ester		Pesticial exposides			Triphenyl Phosphine
Phenoxy biphenyl					Heptadecane
Endrin					
Diiosoctyl phthalate					

[a] Soil samples collected by Prothero, Hannahs, and Harsh of OEPA on 6/18/81. Sample was a composite taken between 3 to 10 inches deep. Each compound was quantified.
[b] Total concentration of listed compounds was approximately 17 percent.

GLT443/11

DRAFT

Onsite soil contamination was also investigated by E&E, Inc. (4) E&E, Inc., analyzed near surface and subsurface soils during the FIT study conducted at Chem-Dyne in 1981-82. The E&E, Inc. soil contamination study developed three general conclusions:

- Most organic compounds identified in the saturated zone (20 to 30 feet deep) are a subset of the compounds found in surface samples.
- The number of organic compounds decreases with increasing depth. This decrease may indicate the sorption properties of site soils.
- The majority of organic compounds were found in the top 3 feet of soil, although deeper penetrations were observed.

Detailed quantitative data on priority pollutant analysis of individual soil samples were tabulated by E&E, Inc., and are reproduced in Tables 23-26. These data were reduced to a qualitative summary table which is reproduced in Table 27. In addition to the summary, a list of tentatively identified compounds is also reproduced directly from the report in Table 28.

GROUNDWATER

Groundwater quality in the vicinity of the Chem-Dyne site has been investigated by Ecology & Environment, Inc., OEPA (using E&E, Inc., monitoring wells), and Roy F. Weston. Additional groundwater samples have been taken by responsible parties at various times during sampling efforts.

FIT Groundwater Sampling

As part of the FIT groundwater investigation of the Chem-Dyne site conducted by E&E, Inc., in 1980-81, several offsite and onsite groundwater monitoring wells were installed and sampled (4). Their locations are shown in Figure 7.

E&E, Inc., sampled groundwater three times in January, February and April 1981. The first sampling was limited to eight monitoring wells as a preliminary effort to establish

TABLE 4. ANALYSES OF SOIL SAMPLES (0-1.5 FEET)

PARAMETER / LOCATION	B-10	B-14	B-15	B-16	B-16a	B-17	B-18	B-19	B-20	B-21	COMP
ORGANIC CONCENTRATIONS (ug/l)											
chlorobenzene				6	67						
chloroform		4.5									
carbon tetrachloride		3.7									
methylene chloride											
ethylbenzene				6.5		9.9					
toluene	1.1	1.1	.8	11	1.9	.7		.7	1	.7	.7
1,1,2,2-tetrachloroethane	1.9										
tetrachloroethylene	5	3		11							7
trichloroethylene	2.2			3.5							
1,1-dichloroethane											
1,2-dichloroethane											
1,2-dichloropropane					6.8						
1,1-dichloroethylene											
1,2-trans-dichloroethylene				.7							
phenol						1100					
2,4-dichlorophenol				6.1							
2,4-dimethylphenol						620					
bis (2 ethylhexyl) phthalate		2.1	.1	391			.2	.3	.3		1000
di-n-butyl phthalate	.3	.2	.3	2.6			2.3	.4	.2	.1	3.1
di-n-octyl phthalate											
butyl benzyl phthalate								.1			
diethyl phthalate	.1		.2				.1		.3		
acenaphthene											
hexachloroethane	.6	.5									
fluoranthene		.1	.3				.2		9.1		
1,2-diphenylhydrazine							.1				
naphthalene		.1	.2				.1		.3		
fluorene									.9		
anthracene							.3		13		
phenanthrene							.3		13		
benzo (a) anthracene			.4				.2		7.2		
chrysene			.4				.2		7.2		
3,4-benzofluoranthene							.2		3.9		
benzo (k) fluoranthene							.2		3.9		
pyrene		.1	.3				.2		6.7		
benzo (a) pyrene							.2		3.8		
indeno (1,2,3-cd) pyrene									1.1		
1,2-dichlorobenzene	.3										
aldrin				30.5	•				.3		1.2
dieldrine											.9
alpha-endosulfan											
4,4'-DDE					.2						
4,4'-DDT				2.6				.3			
endrin				1.3							1.4
endrin aldehyde					.5						
heptachlor				2.9							.9
a-BHC				.4							1.4
b-BHC				1.8					1		.3
g-BHC				.2							
d-BHC									1.7		.3
PCB 1260											37.8
METAL CONCENTRATIONS (mg/kg)											
aluminum	1300	550	1200	440	690	290	850	760	560	570	600
calcium	2400	66000	6700	36000	26000	51000	31000	45 000	540	46000	34900
iron	760	690	390	700	510	250	510	340	750	610	590
zinc	56	17	31	99	64	16	37	24	12	44	175
potassium	< 100	< 100	250	130	130	< 100	360	< 70	< 70	< 90	200
magnesium	280	11000	790	5100	4200	11000	500	720	65	990	7240
sodium	< 100	160	190	580	140	< 100	< 80	70	< 70	< 90	< 20
silver	< .30	< .30	< .27	< .27	< .27	< .3	< .23	< .20	< .21	< .27	< .6
boron	< 8	< 8	< 7.3	< 7.3	< 7.3	< 8	< 6.2	< 5.3	< 5.7	< 7.3	< 10
barium	36	45	28	18	2.8	19	69	33	36	180	310
beryllium	< .10	< .10	< .09	< .09	< .09	< .1	.19	.12	.11	.12	< .3
cadmium	< .20	.48	< .18	6	< .18	.67	< .15	.15	< .1	16	.7
cobalt	< .6	1.5	.84	29	1.1	.93	.80	.77	.46	.8	1.5
chromium	1.1	1.6	1.1	6.5	1.7	1.5	< .62	2.0	< .57	< .73	4.5
copper	9.9	36	7.4	25	7.2	2.1	140	19	29	61	25.7
lithium	< 1	1.7	1.1	4.1	3	1.2	2.6	3.1	< .7	3.3	< .2
manganese	23	260	73	87	110	160	130	180	6.2	180	117
molybdenum	< 1	< 1	< .91	< .91	< .91	< 1	< .77	< .67	< .71	< .91	< 2
nickel	1.6	1.9	< 1.4	15	< 1.4	< 1.5	1.3	< 1	1.6	< 1.4	3.2
lead	< 7	100	8.2	70	46	12	76	29	490	67	124
tin	< 4	< 4	< 3.6	7.9	< 3.6	< 4	< 3.1	< 2.7	< 2.9	< 3.6	17.6
strontium	8	86	20	35	37	57	35	58	5.7	56	19.6
titanium	4.7	7.7	5.9	5.9	4.4	2.5	5.8	12	6.6	4	9
vanadium	< .5	4.9	.8	44	1.8	3.1	2.5	3.5	< .4	3.9	22.6
yttrium	2.5	4.7	1.9	1.8	2.4	2.7	4.4	3.5	1.6	3.8	2.3

SOURCE: Ecology and Environment, Inc., June 1982

TABLE 23
PRIORITY POLLUTANT ANALYSIS OF SOIL FROM CHEM–DYNE

TABLE 5. ANALYSES OF SOIL SAMPLES (2.5 - 9.0 FEET)

PARAMETER / LOCATION	B-2	B-3	B-16	B-16	B-18	B-22	B-26
ORGANIC CONCENTRATIONS (ug/l)							
chlorobenzene							
chloroform							
carbon tetrachloride							
methylene chloride							
ethylbenzene	1	1	1.9			.9	.9
toluene							
1,1,2,2 tetrachloroethane							
tetrachloroethylene							
trichloroethylene							
1,1-dichloroethane						.5	
1,2-dichloroethane							
1,2-dichloropropane			1.7				
1,1-dichloroethylene						.9	
1,2-trans-dichloroethylene							
1,1,1-trichloroethane						9.1	
phenol							
2,4-dichlorophenol							
2,4-dimethylphenol							
bis (2-ethylhexyl) phthalate					.6	.1	1.5
di-n-butyl phthalate	.2	.1	1.7	.2	.5	.1	.8
di-n-octyl phthalate					.07		.1
butyl benzyl phthalate							
diethyl phthalate				.1	.2		
acenaphthene		.1					
hexachloroethane							
fluoranthene		2					.2
1,2-diphenylhydrazine							
naphthalene					.01		.03
fluorene							
anthracene		* 2.4					* .2
phenanthrene		* 2.4					* .2
benzo (a) anthracene		* 2.1					* .2
chrysene		* 2.1					* .2
3,4-benzofluoranthene		* .9					* .2
benzo (k) fluoranthene		* .9					* .2
pyrene		1.5					.2
benzo (a) pyrene		.8					.3
indeno (1,2,3-cd) pyrene							
1,2-dichlorobenzene							
aldrin			1.2				
dieldrin							
alpha endosulfan			.1*				
4,4'-DDE		.2					
4,4'-DDT							
endrin							
endrin aldehyde							
heptachlor							
alpha-BHC							
beta-BHC		.24					
gamma-BHC							
delta-BHC		.14					
PCB 1260							
METAL CONCENTRATIONS (mg/kg)							
aluminum	1100	1400	430	350	380	390	420
calcium	21000	31000	30000	72000	63000	24000	49000
iron	1600	790	310	150	240	1300	340
zinc	< 4	20	36	< 4	< 4	99	7
potassium	150	310	< 100	< 90	< 90	< 80	< 70
magnesium	930	5100	5900	10000	10000	3200	7100
sodium	< 90	100	160	200	< 90	< 80	< 70
silver	< .27	< .25	< .3	< .27	< .27	< .23	< .21
boron	< 7.3	< 6.7	< 8	< 7.3	< 7.3	< 6.2	< 5.7
barium	16	22	40	39	44	81	26
beryllium	< .09	< .08	< .10	< .09	< .09	< .08	.11
cadmium	< .18	< .17	.51	< .18	< .18	3.2	< .14
cobalt	1.8	1.2	1.5	1.3	.73	1.1	.83
chromium	1.6	1.9	1.6	2	1.1	< .62	1
copper	15	16	26	3.6	4.2	190	8.2
lithium	1.5	.9	4.7	1.2	3.6	2	2.8
manganese	340	93	120	160	150	140	160
molybdenum	< .91	< .83	< 1.	< .91	< .91	< .77	< .71
nickel	< 1.4	< 1.3	< 1.5	< 1.4	< 1.4	5.5	< 1.1
lead	< 6.4	56	53	< 6.4	< 6.4	140	460
tin	< 3.6	< 3.3	< 4	< 3.6	< 3.6	< 3.1	< 2.9
strontium	32	33	37	140	120	41	120
vanadium	2.7	2.2	2.1	3	3.4	1.3	2.4
yttrium	2.2	2.8	2.3	3.5	4.2	1.4	3.9
titanium	41	8.4	6.6	1.1	2.3	5.3	3.5

* Coelute

SOURCE: Ecology and Environment, Inc., June 1982

TABLE 24
PRIORITY POLLUTANT ANALYSIS OF SOIL FROM CHEM–DYNE

TABLE 6. ANALYSES OF SOIL SAMPLES (10 - 19 FEET)

PARAMETER / LOCATION	ORGANIC CONCENTRATIONS (ug/l)		
	B - 12	B - 17	B - 19
chlorobenzene			
chloroform			
carbon tetrachloride			
methylene chloride			
ethylbenzene			
toluene	.8		.6
1,1,2,2- tetrachloroethane			
tetrachloroethylene			
trichloroethylene			
1,1-dichloroethane			
1,2-dichloroethane			
1,2-dichloropropane			
1,1-dichloroethylene			
1,2- trans-dichloroethylene			
phenol			
2,4-dichlorophenol			
2,4-dimethylphenol			
bis (2-ethylhexyl) phthalate	6.8		.6
di-n-butyl phthalate	.4	.3	.3
di-n-octyl phthalate			.1
butyl benzyl phthalate			.1
diethyl phthalate	.3	.1	
acenapnthene			
hexachloroethane			
fluoranthene	.3		
1,2-diphenylhydrazine			
naphthalene			
fluorene			
anthracene			
phenanthrene			
benzo (a) anthracene	.5		
chrysene	.5		
3,4-benzofluoranthene	.5		
benzo (k) fluoranthene	.5		
pyrene	.3		
benzo (a) pyrene			
indeno (1,2,3-cd) pyrene			
1,2-dichlorobenzene			
aldrin			
dieldrin			
alpha endosulfan			
4,4'-DDE			
4,4'-DDT			
endrin			
endrin aldehyde			
heptachlor			
alpha - BHC			
beta - BHC			
gamma-BHC			
delta - BHC			
PCB 1260			
METAL CONCENTRATIONS (mg/kg)			
aluminum	1400	250	230
calcium	10000	60000	68000
iron	800	210	230
zinc	< 4	< 3	< 4
potassium	380	< 70	< 90
magnesium	2300	8000	10000
sodium	< 100	< 70	< 90
silver	< .3	< .21	< .27
boron	< 8	< 5.7	< 7.3
barium	24	26	23
beryllium	< .10	< .07	< .09
cadmium	< .20	< .14	< .18
cobalt	< .6	.70	< .55
chromium	1.2	1	1.5
copper	9.6	2.8	2.6
lithium	1.2	3.1	3.7
manganese	67	78	130
molybdenum	< 1	< .71	< .91
nickel	< 1.5	< 1.1	< 1.4
lead	12	< 5	< 6.4
tin	< 4	< 2.9	< 3.6
strontium	17	91	110
titanium	6.1	1.6	1.7
vanadium	.8	3.4	3.4
yttrium	2.5	4	3.8

SOURCE: Ecology and Environment, Inc., June 1982

TABLE 25
PRIORITY POLLUTANT ANALYSIS OF SOIL FROM CHEM–DYNE

TABLE 7. ANALYSES OF SOIL SAMPLES (20 - 35 FEET)

PARAMETER / LOCATION	ORGANIC CONCENTRATIONS (ug/l)						
	B - 8	B - 14	B - 16	B - 17	B - 17	B - 19	B - 26
chlorobenzene							
chloroform							
carbon tetrachloride							
methylene chloride							
ethylbenzene							
toluene	.8	1.1		.5		.8	.7
1,1,2,2- tetrachloroethane							
tetrachloroethylene							
trichloroethylene							
1,1-dichloroethane							
1,2-dichloroethane							
1,2-dichloropropane							
1,1-dichloroethylene							
1,2- trans-dichloroethylene							
phenol				.1			
2,4- dichlorophenol							
2,4-dimethylphenol							
bis (2-ethylhexyl) phthalate		.1	250	.1	.2	.4	.1
di-n-butyl phthalate	.5	.2	.2	.4	3.8	.2	.2
di-n-octyl phthalate			17				
butyl benzyl phthalate						.1	
diethyl phthalate	.1	.2		.1	.1		1.2
acenaphthene							
hexachloroethane							
fluoranthene							
1,2-diphenylhydrazine							
naphthalene					.1		
fluorene							
anthracene							
phenanthrene							
benzo (a) anthracene							
chrysene							
3,4-benzofluoranthene							
benzo (k) fluoranthane							
pyrene							
benzo (a) pyrene							
indeno (1,2,3-cd) pyrene							
1,2- dichlorobenzene							
aldrin							
dieldrin							
alpha endosulfan							
4,4'-DDE							
4,4'-DDT							
endrin							
endrin aldehyde							
heptachlor							
alpha-BHC							
beta-BHC							
gamma-BHC							
delta-BHC							
PCB 1260							
	METAL CONCENTRATIONS (mg/kg)						
aluminum	110	150	57	98	130	84	100
calcium	82000	120000	89000	74000	100000	62000	58000
iron	610	410	370	250	1300	270	280
zinc	< 4	< 4	< 4	< 4	7	< 4	< 3
potassium	< 100	< 100	< 90	< 100	< 100	< 90	< 80
magnesium	11000	11000	5900	17000	9000	11000	9000
sodium	110	120	110	110	120	< .90	< 80
silver	< .30	< .30	< .27	< .30	< .30	< .27	< .25
boron	< 8	< 8	< 7.3	< 8	< 8	< 7.3	< 6.7
barium	7.6	16	9.2	12	11	7.1	8.6
beryllium	< .10	< .10	< .09	< .10	< .10	< .09	< .08
cadmium	< .20	< .20	< .18	< .20	< .20	< .2	< .17
cobalt	.81	1.1	< .55	< .60	.67	< .5	< .50
chromium	2.8	2.1	2	2.6	< .80	1.7	.99
copper	3.2	2.6	1.9	2.1	5.4	1.9	1.8
lithium	1.4	1.6	1.1	1.8	4.3	3.8	3.2
manganese	200	220	210	120	230	110	130
molybdenum	< 1	1.1	< .91	< 1	< 1	< .91	< .83
nickel	< 1.5	< 1.5	< 1.4	< 1.5	< 1.5	< 1.4	< 1.3
lead	< 7	< 7	< 6.4	< 7	< 7	< 6.4	< 5.8
tin	< 4	< 4	< 3.6	< 4	< 4	< 3.6	< 3.3
strontium	100	150	160	59	180	53	80
titanium	2.1	2.1	1.2	1.6	2.3	1.9	1.4
vanadium	4.3	4.4	2.5	6.1	3.6	3.7	2.2
yttrium	5.3	5.2	3.3	2.3	6.2	2.7	3.4

SOURCE: Ecology and Environment, Inc., June 1982

TABLE 26
PRIORITY POLLUTANT ANALYSIS OF SOIL FROM CHEM–DYNE

Table 27
QUALITATIVE SUMMARY OF ORGANIC COMPOUNDS IN
ONSITE SOIL SAMPLES BY E&E, INC.
CHEM-DYNE SITE
W65310.C0
(SOURCE: MCCARRIN, GROUNDWATER INVESTIGATION...,
P. 30-31, JUNE 1982)

Organic Priority Pollutant	Soil Sample Depth, feet			
Volatile Compound	0-1.5	2.5-9.0	10-19	20-35 (Saturated)
chlorbenzene		X		
chlorform	X			
carbon tetrachloride	X			
ethylbenzene	X			
toluene	X	X	X	X
tetrachloroethylene	X			
trichlorethylene	X			
1,1-dichloroethane		X		
1,2-dichloropropane	X	X		
1,1-dichloroethylene		X		
1,2-trans-dichloro ethylene	X			
Acid Compound				
phenol	X			X
2,4-dichlorophenol	X			
2,4-dimethylphenol	X			
Base/Neutral Compound				
bis (2-ethylhexyl) phthalate	X		X	X
di-n-octyl phthalate		X	X	X
butylbenzyl phthalate	X		X	X
hexachloroethane	X			
fluoranthene	X			
1,2-diphenylhydrazine	X			
naphthalene	X			X
fluorene	X			
anthracene	X			
phenathrene	X			
benzo(a)anthracene	X			
chrysene	X			
3,4 benzofluoranthene	X			
pyrene	X			
benzo (a) pyrene	X			

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Table 27 (continued)

Organic Priority Pollutant Pesticide Compounds	Soil Sample Depth Feet 0-1.5	2.5-9.0	10-19	20-35 (Saturated)
aldrin	X	X		
dieldrin	X			
alpha-endosulfan		X		
4,4-DDE	X			
4,4-DDT	X			
endrin	X			
endrin aldehyde	X			
heptachlor	X			
alpha BHC	X			
beta BHC	X			X
gamma BHC (lindane)	X			
delta BHC	X			
PCB 1260	X			

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TABLE 8. TENTATIVELY IDENTIFIED COMPOUNDS IN THE SOIL SAMPLES

LOCATION	B-2	B-3	B-8	B-10	B-12	B-14	B-14	B-15	B-16	B-16	B-16	B-16	B-16	B-17	B-17	B-17	B-17	B-18	B-18	B-19	B-19	B-19	B-20	B-21	B-22	B-26	B-26	COMP
COMPOUND / DEPTH	5 - 6.5	2.5 - 4	33.5 - 35	0 - 1.5	12.5 - 14	0 - 1.5	27.5 - 29	0 - 1.5	0 -	0 -	2.5 - 4	7.5 - 9	33.5 - 35	0 - 1.5	25 - 26.5	15 - 16.5	33.5 - 35	0 - 1.5	7.5 - 9	0 - 1.5	10 - 11.5	20 - 21.5	0 - 1.5	0 - 1.5	2.5 - 4	2.5 - 4	22.5 - 24	SURF.
methylethylketone	•	•	•	•	•	•					•					•					•	•	•	•	•	•	•	•
2-butanone							•	•	•	•		•	•	•	•		•	•	•	•								
3-methyl-2-butanone	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1-butanol									•																			
diphenylsulfide					•																		•					
bis (1,1 dimethylethyl) phenol									•																			
2-phenoxy-1-1-biphenol									•																			
2-butoxyethylbutyl-esterphthalate															•			•		•					•			
(1-methylethyl) benzene									•					•														
2-butoxyethylbutyl-ester 1,2-benzene dicarboxylic acid			•																									
phosphoric acid, triphenyl-ester									•																			
cresol isomer														•														
ethyltoluene isomer														•														
trimethylbenzene isomer														•														
triphenylphosphine-oxide																				•								
phosphoric acid tributyl-ester																								•				
methylphenanthrene		•																					•					
1,1,2,2-tetrachloroethane			•																									
dichloromethane			•																									
2,6,10,14-tetramethylpentadecane								•																				
triphenylesterphosphoric acid									•																			
2,6-bis(1,1-dimethylethyl)-2,5-cyclohexadiene-1,4-dione											•																	
1,1-thiobisbenzene																			•									
4-hydroxy-4-methyl-2-pentanone													•													•		
hydrocarbon (general fit)	•							•			•						•	•						•				

The compounds listed above represent the next most prevalent substances found (other than priority pollutants) in the soil which were identified with a 90% certainty or better. No quantitative limits are inferred.

SOURCE: Ecology and Environment, Inc., June 1982

TABLE 28
TENTATIVELY IDENTIFIED ORGANIC COMPOUNDS IN SOIL SAMPLES FROM CHEM - DYNE

the general location of contamination. The second sampling effort included three onsite monitoring wells and two production wells, a City of Hamilton water supply well (unspecified) and a Champion Papers well (unspecified). Organic analytical results of these groundwater sampling efforts are presented in Table 29. Inorganic analysis was done on the February samples but is not summarized in this TM.

The final groundwater sampling by E&E, Inc., in April 1981 included all 20 of the monitoring wells and 3 production wells. Results of this sampling effort are extensive and, to include these results, the summary tables from the E&E, Inc., report are reproduced directly. Table 30 includes the priority pollutant organic and inorganic results. In addition to the priority pollutant organics, several "tentatively identified" organics which were identified by computer evaluation of mass spectroscopy data with a 90 percent or greater certainty were also listed. These compounds are included in Table 31 reproduced directly from the report.

Ohio EPA Groundwater Sampling

The OEPA reported analytical results for two sets of groundwater samples, samples collected in February 1981, and samples collected in April 1981.

In February 1981, Pennino/OEPA split the three onsite monitoring well samples with E&E, Inc., (Table 29) and composited them into one groundwater sample. On the following week, Carlisle/OEPA sampled the Hamilton city water supply at an unspecified location. Results of these samples were interpreted by Harsh/OEPA (2). These data are shown in Table 32.

In April 1981, Prothero and Pennino of the OEPA sent samples from 18 monitoring wells to the Ohio Department of Health for analysis (5). Results from these samples indicated contamination by volatile priority pollutant compounds in wells B-8, B-11, B-14, and B-17, as shown in Table 33.

Roy F. Weston Groundwater Sampling

Roy F. Weston performed a hydrogeologic study of the Chem-Dyne site (6). As part of this study, Weston installed

DRAFT

Table 29
SUMMARY OF ORGANIC DATA FOR GROUNDWATER SAMPLES
CHEM-DYNE SITE

	January 1981 Samples[a]								February 1981 Samples[a]				
	"Upgradient" Wells				"Downgradient" Wells				Onsite Wells			City of Hamilton Supply[b]	Champion Papers Well[b]
Compound, ug/l	B-1	B-8	B-9	B-13	B-5	B-6	B-11	B-12	B-14[b]	B-15[b]	B-17[b]		
Phenol									*	*	1,000	*	*
Naphthalene									*	*	*		
Bis(2-ethylhexyl)phthalate	45								*	*	*	*	*
Butyl benzyl phthalate									*				
Di-n-butyl phthalate									*	*			
Di-n-octyl phthalate									*				
Anthracene									*				
Phenanthrene									*				
Pyrene									*	*			
Benzene									*		1,300		
1,1-Dichloroethane									*		350		
Carbon tetrachloride									1,700	150	1,100		
Chloroform		3,275							1,000	150	4,000		
1,1-Dichloroethylene			89				2,117		*		200		
Methylene chloride									*	*	1,000		
Dichlorobromomethane									*		140		
1,2-Dichlorobenzene										*	*		
Bis(2-chloroethyl)ether											130		
1,2-Dichloroethane							609				12,000		
1,1,1-Trichloroethane											4,000		
1,1,2-Trichloroethane							3,929				900		
1,1,2,2-Tetrachloroethane											17,000		
1,2-trans-Dichloroethylene											14,000		
Ethylbenzene											280		
Tetrachloroethylene							324				80		
Toluene											1,800		
Trichloroethylene							1,958				4,500		

[a]Blank space indicates that compound was sought but not identified in the sample.
[b]The asterisk represents compound detected at less than 10 mg/l.
Source: McCarrin, Groundwater Investigation . . ., E&E, Inc., June 1982, p. 47 and 49)

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CHEMICAL CONCENTRATIONS IN THE GROUND AND SURFACE WATERS

(UG/L) APRIL, 1981

GROUP		UPGRADIENT WELLS			ONSITE WELLS						DOWNGRADIENT WELLS									RIVER			CANAL			LOCAL WELL SUPPLIES		
SAMPLE LOCATION		B-1	B-27	B-23	B-8	B-9	B-14	B-15	B-16	B-12	B-2	B-12	B-11	B-10	B-25	B-3	B-5	B-4	B-6	B-31	B-30	S-102	S-202	S-302	S-101	S-201	S-301	CHAMP P	HAMIL W	CONC P
COMPOUND	WASTES																													
ORGANICS (ug/L)																														
α BHC	▼					●				●																			●	●
β BHC	▼				●		●			●							●				●	●	●						●	
γ BHC	▼				●					●																			●	●
δ BHC	▼	●	●	●	●	●	●	●	●	●	●	●	●			●	●		●		●	●	●							
2,4 DDD																														
2,4 DDE			●	●			●									●	●				●	●	●							
4,4 DDT	▼		●		●	●															●					●	●			●
dieldrin	▼				●																	●	●							
β endosulfan					●																●									
bis (2 ethylhexyl) phthalate		11.4	10.9		●	●	●			●		●	●			●		●		●	●	●	●				●			●
butylbenzyl phthalate	▼				●						●					●		●	●	●	●	11.1	●	15.1						●
di-n-butyl phthalate		●		●	●					●	●					13		12	16.1			●	●	●			●	●		●
di-n-octyl phthalate				●				●																						
methylene chloride	▼	83.2	41.5	42.5	16200	922	2540	37.3	22.7	5550	42.5	44.1	50.1			45.8	130	45	54.3	20.8	22	57.3	31.2	31.7	22.9	26.2	22.4	26.6	54.1	60.1
methyl chloride	▼																							●						
chloroform	▼				8140		23300	210	38.2	3750			50.5		.5						●									
carbon tetrachloride	▼				5400	●	1600	254	27.7	70			14					●												
vinyl chloride	▼								31.7	2150			127			340														
1,2 trans dichloroethylene						416			25.7	67000			373			●				●	●									
1,1 dichloroethylene					●	●	●		●	22.6			28.4																	
trichloroethylene	▼					55.5				5510					.1						●									
tetrachloroethylene							●																							
1,1 dichloroethane						118	●		●	510			●		.3															
1,2 dichloroethane	▼						37.9		●	20900			131		.1															
1,1,1 trichloroethane	▼				10.5				36.5	1020			688		.3															
1,1,2 trichloroethane									57.6	560			2250																	
chloroethane						1220																								
1,1,2,2 tetrachloroethane	▼								117	2340		16.7	273																	
benzene	▼									359																				
toluene	▼									1970										●					●					
naphthalene	▼										15.5																			
ethylbenzene					93.3		25.3			307										●	●	●	●	●	●	●	●	●	●	
2,4 dinitrophenol						111												114												
METALS																														
antimony	▼	20	<20	<20	<20	<20	<20	20	<20	<20	<20	<20	<20			<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
arsenic	▼	<10	<10	<10	<10	<10	<10	<10	<10	50	<10	<10	<10			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	20
mercury	▼	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	3
selenium		<10	<10	<10	10	<10	10	<10	<10	<10	<10	10	<10			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
zinc	▼	200	240	10	600	400	520	190	210	320	240	770	700			120	350	480	350	<10	30	<10	<10	<10	30	<10	<10	<10	<10	<10
aluminum	▼	<50	50	<50	<50	100	<50	<50	<50	<50	100	<50	<50			100	<50	100	<50	<50	<50	1000	1150	1650	1500	1150	950	<50	<50	<60
barium	▼	160	200	180	70	640	180	340	160	320	160	80	250			40	150	30	60	30	60	30	50	30	20	80	20	140	110	200
cobalt	▼	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	10			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
iron	▼	<20	260	460	<20	400	<20	20	<20	<20	1020	120	240			240	20	280	40	<20	20	1360	1520	2520	1930	1430	1340	<20	<20	<20
manganese		40	150	1150	360	800	310	400	830	1390	610	40	320			230	50	60	20	10	<10	70	70	160	70	60	80	160	150	320
boron		90	150	150	<10	<10	<10	<10	<10	<10	400	<10	<10			<10	<10	<10	140	60	70	60	60	50	40	60	90	300	<10	160
calcium	▼	130000	170000	158000	234000	144000	363000	192000	53600	181000	160000	135000	168000			150000	125000	110000	83400	108000	76700	84800	83100	108000	84000	85300	80200	32000	32500	72900
magnesium	▼	29800	35000	32600	53500	42400	106000	102000	24300	23600	62500	85500	48300			67300	37000	28300	34000	24000	25400	30000	29400	35700	29600	30300	28100	31200	28500	26500
sodium	▼	17300	25400	11700	35500	11200	5900	21300	22200	22300	20400	12800	33300			30300	12900	27200	23000	18100	13300	18700	15500	19200	19300	19300	20200	27500	12000	28100
chromium		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
beryllium		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
cadmium		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
copper		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20			<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
lead		<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40			<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
nickel		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20			<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
vanadium		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
tin		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20			<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
silver		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20			<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
thallium		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

EXPLANATION

▼ WASTES AT LEAST KNOWN TO HAVE BEEN ONSITE

■ CONCENTRATIONS LESS THAN 10 ug/l

● CONCENTRATIONS LESS THAN 5 ug/l

SOURCE Ecology & Environment, June 1982

TABLE 30
CHEMICAL CONCENTRATIONS IN THE GROUND AND SURFACE WATERS
CHEM DYNE SITE

TENTATIVELY IDENTIFIED ORGANICS IN THE GROUND AND SURFACE WATERS

Locations: UP GRADIENT (B-1, B-27, B-29); ON SITE (B-14, B-15, B-16, B-17, B-20); DOWN GRADIENT (B-8, B-9, B-2, B-12, B-11, B-10, B-25, B-3, B-5, B-4, B-6, B-31, B-30); RIVER (S-102, S-202, S-302); CANAL (S-101, S-201, S-301); PRIVATE (HAMILTON, CHAMPION, FAIRFIELD). No compounds are marked at B-20, B-10, B-25 or B-31.

COMPOUNDS	Known Wastes	UP GRADIENT	ON SITE	DOWN GRADIENT	RIVER	CANAL	PRIVATE
1-chloro 2-butene		B-1 ●		B-9 ●, B-12 ●, B-5 ●, B-4 ●	S-102 ●		
1,1 dimethyl cyclopentane	▼	B-1 ●		B-4 ●, B-30 ●			
arsine		B-1 ●		B-9 ●	S-102 ●	S-301 ●	
2-methyl 2h-tetrazole		B-1 ●		B-12 ●, B-5 ●, B-6 ●			
1,3 dichloro butane				B-2 ●			FAIRFIELD ●
5-cyclohexylmethyl 2-pyrrilidinone		B-29 ●	B-14 ●, B-17 ●	B-9 ●, B-2 ●, B-11 ●, B-3 ●			
3,3 dimethyl 1-butyne				B-2 ●			
3-chloro 2methyl 1-propene		B-27 ●		B-8 ●, B-3 ●			
n,n difluoro methanamine				B-8 ●, B-3 ●			HAMILTON ●
1,1,3,3 tetrachloro 2-propanone				B-5 ●			
1,4 dione 2,5 cyclohexadiene			B-15 ●	B-5 ●, B-6 ●		S-101 ●	
tetrafluoro methane	▼			B-6 ●			
4-methyl 2-pentanone (methyl isobutyl ketone)	▼			B-8 ●			
3,3 dichloro 1-propene				B-8 ●			
2,3,5 trimethyl-6-(3 methyl-2-butenyl) 2,5-cyclohexadiene 1,4 dione				B-8 ●			
1,2 benzene dicarboxylic acid butyl methylpropyl ester				B-8 ●			
cyclopentane carboxylic acid				B-8 ●			
2h-10 1a-(epoxymethone) oxireno 4,5 cyclodeca 1,2 bifuran-1,2-one				B-8 ●			
dichlorofluoromethane				B-9 ●			
trifluoro borane				B-9 ●			
2h-cycloprop/a/naphthalene-2-one, 1,1a4,5,6,7,7a,7b octhydro 1,1,7,7a				B-9 ●			FAIRFIELD ●
1,1,2 trichloro 1,1,2 trifluoro ethane	▼			B-11 ●			
4-fluoro 1,1'biphenyl			B-16 ●	B-11 ●		S-101 ●	FAIRFIELD ●
2,3 dichloro 1-propene				B-11 ●			
1,3,4,4 tetrafluoro 1,5 hexadiene				B-12 ●			
3-chloro 1,2,4 triazole				B-12 ●			
n-methoxymethanamine			B-14 ●				
n (2,6 dimethylphenyl) 1-methyl 2-piperidine carboximide			B-14 ●, B-16 ●	B-3 ●	S-102 ●, S-302 ●	S-101 ●	
3-methyl 1h-pyrazole			B-15 ●				
2-butyne			B-15 ●				
4,5,6,7 tetra 1h-1,3-diazepine			B-15 ●				
3,3,3-trichloro 1-propene			B-16 ●				
3-methyl, 3-hydroxy, 2-butanone			B-16 ●				
2-methyl, 5-ethyl heptane	▼	B-29 ●	B-16 ●				
oxetnane			B-17 ●				
urea			B-17 ●				
bis-dihydro, 2,2 (1-methyl 1,2-ethanediylidene) hydrazinecarboximidamine			B-17 ●				
7-methyl nonanoic acid methyl ester			B-17 ●				
4-methyl phenol			B-17 ●				
1-(3-methyl oxiranyl)-ethanone			B-17 ●				
benzoic acid	▼		B-17 ●				
3-methyl phenol			B-17 ●				
acetic acid trifluoro, ester with 4 hydroxyacetophenone			B-17 ●				
2-oxabicyclo (2,2,2) octane 1,3			B-17 ●				
1-methyl 1,4 imidazozone			B-17 ●				
2-chloro-5-methyl pyridine			B-17 ●				
methyl (methylsulfinyl) benzene			B-17 ●				
2-pyrrolidine carboxylic acid			B-17 ●				
2-hydroxy cyclopentane ethanol			B-17 ●				
7-h-pyrazolo (4,3-d) pyrimidin-7			B-17 ●				
dicarbonylnitros manganese			B-17 ●				
1,5 dihydro 4h-pyrazolo 3,4 dipyrimidin-4-one		B-29 ●					
3-methyl pentane	▼			B-30 ●			
1,2,3 trichloro propane				B-30 ●	S-102 ●	S-201 ●	
2-chloro 2-methyl propane					S-102 ●		
1,2 benzene dicarboxylic acid (phthalic acid)					S-102 ●		
1,3,5 triazine					S-102 ●		
1,3 dichloro-1-propene					S-202 ●		
2 methyl-2,3 dichloro propanol					S-202 ●		
trinitro methane					S-202 ●		
2-propyn-1-ol					S-302 ●		
2,3-dichloro-2-methyl propanol							
4-methyl-5-hydroxy-6-hepten-3-one						S-101 ●, S-201 ●, S-301 ●	
2-imidazoldinone						S-101 ●	
bromocyclopentane						S-201 ●	FAIRFIELD ●
1-methyl-5-methoxy-1-proline						S-201 ●	
5-triazolo (4,3 b) pyridazin-6-d						S-201 ●	
tetramethyl pyridazin						S-301 ●	
1,1 dichloro 2-ethyl cyclopropane						S-301 ●	
(2-hydroxyphenyl) phenyl methanone							CHAMPION ●
chloroacetic acid butyl ester							FAIRFIELD ●
1-h-1,2,4-triazol-3-amine							FAIRFIELD ●
2,3-dichloro-2-methyl butane							FAIRFIELD ●
2,3-dichloro-2-methyl propanol							FAIRFIELD ●
3-chlorothieno (2,3-b) pyridine							FAIRFIELD ●
1112 tetrachloro ethane	▼			B-11 ●	S-202 ●		
3(11 dimethyl propal)					S-302 ●		

▲ Substances which at a minimum are known to have been transported to the site.

● Substances which have been identified with a 90% certainty or better. No quantification is inferred.

SOURCE: Ecology & Environment, June 1982

TABLE 31
TENTATIVELY IDENTIFIED ORGANICS IN THE GROUND AND SURFACE WATERS
CHEM-DYNE SITE

Table 32
GROUNDWATER RESULTS FROM OEPA SAMPLING FEBRUARY 1981
CHEM-DYNE SITE
W65310.CO

Onsite Monitoring Wells (B-14,15,17) Composite Sample	Approximate Concentration,[a] ug/l
Methylene Chloride	3,000
Diisooctyl phthalate	1,237
Trimethyl Hexene	696
Cyclohexene	400
Methyl Benzene	347
Tetrachloroethane	306
Phenol	206
4-methyl-2-pentanone	200
Methyl-Pentanoic Acid	164
2-Methyl Phenol	130
Ethyl Hexanoic Acid	92
2,2 -Methylene Bis (oxy) Bis-Propane	75
Octanoic Acid	65
2,2 -Oxy Bis-Propane	56
Pentanoic Acid	55
1,3 - Dimethyl Benzene	49
1,1 -Oxy Bis-2-Methoxy-Ethane	38
Benzene Propenoic Acid	32
Methyl Pentanoic Acid	28
Ethyl Benzene	26
Benzene Acetic Acid	24
2-Hexanone	24
Dimethyl Phenol	19
Dichloropropene	18
2-methyl cyclopentanol	16
Trimethyl Benzene	11
Trichloropropene	5
1-Dodecanol	5
City of Hamilton Water Supply	
Tetramethyl Butane	320
Tetrahydro-3-Methyl-4-Methylene Furan	43
2-Hexanone	4
1-Methyhexyl Hydroperoxide	3
Nonadecanol	3
Methyl Benzene	1
Cyclopentane Carboxyaldehyde	1
Methyl dodecane	0.5
3-Bromo Cyclohexene	0.5

[a]Quantification based on response to D_{10} Anthracene.

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Table 33
GROUNDWATER RESULTS FROM OEPA SAMPLING APRIL 1981[a]
CHEM-DYNE SITE
W65310.CO

Volatile Organic Priority Pollutant ug/l	E&E Monitoring Well[b]			
	B-8	B-11	B-14	B-17
Chloroform	4,700		12,600	1,900
Carbon tetrachloride	12,800		1,900	
1,2-Dichloroethane				5,300
1,1,1-Trichloroethane				2,700
1,1,2,2,-Tetrachloroethane		900		500
1,2-Dichloroethylene				26,900
Trichlorethylene				3,100
Toluene				900

[a]Analysis by Ohio Department of Health.
[b]Blank spaces indicates that compound was sought but not identified in the sample.

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12 additional groundwater monitoring wells. Four of these new wells were replacements of unserviceable FIT wells and the other eight wells were in new locations. All Weston wells were 4-inch diameter casing and screen installed using air rotary methods and temporary casing. Each well assembly was placed into position inside a 6-inch temporary casing which was advanced using a 300-lb hammer.

All of the FIT wells and Weston wells were sampled by Roy F. Weston personnel in December 1982. Results of the analysis of these samples are presented in Table 34 and the monitoring well data summary tables attached as Appendix B(7).

Groundwater samples from several monitoring wells were split with a representative from FMC Corporation, which was the field sampling representative for the Chem-Dyne waste generators. Results of the analysis by FMC are presented in the monitoring well data summary tables attached as Appendix B (7).

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TABLE 34 (Page 1 of 3)
SUMMARY OF PRIORITY POLLUTANT ORGANIC ANALYSIS OF GROUNDWATER FROM ROY F. WESTON SAMPLING
AT CHEM-DYNE - DECEMBER 1982

Compound	MW-1	MW-2	MW-3	MW-4	VOA MW-4	VOA MW-4	VOA MW-4	MW-7	MW-8	Pumped MW-8	Bailed VOA MW-8	Pumped VOA MW-8	MW-10	Duplicate MW-10	MW-11	MW-11
Acid Compounds, ug/l																
phenol					NA	NA	NA				NA	NA	440	650		
Base/Neutral Compounds, ug/l																
bis(2-chloroethyl)ether					NA	NA	NA				NA	NA	40K	60K		
bis(2-ethylhexyl)phthalate	12	1K		2K	NA	NA	NA	3K	2K	4K	NA	NA			2K	
benzyl butyl phthalate					NA	NA	NA				NA	NA				
di-N-butyl phthalate	4K				NA	NA	NA				NA	NA				
isophorone																
chrysene																
Volatiles, ug/l																
benzene					15K								660	700		
carbon tetrachloride													760	760		
chlorobenzene													160K	160		
1,2-dichloroethane							8K						15,000	16,000		
1,1,1-trichloroethane													2,600	2,700		
1,1-dichloroethane					320	390	180	800K					480	570		
1,1,2-trichloroethane													1,100	1,300		
1,1,2,2-tetrachloroethane													640	680		
chloroethane				2,300	1,700	2,300	980									
chloroform													3,300	3,200		
1,1-dichloroethene													620	660		
trans-1,2-dichloroethene				860	1,900	930	900					2K	21,000	31,000		
1,2-dichloropropane													60K	60K		
ethylbenzene													1,100	1,100		
methylene chloride				85	120	140	54		9K	15		7K	1,000	1,000		
tetrachloroethene													940	980		
toluene													6,100	4,600		
trichloroethene				70	130	60	46			11		11	8,400	6,700	4K	
vinyl chloride																
chloromethane		6K														
Pesticides, ug/l					NA	NA	NA				NA	NA				
Non-Priority Pollutant Hazardous Substances, ug/l																

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TABLE 34 (Page 2 of 3)

SUMMARY OF PRIORITY POLLUTANT ORGANIC ANALYSIS OF GROUNDWATER FROM ROY F. WESTON SAMPLING AT CHEM-DYNE - DECEMBER 1982

Compounds	MW-12	Pumped VOA MW-12	Pumped VOA MW-12	Bailed VOA MW-12	Bailed VOA MW-12	MW-13	Pumped VOA MW-13	Pumped VOA MW-13	Bailed VOA MW-13	Bailed VOA MW-13	MW-15	MW-16	MW-17	MW-18	MW-19
Acid Compounds, ug/l															
phenol		NA	NA	NA	NA		NA	NA	NA	NA					
Base/Neutral Compounds, ug/l															
bis(2-chloroethyl)ether		NA	NA	NA	NA		NA	NA	NA	NA	70K	2K	7K		
bis(2-ethylhexyl)phthalate	3K	NA	NA	NA	NA		NA	NA	NA	NA					
benzyl butyl phthalate		NA	NA	NA	NA		NA	NA	NA	NA					
di-N-butyl phthalate	1K	NA	NA	NA	NA	1K	NA	NA	NA	NA					
isophorone															
chrysene															
Volatiles, ug/l															
benzene															
carbon tetrachloride															
chlorobenzene											1,600				
1,2-dichloroethane						30K	23	29	33	28	21,000			55	
1,1,1-trichloroethane						70	61	67	71	61			1K		
1,1-dichloroethane											3,800			22	
1,1,2-trichloroethane							236	426	532	393	31,000			218	
1,1,2,2-tetrachloroethane		25	40				171	229	325	293	19,000				
chloroethane															
chloroform						45K	43	49	55	48	5,800				
1,1-dichloroethene						25K	26	55	64	34	6,600			59	
trans-1,2-dichloroethene		35	30				227	379	444	347	15,000			253	
1,2-dichloropropane						420									
ethylbenzene															
methylene chloride				160	80			9K	10	9K	1,600		14	5K	16
tetrachloroethene		10					60	155	211		750				
toluene						140				105	1,400				
trichloroethene		70	30	55	25K	380	169	392	438	246	8,100		3K	14	2K
vinyl chloride											5,100			326	
chloromethane															
Pesticides, ug/l		NA	NA	NA	NA		NA	NA	NA	NA					
Non-Priority Pollutant Hazardous Substances, ug/l															

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TABLE 34 (Page 3 of 3)
SUMMARY OF PRIORITY POLLUTANT ORGANIC ANALYSIS OF GROUNDWATER FROM ROY F. WESTON SAMPLING
AT CHEM-DYNE - DECEMBER 1982

Compounds	MW-20	MW-21	MW-22	City of Hamilton Well No. 11	Champion Well No. 1	Champion Well No. 4	MW-5*	Champion Well No. 9	Champion Well No. 10	Beckett PW-2	Ransohoff Fire Hydrant
Acid Compounds, ug/l											
phenol											
Base/Neutral Compounds, ug/l											
bis(2-chloroethyl)ether											
bis(2-ethylhexyl)phthalate				2K		2K	7K		2K		1K
benzyl butyl phthalate		7K									
di-N-butyl phthalate	1K					1K					1K
isophorone											30
chrysene											1K
Volatiles, ug/l											
benzene											
carbon tetrachloride											
chlorobenzene											
1,2-dichloroethane							40K				
1,1,1-trichloroethane	8K						290				
1,1-dichloroethane											
1,1,2-trichloroethane							120				
1,1,2,2-tetrachloroethane							320				
chloroethane											
chloroform							170				
1,1-dichloroethene											
trans-1,2-dichloroethene							210				
1,2-dichloropropane											
ethylbenzene											
methylene chloride	10K	9K		4K	15	17			9K		
tetrachloroethene				2K			10K				
toluene											4K
trichloroethene	12K	2K		2K			100				1K
vinyl chloride											
chloromethane											
Pesticides, ug/l											
Non-Priority Pollutant Hazardous Substances, ug/l											

* The Organic Traffic report for sample tag number S1819 indicates these results are for groundwater collected from MW-5; however, tag number key provided by Roy F. Weston indicates Champion Well No. 4 sample source.

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REFERENCES

Chem-Dyne Site Remedial Investigation
Review of Existing Information
Task 1

OBJECTIVE

Refer to the final Work Plan for the Chem-Dyne RI/FS, EPA WA 21.5M10.0 and CH2M HILL number W65310.C0/D0.

CHEM-DYNE SITE BACKGROUND

1. Polrep: Security Improvements, Chem-Dyne Corporation, Hamilton, Ohio. U.S. EPA (Feb 1982).

2. Invitation to Prospective Bidders and bidding documents for drum, bulk, and other waste removal at Chem-Dyne site, U.S. Army Corps of Engineers (11/19/82).

3. Feasibility Study for Drum Waste Removal from the Chem-Dyne Site, Roy F. Weston, Inc. (9/10/82).

4. Personal communication with Dave Strayer, SWDO, Ohio EPA.

5. Examination of Title, Lawyers Title of Cincinnati, Inc. (4/7/83).

6. Letter from James L. Rozelle (MCD) to Mike McCarrin (Ecology and Environment, Inc.) (1/15/82).

7. McCarrin, Groundwater Investigation of the Chem-Dyne Hazardous Materials Recycling Facility in Hamilton, Ohio, Ecology and Environment, Inc. (June 1982).

8. United States of America vs. Chem-Dyne, et al., Civil Action No. C-1-79-703, Complaint for Injunctive Relief, United States District Court for the Southern District of Ohio (12/19/79).

9. Transfer Records from the Miami Conservancy District.

10. Chem-Dyne Public Information Activity Report, Ohio EPA.

11. Chorlton, P., "Hamilton, Ohio Struggles with Massive Toxic Waste Cleanup", The Washington Post, (11/3/83).

12. Feasibility Study for Bulk Waste Removal from the Chem-Dyne Site, Hamilton, Ohio, (Draft Report), Roy F. Weston, Inc. (8/9/82).

13. Harsh, K.M., Affidavit, State of Ohio, County of Franklin (9/28/76).

14. Lamm, D., Office Memorandum, Indiana State Board of Health (5/10/76).

15. Preliminary Hydrogeologic Investigation and Preliminary Evaluation of Remedial Action Alternatives Feasibility, Chem-Dyne Hazardous Materials Recycling Facility, Hamilton, Ohio (Draft Report), Roy F. Weston, Inc. (June 1983).

16. State of Ohio ex rel. vs Chem-Dyne Corporation, et al., Case No. CV-76-09-0834, Stipulation and Judgment Entry, Court of Common Pleas, Butler County, Ohio (9/18/83).

17. United States of America vs Chem-Dyne Corporation, et al., Civil Action No. C-1-79-703, Judgment, United States District Court for the Southern District of Ohio (1/25/83).

18. Aletakos, I., Site Inspection Report, U.S. EPA (3/25/80).

19. Summary of fish contamination data for fish collected from the Great Miami River by the Ohio EPA (preliminary data), 5/1/83).

20. "Hamilton Water Found Safe," The Cincinnati Enquirer, (3/5/81).

21. Interim Report of Projected Cleanup Costs for the Chem-Dyne Site in Hamilton, Ecology and Environment, Inc. 3/27/81).

22. Site assessment report by K. Harsh, Ohio EPA.

23. Hazardous Waste Site Ranking Model Summary Sheet, Ecology and Environment, Inc. (9/22/81).

CHEM-DYNE SITE SETTING

1. McCarrin, Groundwater Investigation of the Chem-Dyne Hazardous Materials Recycling Facility in Hamilton, Ohio, E & E, Inc., June, 1982.

2. "Hydrologic Data for the Hamilton-New Baltimore Area," 1976-1977, Miami Conservancy District, September 1977.

3. Spieker, USGS Professional Paper 605-A, 1968.

4. Spieker, USGS Professional Paper 605-D, 1968.

5. "Water Resources in the Hamilton-New Baltimore Area 1974," Miami Conservancy District, September 1975.

6. "Preliminary Hydrogeologic Investigation and Preliminary Evaluation of Remedial Action Alternatives Feasibility, Chem-Dyne Hazardous Materials Recycling Facility, Hamilton, Ohio"(draft), Roy F. Weston, Inc., June, 1983.

7. "Hydrologic Data for the Hamilton-New Baltimore Area," Miami Conservancy District, May 1982.

8. Smith, June 1960.

9. Smith, July 1960.

10. "Groundwater Quality in the Hamilton-New Baltimore Area, Ohio," Miami Conservancy District, May 1982.

11. "Proposal for Groundwater Investigations in Chem-Dyne Vicinity," Miami Conservancy District, July 1982.

12. Telephone Memorandum by Don Bruce/U.S. EPA with Jack Thorsen/Roy F. Weston, August 12, 1982.

13. CH2M HILL Technical Memorandum (draft), "Fish Tissue Sampling Phase II Subtask 3-2.5," December 9, 1983.

CHEM-DYNE DATA AND PREVIOUS EVALUATION SUMMARIES

1. Harsh, "Emergency Action Plan for Chem-Dyne Site, OEPA, undated.

2. Harsh, "Interpretation of Chem-Dyne Sample Results," OEPA, March 1983.

3. Invitation to Prospective Bidders and Bidding Documents for drum, bulk, and other waste removal at Chem-Dyne, U.S. Army Corps of Engineers, November 1982.

4. McCarrin, "Groundwater Investigation of the Chem-Dyne Hazardous Materials Recycling Facility in Hamilton, Ohio," E & E, Inc., June 1982.

5. Ohio Department of Health laboratory reports to OEPA on April 1981 samples.

6. "Preliminary Hydrogeologic Investigation and Preliminary Evaluation of Remedial Action Alternatives Feasibility, Chem-Dyne Hazardous Materials Recycling Facility, Hamilton, Ohio" (draft), Roy F. Weston, Inc., June 1983.

7. Analysis by Radian Corporation on Groundwater Samples split with Roy F. Weston, Inc., December 1982.

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ATTACHMENT A

Chem-Dyne Site
Chronology File

The site chronology file describes the major events which occurred at the Chem-Dyne site based on the documents in CH2M HILL files.

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The following is a site chronology which describes the major events which have occurred at the Chem-Dyne site based on documents in CH2M HILL files.

CHRONOLOGY FILE

Date: 00/00/00
Document No.: 00023
Key Word: Site Data
Description: Site inspection report by Meyer (U.S. EPA), undated. Other participants included Biros (U.S. EPA), Forba (NEIC), and Shepard (Asst. City Mngr.).

Date: 00/00/00
Document No.: 00024
Key Word: Site Data
Description: Site inspection report submitted by Griogalavski (U.S. EPA), undated. Other participants included Brossman and Alexakos (both of U.S. EPA).

Date: 00/00/00
Document No.: 00087
Key Word: Sampling/Testing
Description: Ohio EPA priority pollutant scan on tank contents reveals presence of PCB's and pesticides in solvent tank.

Date: 00/00/74
Document No.: 00119
Key Word: Miscellaneous
Description: As early as 1974 chemical residues and wastes were being trucked to Chem-Dyne site in Hamilton, Ohio.

Date: 00/00/75
Document No.: 00057
Key Word: Miscellaneous
Description: Whitten and Kovacs start Spray-Dyne which makes antifreeze by recycling chemical waste.

Date: 00/00/76
Document No.: 00121
Key Word: Miscellaneous
Description: Chem-Dyne is formed as a company to collect and dispose of waste. Some effort is made to recycle oil wastes as fuel. Wastes which are not suitable are stored in drums and tanks on site.

Date: 04/00/76
Document No.: 00012
Key Word: Miscellaneous
Description: OEPA search warrant to view Chem-Dyne property. Observed thousands of coded and unmarked barrels stored in their warehouse. Shortly after the inspection the barrels were loaded into semi-trucks and transported to an unknown destination(s).

Date: 04/00/76
Document No.: 00012
Key Word: Miscellaneous
Description: Fire reported in landfill south of Hamilton. Landfill operators refused to let OEPA representatives or fire department on site. By the time a search warrant was obtained, the site had been cleaned up, dozed off and there were no longer any visible barrels.

Date: 04/15/76
Document No.: 00106
Key Word: Miscellaneous
Description: Velsicol Chemical Corp. alleged that spoiled rodenticide product shipped to Chem-Dyne for disposal was found to have been sold in the market. Velsicol requests investigation by U.S. EPA.

Date: 04/23/76
Document No.: 00012
Key Word: Miscellaneous
Description: Chem-Dyne receives bulk shipment of chlorinated hydrocarbons from Shell Chemical.

Date: 04/23/76
Document No.: 00075
Key Word: Miscellaneous
Description: Runoff from Chem-Dyne site containing endrin enters the Ford Hydraulic Canal and the Great Miami River resulting in a major fish kill.

Date: 04/24/76
Document No.: 00106
Key Word: Miscellaneous
Description: Chem-Dyne adds unknown chemical to Shell chemical tank car to get "saleable" product. Heat of reaction causes tank car to overheat. Noxious and toxic

fumes emitted. Local fire department called but could not reduce heat. (Also, see Doc. No. 00012).

Date: 04/26/76
Document No.: 00106
Key Word: Miscellaneous
Description: Shell tank car overheats again. Local fire department called but is unable to reduce heat. Noxious and toxic fumes are being released. Car fumes for 4 days.

Date: 05/10/76
Document No.: 00012
Key Word: Site Data
Description: Site observations by W. McElwee (OEPA) are summarized by Lamm (ISBH). This memo was leaked to Chem-Dyne and was the subject of future controversy.

Date: 06/00/76
Document No.: 00011
Key Word: Legal Action
Description: Chem-Dyne files a $30 million suit against the City of Hamilton on the grounds of harassment and other charges.

Date: 06/08/76
Document No.: 00011
Key Word: Miscellaneous
Description: OEPA legal and technical assistance to the city of Hamilton is discussed in OEPA interoffice memorandum.

Date: 06/08/76
Document No.: 00013
Key Word: Miscellaneous
Description: Correspondence from Kovacs (Chem-Dyne) to McElwee questions the contents of Lamm memorandum.

Date: 06/08/76
Document No.: 00015
Key Word: Legal Action
Description: Chem-Dyne transmits copy of Chem-Dyne suit against City of Hamilton to OEPA and requests all public information available on Chem-Dyne from OEPA.

Date: 06/18/76
Document No.: 00014
Key Word: Miscellaneous

Description: McElwee (OEPA) responds to Chem-Dyne remarks on Lamm memorandum in letter to Kovacs (Chem-Dyne).

Date: 06/24/76
Document No.: 00016
Key Word: Miscellaneous
Description: McElwee (OEPA) recommends to OEPA legal advisor that Chem-Dyne be required to submit monthly reports describing wastes handled onsite.

Date: 07/23/76
Document No.: 00106
Key Word: Miscellaneous
Description: Endrin discharged by Chem-Dyne is responsible for major fish kill on Great Miami River. Fish kill stretches 37 miles from Ford Hydraulic Canal to the mouth of the Great Miami River.

Date: 08/03/76
Document No.: 00106
Key Word: Miscellaneous
Description: K.M. Harsh (OEPA) takes samples of water draining from Chem-Dyne's property on eight different occasions between August 3 and September 17. Analysis showed that each sample contained the pesticide endrin. The pesticides dieldrin and heptachlor were also present in some samples.

Date: 08/05/76
Document No.: 00017
Key Word: Miscellaneous
Description: McElwee (OEPA) recommends to OEPA legal advisor that a statewide policy statement should be issued on the subject of monthly reports. Also recommends initiation of a manifest reporting system.

Date: 08/06/76
Document No.: 00018
Key Word: Miscellaneous
Description: Velsicol wastes sent to Chem-Dyne found to be similar to waste sampled at Skinner Landfill. OEPA suspects waste arrived at Skinner landfill via Chem-Dyne.

Date: 08/13/76

Document No.: 00103
Key Word: Miscellaneous
Description: K.M. Harsh (OEPA) receives report that tank car at Chem-Dyne site is being cleaned and contents allowed to enter sewer. Harsh investigates but finds no material entering sewer.

Date: 08/13/76
Document No.: 00103
Key Word: Miscellaneous
Description: Chem-Dyne runoff containing endrin and dieldrin enters Great Miami River resulting in fish kill.

Date: 08/13/76
Document No.: 00103
Key Word: Miscellaneous
Description: Report is filed by Harsh (OEPA) on August 13 fish kill which is believed to have occurred as a result of runoff from the Chem-Dyne site entering the Great Miami River.

Date: 09/19/76
Document No.: 00019
Key Word: Miscellaneous
Description: OEPA and Kentucky DNR suspect Pristine, Skinner, and Chem-Dyne operations are related.

Date: 09/28/76
Document No.: 00106
Key Word: Legal Action
Description: K. Harsh (OEPA) files affidavit testifying to his monitoring of the Chem-Dyne site.

Date: 09/28/76
Document No.: 00107
Key Word: Legal Action
Description: K. Applegate (OEPA) files affidavit testifying to the hazardous nature of contaminants found in the waterways which lie in close proximity to the Chem-Dyne site. The hazardous contaminants of concern were endrin, dieldrin, and heptachlor.

Date: 09/28/76
Document No.: 00108
Key Word: Legal Action
Description: R.P. Francis, Assistant Law Enforcement

Office of ODNR, files affidavit testifying that Chem-Dyne was responsible for three separate incidents in which wild animals were killed as a result of pollution.

Date: 09/29/76
Document No.: 00075
Key Word: Legal Action
Description: Several incidents involving the discharge of pesticides and noxious fumes lead to suit by State of Ohio. Suit names Whitten, Kovacs, and Chem-Dyne Corp. as defendants. State of Ohio seeks both penal and compensatory damages of $340,000.

Date: 11/16/76
Document No.: 00102
Key Word: Legal Action
Description: Interrogatories filed by defendents in the case of State of Ohio, ex rel. versus Chem-Dyne Corp., et al.; to be ansewered by Ohio DNR.

Date: 01/09/79
Document No.: 00066
Key Word: Legal Action
Description: U.S. EPA suit alleges that material from Chem-Dyne arrived at Indiana landfill in drums that were clearly mislabeled.

Date: 07/19/79
Document No.: 00076
Key Word: Legal Action
Description: Defendants agree to stipulation and judgment entry whereby they agree to prevent future pollution and remove all inventory within 12 months. Defendants also agree to pay $75,000 fine.

Date: 07/19/79
Document No.: 00076
Key Word: Site Data
Description: Chem-Dyne estimates that currently they have the following quantities of industrial wastes and/or other wastes stored at their facility: 850,000 gallons in liquid form and 4,000 barrels of soild or semi-solid sludge (total of 19,454 drum equivalents).

Date: 07/27/79

Document No.: 00072
Key Word: Miscellaneous
Description: Hamilton Fire Department responds to fire call at the Chem-Dyne site. A tanker on site has flames coming from its hatch. Fire is extinguished.

Date: 08/24/79
Document No.: 00057
Key Word: Miscellaneous
Description: Fire breaks out among approximately 100 barrels. Entire Hamilton Fire Department responds. Firefighting efforts hampered by piles of drums which prevented easy access to fire. Drums of chemicals explode releasing large quantities of noxious fumes. Five firefighters taken to hospital after being overcome by fumes. Arson is suspected by local fire officials.

Date: 08/31/79
Document No.: 00072
Key Word: Miscellaneous
Description: Fire departments responds to call that a tank truck from Chem-Dyne site was spilling material onto the city streets. Evidence indicated material was a solvent and flammable.

Date: 09/14/79
Document No.: 00072
Key Word: Miscellaneous
Description: Fire department responds to a call about smoke at the Chem-Dyne site. Fireman told rainwater had reacted with some chemicals stored at the site.

Date: 09/25/79
Document No.: 00022
Key Word: Miscellaneous
Description: Bryson (U.S. EPA) and Northrug, Ohio Assistant D.A., discuss possible legal action to force better tracking of wastes being removed from Chem-Dyne site.

Date: 10/04/79
Document No.: 00168
Key Word: Miscellaneous
Description: Kovacs reports vandalism at Chem-Dyne site. Claims that disgruntled workers of Win Enterprises, company

subcontracted by C-D to assist in court ordered cleanup, punctured drums and spilled contents onto ground as well as broke windows and damaged office equipment. Win employees claim Kovacs ordered them to dump chemicals on ground, mix them with sand and haul them to city landfill.

Date: 11/05/79
Document No.: 00081
Key Word: Sampling/Testing
Description: Study finds solid landfill contents at Hamilton to be nonhazardous.

Date: 11/19/79
Document No.: 00066
Key Word: Site Data
Description: OEPA conducts inventory of chemical wastes stored on site. Find 30,651 drum equivalents are stored on premises. Figure is a substantial increase over quantity stored on site in July 1979 and thus in violation of earlier court order to cleanup site (Also see Doc No. 00071).

Date: 11/20/79
Document No.: 00072
Key Word: Miscellaneous
Description: Chem-Dyne discharges chemicals into hydraulic canal and/or the Great Miami River via pipes and drains.

Date: 12/19/79
Document No.: 00072
Key Word: Legal Action
Description: U.S. EPA files suit (C-1-79-703) against Chem-Dyne et al. under provisions of RCRA. Suit seeks to force Chem-Dyne to stop operations, remove wastes from site, and cleanup any soil or groundwater contamination.

Date: 12/21/79
Document No.: 00063
Key Word: Legal Action
Description: Ransohoff alleges in suit that employees of Chem-Dyne regularly use pickaxes and other crude tools to break open 55-gallon drums onsite in order to mix the drummed chemicals in open pits.

Date: 12/21/79
Document No.: 00063
Key Word: Legal Action
Description: Ransohoff alleges in suit that as a result of Chem-Dyne operations their employees have become ill on numerous occasions and been forced to leave work. Employees have experienced nausea and vomiting, irritation to their eyes and ears, sore throats, and various congestive difficulties.

Date: 12/21/79
Document No.: 00062
Key Word: Legal Action
Description: J.L. Mestemaker files motion to be dismissed as a party defendant in case in U.S. versus Chem-Dyne Corp., et al.

Date: 12/21/79
Document No.: 00063
Key Word: Legal Action
Description: Ransohoff Company files motion to intervene as plantiff in case of U.S. versus Chem-Dyne Corp., et al.

Date: 12/21/79
Document No.: 00077
Key Word: Legal Action
Description: City of Hamilton files application to intervene as a plantiff in Federal suit.

Date: 12/26/79
Document No.: 00066
Key Word: Legal Action
Description: Hearing on preliminary injunction (C-1-79-703) held on 12/26 and 12/28. Biros, U.S. EPA chemist, testifies that Chem-Dyne site constituted an imminent and substantial hazard to public health and the environment.

Date: 00/00/80
Document No.: 00079
Key Word: Legal Action
Description: Department of Justice files a memorandum as amicus curiae in Ohio's case against Chem-Dyne Corp., et al. (CV76-09-0834).

Date: 01/00/80
Document No.: 00070
Key Word: Legal Action
Description: Defendants motion for dismissal denied

(CV76-09-0834).

Date: 01/02/80
Document No.: 00064
Key Word: Legal Action
Description: Plantiffs and defendants submit nominations for experts to conduct a physical inventory of the Chem-Dyne site.

Date: 01/03/80
Document No.: 00078
Key Word: Legal Action
Description: J.L. Mestemaker files memorandum in support of motion to be dismissed as a party defendant.

Date: 01/09/80
Document No.: 00065
Key Word: Legal Action
Description: Judge appoints expert witness and experts to assist.

Date: 01/09/80
Document No.: 00066
Key Word: Legal Action
Description: U.S. Department of Justice submits brief against District Court abstention from an exercise of jurisdiction in suit (C-1-79-703).

Date: 01/10/80
Document No.: 00067
Key Word: Legal Action
Description: Ransohoff files memorandum against District Court abstention from an exercise of jurisdication.

Date: 01/10/80
Document No.: 00068
Key Word: Legal Action
Description: City of Hamilton files memorandum opposing District Court abstention from an exercise of jurisdiction.

Date: 01/21/80
Document No.: 00069
Key Word: Legal Action
Description: District Court agrees to consider plantiff's motion for a preliminary injunction (C-1-79-703).

Date: 01/22/80

Document No.: 00169
Key Word: Site Data
Description: OEPA conducts inventory of chemical wastes stored onsite. Find 27,852 drum equivalents are stored on premises. Pursuant to the removal rate required by the consent order, there should be 9,727 drum equivalents remaining on premises.

Date: 01/24/80
Document No.: 00169
Key Word: Legal Action
Description: Ohio's Attorney General asks state courts that a receiver be named to assume operations at Chem-Dyne Corp.

Date: 01/25/80
Document No.: 00028
Key Word: Community Relations
Description: The Times Reporter prints "Chemical Firm's Business Halted."

Date: 01/25/80
Document No.: 00071
Key Word: Legal Action
Description: District Court grants preliminary injunction prohibiting defendants from hauling into, receiving, or taking delivery of, any industrial wastes at its premises.

Date: 01/29/80
Document No.: 00025
Key Word: Site Data
Description: Potential Hazardous Waste Site Identification and Preliminary Assessment prepared by Marshall.

Date: 02/04/80
Document No.: 00073
Key Word: Legal Action
Description: Jack A. Zettler appointed receiver by Common Pleas Court of Butler County. Only $135 remain in company accounts. However, firm has some assets. (Also, see Doc No. 00057).

Date: 02/06/80
Document No.: 00029
Key Word: Miscellaneous
Description: Goldstein (U.S. EPA) request staff to inquire into incineration of Chem-Dyne waste by the Metropolitan Sanitary

District.

Date: 02/11/80
Document No.: 00020
Key Word: Miscellaneous
Description: Metropolitan Sanitary District incinerates selected Chem-Dyne wastes under agreement with OEPA.

Date: 02/12/80
Document No.: 00170
Key Word: Miscellaneous
Description: The Fifth Third Bank of Cincinnati files suit in Hamilton County Common Pleas Court seeking payment of $163,000 made in loans to Whitten and Kovacs.

Date: 02/13/80
Document No.: 00170
Key Word: Miscellaneous
Description: Zettler charges that Whitten sold his interest in Chem-Dyne Corp. to partner Kovacs in attempt to defraud the state in its suit against the company. Also charges that both men are trying to "insulate assets" from Ohio and from compliance with court order to cleanup.

Date: 03/05/80
Document No.: 00073
Key Word: Legal Action
Description: Department of Justice files amended complaint for injunctive relief.

Date: 03/07/80
Document No.: 00074
Key Word: Legal Action
Description: Court appointed receiver files interim reports. Reports significant progress.

Date: 04/28/80
Document No.: 00082
Key Word: Sampling/Testing
Description: Ohio EPA results from five waste tanks establishes high concentrations of pesticides, PCB's and other toxic compounds.

Date: 05/01/80
Document No.: 00021
Key Word: Site Data
Description: U.S. EPA site visit finds considerable progress in cleanup effort has been made

by the court appointed receiver, Jack Zettler.

Date: 05/01/80
Document No.: 00021
Key Word: Site Data
Description: Incineration of flammable wastes, by MSD near completion. About 3000 barrels of waste still awaiting incineration by MSD.

Date: 05/01/80
Document No.: 00021
Key Word: Site Data
Description: U.S. EPA review of Chem-Dyne invoices indicate that large volumes of acid, arsenic, cyanide, pesticide, and PCB wastes were received onsite. Some indications that part of the waste was handled through "proper channels". However, large volumes of wastes were unaccounted for.

Date: 05/13/80
Document No.: 00083
Key Word: Sampling/Testing
Description: Ohio EPA tank analysis reports high chloride concentration.

Date: 05/15/80
Document No.: 00084
Key Word: Sampling/Testing
Description: Ohio EPA receives results of tank and drum analyses.

Date: 05/16/80
Document No.: 00085
Key Word: Sampling/Testing
Description: Ohio EPA receives tank analysis results.

Date: 06/23/80
Document No.: 00086
Key Word: Sampling/Testing
Description: Tank analyzed for BTU value.

Date: 07/00/80
Document No.: 00153
Key Word: Site Data
Description: Truck and rail dock liquid samples analyzed through OEPA. Aldrin, alpha-endosulfan, heptachlor, beta-BHC, gamma-BHC, and PCB-1260 found as contaminants.

Date: 07/00/80
Document No.: 00153
Key Word: Site Data
Description: Truck and dock sludge samples analyzed through OEPA. Aldrin, Dieldrin, alpha-endosulfan, endrin, heptachlor, and PCB-1260 found as contaminants.

Date: 12/12/80
Document No.: 00142
Key Word: Miscellaneous
Description: Chem-Dyne office is vandalized. The guard on duty is suspected vandal and was fired when he refused to take a lie detector test.

Date: 01/00/81
Document No.: 00121
Key Word: Site Data
Description: Half of site cleanup completed.

Date: 01/12/81
Document No.: 00137
Key Word: FIT/TAT/REM Activities
Description: Steve White (Ohio EPA) appointed site coordinator for Chem-Dyne cleanup effort.

Date: 01/29/81
Document No.: 00141
Key Word: Legal
Description: Zettler files Seventh Interim Report of Receiver. Reports approximately half the drums present when receivership occurred have been removed. About 8,000 drums are unidentifiable as to origin and contents and will probably remain so. Receivership is experiencing cash flow problems and will most likely be unable to complete cleanup without additional funding. Kovacs is trying to discharge any financial obligation or responsibility to cleanup C-D site by filing for bankruptcy.

Date: 03/05/81
Document No.: 00173
Key Word: Community Relations
Description: The Cincinnati Enquirer prints, "Hamilton Water Found Safe." OEPA sampling of Hamilton's southern well-field detects no contamination from

Chem-Dyne site.

Date: 03/27/81
Document No.: 00030
Key Word: FIT/TAT/REM Activities
Description: E & E submits "Interim Report of Projected Cleanup Costs for the Chem-Dyne site in Hamilton." Total cleanup costs estimated at $20 million.

Date: 04/22/81
Document No.: 00145
Key Word: Miscellaneous
Description: T. Winston (OEPA) alleges that Zettler may be gouging the receivership and running an inefficient operation.

Date: 06/00/81
Document No.: 00126
Key Word: Site Data
Description: Extensive sampling is conducted by OEPA at site. Approximately 40 GC-MS samples were taken of several tanks, 200 plus drums and local soils. The sampling identified some additional drums and evidenced gross soil contamination in approximately the top meter of soil in various locations.

Date: 07/29/81
Document No.: 00146
Key Word: Miscellaneous
Description: O.H. Materials samples sludge from railroad and truck docks. Numerous organic contaminants found in samples.

Date: 09/22/81
Document No.: 00031
Key Word: FIT/TAT/REM Activites
Description: E & E FIT Team completes scoring for hazardous waste site ranking model.

Date: 11/00/81
Document No.: 00057
Key Word: Miscellaneous
Description: Receivership has exhausted all money and assets. About 20,000 drums have been removed from site, mostly by pursuading generators to remove waste. About 11,500 drums and 200,000 gallons of bulk wastes remain (Also see Doc No. 00127).

Date: 11/30/81

Document No.: 00150
Key Word: Community Relations
Description: Cincinatti Post prints, "Chem-Dyne Site 'Poses Danger.'"

Date: 12/00/81
Document No.: 00127
Key Word: Miscellaneous
Description: OEPA nominates Chem-Dyne site as Ohio's number one priority site.

Date: 01/11/82
Document No.: 00152
Key Word: Miscellaneous
Description: Governor Rhodes requests that Ohio's request for a Superfund grant to clean up C-D site be given early consideration by U.S. EPA.

Date: 02/11/82
Document No.: 00088
Key Word: Sampling/Testing
Description: U.S. EPA performs QC study on Chem-Dyne case.

Date: 02/26/82
Document No.: 00154
Key Word: Site Data
Description: Final draft of POLREP 1 sent to U.S. EPA. Requested funding for fence repairs and for removal and disposal of contaminated water and sludge in the truck and rail docks.

Date: 03/08/82
Document No.: 00154
Key Word: Miscellaneous
Description: Approval of expenditure of $200,000 for fence repair and cleanup of loading docks approved.

Date: 03/16/82
Document No.: 00154
Key Word: Miscellaneous
Description: Leak develops in Tank 6. About 50 gallons leaked from tank before being sealed.

Date: 03/19/82
Document No.: 00159
Key Word: FIT/TAT/REM Activities
Description: J. Pennino, OEPA geologist, questions validity of E&E groundwater data.

Suggested recommendations are based on insufficient and contradictory data. Also criticizes well installation and sample collection and preparation.

Date: 04/22/82
Document No.: 00035
Key Word: FIT/TAT/REM Activities
Description: W.N. Hedeman, Jr. (U.S. EPA) requests authorization from C.J. Capper (U.S. EPA) to clean up surface drums and bulk tanks and to investigate subsurface remedial action.

Date: 05/20/82
Document No.: 00026
Key Word: Site Data
Description: Data sheets for hazardous waste spills issued to Velsicol Chemicals and Georgia Pacific.

Date: 07/21/82
Document No.: 00038
Key Word: Site Data
Description: Site Response Management System report for June 1982 submitted.

Date: 07/23/82
Document No.: 00037
Key Word: FIT/TAT/REM Activities
Description: G. Lucero (U.S. EPA) gives Hedman (U.S. EPA) approval for expenditure of Superfund money for surface cleanup and subsurface investigation.

Date: 07/27/82
Document No.: 00044
Key Word: Legal Action
Description: Journal News prints, "Talks Stall Chem-Dyne Cleanup."

Date: 07/27/82
Document No.: 00045
Key Word: FIT/TAT/REM Activites
Description: Weston submits cost estimates for bulk waste removal.

Date: 07/31/82
Document No.: 00039
Key Word: Site Data
Description: Air monitoring tests performed by Roy F. Weston, Inc., find detectable levels of organic solvents in air.

Date: 07/31/82
Document No.: 00166
Key Word: FIT/TAT/REM Activities
Description: Temporary moratorium on voluntary removal of drummed waste initiated to allow Weston undisturbed access to site while they prepare the remedial action plan for surface cleanup.

Date: 08/18/82
Document No.: 00040
Key Word: FIT/TAT/REM Activities
Description: Weston issues rough draft of report which identifies and evaluates alternatives for the removal of bulk wastes. Weston recommends offsite disposal of wastes.

Date: 08/26/82
Document No.: 00041
Key Word: Legal Action
Description: Administrator Gorsuch announces agreement between EPA and companies for surface cleanup of waste site. Generators agree to pay 2.4 million dollars in cleanup costs. Agreement allows government to demand additional payments if unexpected costs arise. Department of Justice simultaneously files suit to recover additional costs from owners, operators, and major generators who refused to participate.

Date: 08/27/82
Document No.: 00042
Key Word: Legal Action
Description: Chicago Tribune prints, "U.S. Sues 25 to Force Ohio Waste Cleanup".

Date: 09/03/82
Document No.: 00046
Key Word: FIT/TAT/REM Activities
Description: Draft report of plans and specifications for bulk waste removal and tankage demolition submitted to U.S. EPA by Weston.

Date: 09/08/82
Document No.: 00048
Key Word: FIT/TAT/REM Activities
Description: In letter to D. Bruce (U.S. EPA), Hannahs (Ohio EPA) expresses concern

over Weston feasibility study recommendations to demolish and dispose of empty tanks and construction of a staging and holding area. Hannahs advises that approval must be obtained from the property owners.

Date: 09/10/82
Document No.: 00047
Key Word: FIT/TAT/REM Activities
Description: Preliminary draft of feasibility study for drum waste removal submitted by Weston.

Date: 09/14/82
Document No.: 00050
Key Word: FIT/TAT/REM Actitives
Description: Corps of Engineers submit comments on Weston report (Doc. No. 00046).

Date: 09/17/82
Document No.: 00051
Key Word: FIT/TAT/REM Activities
Description: J.W. Thorsen (Weston) comments on rough draft of Weston report (Doc. No. 00046) in letter to Willis (U.S. EPA).

Date: 09/22/82
Document No.: 00052
Key Word: FIT/TAT/REM Activities
Description: Weston work plan and cost estimate for a field investigation (Phase B) of the contaminated soils and groundwater is submitted to the U.S EPA.

Date: 09/30/82
Document No.: 00052
Key Word: Site Data
Description: Site Response Management System report for August 1982 submitted.

Date: 10/01/82
Document No.: 00054
Key Word: FIT/TAT/REM Activities
Description: Weston submits revised work plan and cost estimates for Phase B.

Date: 10/11/82
Document No.: 00123
Key Word: FIT/TAT/REM Activities
Description: H.B. Eagon, Jr., and S.E. Norris (N.B. Eagon, Jr., Consulting Geologist) express concern over short time

schedule, unexploited sources of information, drilling technique, and objective of study in Weston Phase B work plan.

Date: 10/18/82
Document No.: 00056
Key Word: FIT/TAT/REM Activities
Description: Weston submits revised work plan to include additional shallow and deep monitoring wells and abandonment of other wells.

Date: 11/03/82
Document No.: 00057
Key Word: Community Relations
Description: The Washington Post prints "Hamilton, Ohio, Struggles with Toxic Waste Cleanup."

Date: 12/03/82
Document No.: 00184
Key Word: FIT/TAT/REM Activities
Description: U.S. Army Corps of Engineers issues the Invitation to Bid on the drum, bulk and other waste removal at Chem-Dyne as an IRM under the reference number DACW45-83-B-0002.

Date: 12/15/82
Document No.: 00124
Key Word: Community Relations
Description: The Cincinnati Enquirer prints, "Cleanup Readied for Remaining Chem-Dyne Waste."

Date: 01/18/83
Document No.: 00134
Key Word: FIT/TAT/REM Activities
Description: U.S. Corps of Engineers opens bids for drum, bulk, and other waste removal.

Date: 02/18/83
Document No.: 00060
Key Word: Community Relations
Description: J.A. Gillens of the Hamilton Appalachian People's Service Organization (HAPSO) requests results from the hydrologic study in a letter to B. Hartlan (U.S. EPA).

Date: 02/23/83
Document No.: 00061
Key Word: Community Relations

Description:	J.H. Gillens of HAPSO requests that B. Hartlan (U.S. EPA) do all within his power to expedite cleanup at Chem-Dyne.
Date:	06/23/83
Document No.:	00036
Key Word:	Site Data
Description:	Site Response Management System (SRMS) report for May 1982 submitted.

APPENDIX B

Chem-Dyne Site

Groundwater Monitoring Wells MW-1 through MW-22

Overall Data Summaries

GLT/414/8-3

Table B-1
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELLS MW-1
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Weston Sampling Date 12/82	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate					12		15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate					4K		34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

Table B-1 (Page 2 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Weston Sampling Date 12/82	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			310K					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene								27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

GLT432/46-2

Table B-1 (Page 3 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Weston Sampling Date 12/82	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			28,000					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

GLT432/46-3

Table B-2
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-2
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate				1K			15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Table B-2 (Page 2 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			240					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene								27
vinyl chloride								20
chloromethane				6K				
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Table B-2 (Page 3 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone		420	4,000					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

GLT432/47-3

Table B-3
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-3
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate							15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

Table B-3 (Page 2 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			1,200K					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene	5K							8.0
toluene							14,300	
trichloroethene								27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

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Table B-3 (Page 3 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone		1,600	77,000					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-4
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-4
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 7/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Weston Sampling Date 12/82	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l											
2,3-dimethylphenol		NA				NA	NA	NA			
2-nitrophenol		NA				NA	NA	NA		NCA	
2,4-dinitrophenol		111				NA	NA	NA		70	
phenol		NA				NA	NA	NA		3,500	
Base/Neutral Compounds, ug/l											
bis(2-chloroethyl)ether		NA				NA	NA	NA			0.30
1,2-dichlorobenzene		NA				NA	NA	NA		400	
1-3-dichlorobenzene		NA				NA	NA	NA		400	
1,4-dichlorobenzene		NA				NA	NA	NA		400	
isophorone		NA				NA	NA	NA		5,200	
naphthalene						NA	NA	NA		NCA	0.028
bis(2-ethylhexyl)phthalate		10K			6K	NA	NA	NA	2K	15,000	
benzyl butyl phthalate						NA	NA	NA		NCA	
di-n-butyl phthalate						NA	NA	NA		34,000	
di-n-octyl phthalate						NA	NA	NA		NCA	
Volatiles, ug/l											
benzene	5k										6.6
carbon tetrachloride		10K				15K				488	
chlorobenzene		NA						8K			9.4
1,2-dichloroethane	140	118			150					18,400	
1,1,1-trichloroethane						320	390	180		NCA	
1,1-dichloroethane											6.0
1,1,2-trichloroethane											1.7
1,1,2,2-tetrachloroethane											
chloroethane	690	1,220			1,400	1,700	2,300	980	2,300	NCA	

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Table B-4 (Page 2 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 7/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)											
chloroform											1.9
1,1-dichloroethene		10K	89								0.33
trans-1,2-dichloroethene	890	416		800	160	1,900	930	900	860	NCA	
1,2-dichloropropane		NA								NCA	
ethylbenzene										1,400	
methylene chloride		92.2			78K	120	140	54	85		1.9
bromodichloromethane		NA									1.9
fluorotrichloromethane		NA									1.9
chlorodibromomethane		NA								NCA	
tetrachloroethene											8.0
toluene	5									14,300	
trichloroethene	75	65.4			35K	130	60	46	70		27
vinyl chloride	10										20
Pesticides, ug/l											
dieldrin						NA	NA	NA			0.00071
4,4'-DDT		5K				NA	NA	NA			0.00024
4,4'-DDE						NA	NA	NA		NCA	
4,4'-DDD						NA	NA	NA		NCA	
a-endosulfan		NA				NA	NA	NA		74	
b-endosulfan						NA	NA	NA		74	
endrin		NA				NA	NA	NA		1.0	
a-BHC		5K				NA	NA	NA			0.092
b-BHC	0.10					NA	NA	NA			0.163
d-BHC						NA	NA	NA		NCA	
g-BHC (lindane)		NA				NA	NA	NA			0.186
r-BHC						NA	NA	NA			

Table B-4 (Page 3 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 7/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Weston Sampling Date 12/82	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l											
benzoic acid	100K	NA									
2-methylphenol		NA									
4-methylphenol		NA									
acetone	50	NA			250K						
2-butanone		NA									
carbon disulfide		NA									
4-methyl-2-pentanone		NA									
o-xylene		NA									
Dioxins											
2,3,7,8-tetrachlorodibenzo-p-		NA			dioxin						

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-5
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-5
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol		NA						
2-nitrophenol		NA					NCA	
2,4-dinitrophenol							70	
phenol		NA					3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether		NA						0.30
1,2-dichlorobenzene		NA					400	
1-3-dichlorobenzene		NA					400	
1,4-dichlorobenzene		NA					400	
isophorone		NA					5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate	170			300			15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene	39		230	58				6.6
carbon tetrachloride	25	22.7						
chlorobenzene		NA	19				488	
1,2-dichloroethane	28	10K	59	31				9.4
1,1,1-trichloroethane	90	36.9	130	54			18,400	
1,1-dichloroethane	32	10K	150	28			NCA	
1,1,2-trichloroethane	45	57.6	40	65				6.0
1,1,2,2-tetrachloroethane	62	117	26	50				1.7
chloroethane							NCA	

Table B-5 (Page 2 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform	180	38.2	430	18				1.9
1,1-dichloroethene	37	10K	62	14				0.33
trans-1,2-dichloroethene	100	25.7	250	250			NCA	
1,2-dichloropropane		NA					NCA	
ethylbenzene							1,400	
methylene chloride		22.7	18	7K				1.9
bromodichloromethane		NA						1.9
fluorotrichloromethane		NA						1.9
chlorodibromomethane		NA					NCA	
tetrachloroethene	60		100	15				8.0
toluene	8		12				14,300	
trichloroethene	92		130	40				27
vinyl chloride		31.7	20	47				20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan		NA					74	
b-endosulfan							74	
endrin		NA					1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC		5K					NCA	
g-BHC (lindane)		NA						0.186
r-BHC								

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Table B-5 (Page 3 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid		NA						
2-methylphenol		NA						
4-methylphenol		NA						
acetone	130	NA	17,000	48K				
2-butanone		NA	1,500	44K				
carbon disulfide		NA						
4-methyl-2-pentanone		NA						
o-xylene		NA						
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin		NA						

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

Table B-6
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-6
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 2/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 7/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l									
2,3-dimethylphenol		NA							
2-nitrophenol		NA						NCA	
2,4-dinitrophenol								70	
phenol		NA	< 1					3,500	
Base/Neutral Compounds, ug/l									
bis(2-chloroethyl)ether		NA							0.30
1,2-dichlorobenzene		NA						400	
1-3-dichlorobenzene		NA						400	
1,4-dichlorobenzene		NA						400	
isophorone		NA						5,200	
naphthalene			< 1					NCA	0.028
bis(2-ethylhexyl)phthalate	290	10K	< 1			270		15,000	
benzyl butyl phthalate			< 1					NCA	
di-n-butyl phthalate			< 1					34,000	
di-n-octyl phthalate			< 1		24				NCA
anthracene			< 1						
phenanthrene			< 1						
pyrene			< 1						
Volatiles, ug/l									
benzene	55		< 1			160			6.6
carbon tetrachloride	5,100	1,600	1,700	1,900	2,800	2,600	2,600		
chlorobenzene		NA						488	
1,2-dichloroethane	165	37.9			260	690			9.4
1,1,1-trichloroethane	120				120	270	120	18,400	
1,1-dichloroethane		10K	< 1					NCA	
1,1,2-trichloroethane					240	510	240		6.0

Table B-6 (Page 2 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 2/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 7/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatile, ug/l (continued)									
1,1,2,2-tetrachloroethane						130			1.7
chloroethane								NCA	
chloroform	15,000	23,300	1,000	12,600	13,000	22,000	13,000		1.9
1,1-dichloroethene		10K							0.33
trans-1,2-dichloroethene					180	360	180	NCA	
1,2-dichloropropane		NA						NCA	
ethylbenzene		25.3						1,400	
methylene chloride		2,540	< 1		1,200	440	1,400		1.9
bromodichloromethane	55	NA							1.9
fluorotrichloromethane		NA							1.9
chlorodibromomethane		NA	< 1			61K		NCA	
tetrachloroethene		10K							8.0
toluene								14,300	
trichloroethene									27
vinyl chloride						49K			20
Pesticides, ug/l									
dieldrin									0.00071
4,4'-DDT									0.00024
4,4'-DDE		5K						NCA	
4,4'-DDD								NCA	
a-endosulfan		NA						74	
b-endosulfan								74	
endrin		NA						1.0	
a-BHC									0.092
b-BHC		5K							0.163
d-BHC		5K						NCA	
g-BHC (lindane)		NA							0.186
r-BHC									

Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 2/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 7/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l									
benzoic acid		NA							
2-methylphenol		NA							
4-methylphenol		NA					16K		
acetone	650	NA					8,800		
2-butanone		NA							
carbon disulfide		NA							
4-methyl-2-pentanone		NA					79K		
o-xylene		NA							
Dioxins									
2,3,7,8-tetrachlorodibenzo-p-dioxin		NA							

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 1/81	OEPA Sampling Date 4/81	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)									
chloroform	5,000	8,140	3,275	4,700		7,000	6,800		1.9
1,1-dichloroethene	17								0.33
trans-1,2-dichloroethene								NCA	
1,2-dichloropropane								NCA	
ethylbenzene		93.3						1,400	
methylene chloride	300	16,200							1.9
bromodichloromethane		NA							1.9
fluorotrichloromethane		NA							1.9
chlorodibromomethane		NA						NCA	
tetrachloroethene									8.0
toluene	20							14,300	
trichloroethene									27
vinyl chloride									20
Pesticides, ug/l									
dieldrin	5K								0.00071
4,4'-DDT	5K								0.00024
4,4'-DDE								NCA	
4,4'-DDD								NCA	
a-endosulfan		NA						74	
b-endosulfan	5K							74	
endrin		NA						1.0	
a-BHC									0.092
b-BHC	5K								0.163
d-BHC	5K							NCA	
g-BHC (lindane)		NA						0.9*	0.186
r-BHC									

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Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 1/81	OEPA Sampling Date 4/81	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] CH2M Sampling Date 10/83	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l									
benzoic acid		NA							
2-methylphenol		NA							
4-methylphenol		NA							
acetone	27,000	NA					29,000		
2-butanone	4,500	NA					1,100K		
carbon disulfide	200	NA							
4-methyl-2-pentanone	200	NA							
o-xylene		NA							
Dioxins									
2,3,7,8-tetrachlorodibenzo-p-dioxin		NA							

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-8

ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-8

CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Weston Sampling Date (Pumped) 12/82	Weston Sampling Date (Pumped) 12/82	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Weston Sampling Date (Bailed) 12/82	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l						NA	NA		
						NA	NA		
2,3-dimethylphenol						NA	NA		
2-nitrophenol						NA	NA	NCA	
2,4-dinitrophenol						NA	NA	70	
phenol						NA	NA	3,500	
Base/Neutral Compounds, ug/l									
bis(2-chloroethyl)ether						NA	NA		0.30
1,2-dichlorobenzene						NA	NA	400	
1-3-dichlorobenzene						NA	NA	400	
1,4-dichlorobenzene						NA	NA	400	
isophorone						NA	NA	5,200	
naphthalene						NA	NA	NCA	0.028
bis(2-ethylhexyl)phthalate			3K	2K	4K	NA	NA	15,000	
benzyl butyl phthalate						NA	NA	NCA	
di-n-butyl phthalate						NA	NA	34,000	
di-n-octyl phthalate						NA	NA	NCA	
Volatiles, ug/l									
benzene									6.6
carbon tetrachloride									
chlorobenzene								488	
1,2-dichloroethane									9.4
1,1,1-trichloroethane								18,400	
1,1-dichloroethane								NCA	
1,1,2-trichloroethane									6.0
1,1,2,2-tetrachloroethane									1.7
chloroethane								NCA	

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Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date (Pumped) 12/82	Sampling Date (Pumped) 12/82	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date (Bailed) 12/82	Toxicity Protection	genicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)									
chloroform									1.9
1,1-dichloroethene									0.33
trans-1,2-dichloroethene						2K		NCA	
1,2-dichloropropane								NCA	
ethylbenzene								1,400	
methylene chloride			340	9K	15	7K			1.9
bromodichloromethane									1.9
fluorotrichloromethane									1.9
chlorodibromomethane								NCA	
tetrachloroethene									8.0
toluene								14,300	
trichloroethene					11	11			27
vinyl chloride									20
Pesticides, ug/l									
dieldrin						NA	NA		0.00071
4,4'-DDT						NA	NA		0.00024
4,4'-DDE						NA	NA	NCA	
4,4'-DDD						NA	NA	NCA	
a-endosulfan						NA	NA	74	
b-endosulfan						NA	NA	74	
endrin						NA	NA	1.0	
a-BHC						NA	NA		0.092
b-BHC						NA	NA		0.163
d-BHC						NA	NA	NCA	
g-BHC (lindane)						NA	NA		0.186
r-BHC									

Table B-9
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-9
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 2/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol		NA						
2-nitrophenol		NA					NCA	
2,4-dinitrophenol							70	
phenol		NA					3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether		NA						0.30
1,2-dichlorobenzene		NA					400	
1-3-dichlorobenzene		NA					400	
1,4-dichlorobenzene		NA					400	
isophorone		NA					5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate	260			150	55		15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate		10K					NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride	1,200	254	150	1,200	580			
chlorobenzene		NA					488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 2/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform	440	210	150	920	380			1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane		NA					NCA	
ethylbenzene							1,400	
methylene chloride		37.3			55K			1.9
bromodichloromethane		NA						1.9
fluorotrichloromethane		NA						1.9
chlorodibromomethane		NA					NCA	
tetrachloroethene								8.0
toluene		10					14,300	
trichloroethene								27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan		NA					74	
b-endosulfan							74	
endrin		NA					1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC		5K					NCA	
g-BHC (lindane)		NA						0.186
r-BHC								

Table B-9 (3 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	E&E Sampling Date 2/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid		NA						
2-methylphenol		NA						
4-methylphenol		NA						
acetone		NA			120K			
2-butanone		NA						
carbon disulfide		NA						
4-methyl-2-pentanone		NA						
o-xylene		NA						
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin		NA						

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

Table B-10
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-10
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	Weston Sampling Date 12/82	E&E Sampling Date 2/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] CH2M Sampling Date 10/83	CH2M Sampling Date 10/83	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l														
2,3-dimethylphenol			NA	NA										
2-nitrophenol			NA	NA						80			NCA	
2,4-dinitrophenol				NA									70	
phenol	320	260	NA	NA	440	650	1,000		36		58	53	3,500	
Base/Neutral Compounds, ug/l														
bis(2-chloroethyl)ether				NA	40K	60K	130							0.30
1,2-dichlorobenzene	110	100	NA	NA			< 1						400	
1-3-dichlorobenzene	10K	10K	NA	NA									400	
1,4-dichlorobenzene	11	11	NA	NA									400	
isophorone	10K	10K	NA	NA							4K		5,200	
naphthalene	10K		NA	NA			< 1						NCA	0.028
bis(2-ethylhexyl)phthalate	10K			NA			< 1				6K	7K	15,000	
benzyl butyl phthalate				NA									NCA	
di-n-butyl phthalate	10K			NA									34,000	
di-n-octyl phthalate				NA									NCA	
Volatiles, ug/l														
benzene	340	460	359	460	660	700	1,300					550K		6.6
carbon tetrachloride	230	480	70	410	760	760	1,100							
chlorobenzene	100K	110	NA	110	160K	160							488	
1,2-dichloroethane	2,400	3,500	20,900	3,400	15,000	16,000	5,300				3,700	3,900		9.4
1,1,1-trichloroethane	3,400	5,800	3,030	5,700	2,600	2,700	4,000	2,700	3,700		2,800	3,100	18,400	
1,1-dichloroethane	240	330	510	340	480	520	350						NCA	
1,1,2-trichloroethane	6,400	7,200	960	7,500	1,100	1,300	900		4,400		4,400			6.0
1,1,2,2-tetrachloroethane	5,100	5,300	2,340	5,800	640	680	17,000	500	2,600		1,000K	1,000K		1.7
chloroethane													NCA	

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Table B-10 (Page 2 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	Weston Sampling Date 12/82	E&E Sampling Date 2/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] CH2M Sampling Date 10/83	CH2M Sampling Date 10/83	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)														
chloroform	1,500	2,200	3,760	2,200	3,300	3,200	4,000	1,900	13,000	11,000	8,200	8,800		1.9
1,1-dichloroethene	1,000	1,800	99.6	1,800	620	660	200	26,900						0.33
trans-1,2-dichloroethene	33,000	32,000	67,000	32,000	21,000	31,000	14,000		7,500	9,000	38,000	40,000	NCA	
1,2-dichloropropane		40	NA	100K	60K	60K							NCA	
ethylbenzene	520	860	207	920	1,100	1,100	280						1,400	
methylene chloride		280	5,690	260	1,000	1,000	1,000		4,700		3,000	3,100		1.9
bromodichloromethane			NA											1.9
fluorotrichloromethane			NA	10K										1.9
chlorodibromomethane			NA										NCA	
tetrachloroethene	2,300	2,900	5,520	2,900	940	980	80		3,900	5,400	3,500	3,900		8.0
toluene	4,200	4,800	1,970	5,000	6,100	4,600	1,800	900			7,200	7,800	14,300	
trichloroethene	10,000	9,500		9,600	8,400	6,700	4,500	3,100	4,300	5,200	54,000	58,000		27
vinyl chloride		350	3,160	120							2,000K	2,000K		20
Pesticides, ug/l														
dieldrin				NA										0.00071
4,4'-DDT				NA										0.00024
4,4'-DDE				NA									NCA	
4,4'-DDD				NA									NCA	
a-endosulfan			NA	NA									74	
b-endosulfan				NA									74	
endrin			NA	NA									1.0	
a-BHC			10K	NA										0.092
b-BHC			10K	NA										0.163
d-BHC			10K	NA									NCA	
g-BHC (lindane)			NA	NA										0.186
r-BHC				NA										

Table B-10 (Page 3 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	Weston Sampling Date 12/82	E&E Sampling Date 2/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] CH2M Sampling Date 10/83	CH2M Sampling Date 10/83	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l														
benzoic acid	190	190								320	380	370		
2-methylphenol	11	11												
4-methylphenol	50	50	NA	NA										
acetone		200	NA	300					50,000		11,000K	9,700K		
2-butanone		550	NA	930										
carbon disulfide			NA											
4-methyl-2-pentanone	240	340	NA	390										
o-xylene	640	990	NA	1,100										
Dioxins														
2,3,7,8-tetrachlorodibenzo-p-dioxin			NA	NA										

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-11
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-11
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	Weston Sampling Date 12/82	E&E Sampling Date 1/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol		NA						
2-nitrophenol		NA					NCA	
2,4-dinitrophenol							70	
phenol		NA					3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether		NA						0.30
1,2-dichlorobenzene		NA					400	
1-3-dichlorobenzene		NA					400	
1,4-dichlorobenzene		NA					400	
isophorone		NA					5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate		10K	2K				15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene		NA					488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane		16.7					NCA	

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Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	Weston Sampling Date 12/82	E&E Sampling Date 1/81	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene				2.3			NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride				< 1		7K		1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene				< 1			14,300	
trichloroethene			4K	4.0				27
vinyl chloride				17				20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan		NA					74	
b-endosulfan							74	
endrin		NA					1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)		5K						0.186
r-BHC		NA						

Table B-11 (Page 3 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	E&E Sampling Date 4/81	Weston Sampling Date 12/82	E&E Sampling Date 1/81	CH2M Sampling Date 7/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] CH2M Sampling Date 10/83	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid		NA						
2-methylphenol		NA						
4-methylphenol		NA						
acetone	30	NA			300	280		
2-butanone		NA						
carbon disulfide		NA						
4-methyl-2-pentanone		NA						
o-xylene		NA						
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin		NA						

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

Table B-12
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-12
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83*	CH2M Sampling Date 4/83	Weston Sampling Date (Pumped) 12/82	Weston Sampling Date (Pumped) 12/82	Weston Sampling Date 12/82	Weston Sampling Date (Bailed) 12/82	Weston Sampling Date (Bailed) 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l												
2,3-dimethylphenol			NA	NA	NA		NA	NA				
2-nitrophenol			NA	NA	NA		NA	NA			NCA	
2,4-dinitrophenol			NA	NA	NA		NA	NA			70	
phenol			NA	NA	NA		NA	NA			3,500	
Base/Neutral Compounds, ug/l												
bis(2-chloroethyl)ether			NA	NA	NA		NA	NA				0.30
1,2-dichlorobenzene			NA	NA	NA		NA	NA			400	
1-3-dichlorobenzene			NA	NA	NA		NA	NA			400	
1,4-dichlorobenzene			NA	NA	NA		NA	NA			400	
isophorone			NA	NA	NA		NA	NA			5,200	
naphthalene			NA	NA	NA		NA	NA			NCA	0.028
bis(2-ethylhexyl)phthalate			NA	NA	NA		NA	NA			15,000	
benzyl butyl phthalate			NA	NA	NA	3K	NA	NA			NCA	
di-n-butyl phthalate			NA	NA	NA		NA	NA			34,000	
di-n-octyl phthalate			NA	NA	NA	1K	NA	NA			NCA	
Volatiles, ug/l												
benzene												6.6
carbon tetrachloride												
chlorobenzene											488	
1,2-dichloroethane												9.4
1,1,1-trichloroethane											18,400	
1,1-dichloroethane											NCA	
1,1,2-trichloroethane		19	5									6.0
1,1,2,2-tetrachloroethane		10K	10K	25	40							1.7
chloroethane											NCA	

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Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83*	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)												
chloroform												1.9
1,1-dichloroethene	5K	5K										0.33
trans-1,2-dichloroethene	51	50	7	35	30				8.1		NCA	
1,2-dichloropropane											NCA	
ethylbenzene											1,400	
methylene chloride							160	80		61K		1.9
bromodichloromethane												1.9
fluorotrichloromethane												1.9
chlorodibromomethane											NCA	
tetrachloroethene	9	10	5K	10					5.7			8.0
toluene	12	18	7								14,300	
trichloroethene	44	43	10	70	30		55	25K	8.6			27
vinyl chloride	10K	10K							41			20
Pesticides, ug/l												
dieldrin			NA									0.00071
4,4'-DDT			NA									0.00024
4,4'-DDE			NA								NCA	
4,4'-DDD			NA								NCA	
a-endosulfan			NA								74	
b-endosulfan	0.08		NA								74	
endrin											1.0	
a-BHC			NA									0.092
b-BHC			NA									0.163
d-BHC			NA								NCA	
g-BHC (lindane)			NA									0.186
r-BHC			NA									

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Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83*	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l												
benzoic acid			NA									
2-methylphenol			NA									
4-methylphenol			NA									
acetone		92							700	3,200		
2-butanone												
carbon disulfide												
4-methyl-2-pentanone												
o-xylene												
Dioxins												
2,3,7,8-tetrachlorodibenzo-p-dioxin			NA									

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-13
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-13
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83*	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	Weston Sampling Date (Pumped) 12/82	Weston Sampling Date (Pumped) 12/82	Weston Sampling Date (Bailed) 12/82	Weston Sampling Date (Bailed) 12/82	E&E Sampling Date 1/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] CH2M Sampling Date 10/83	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l																
2,3-dimethylphenol	NA			NA		NA	NA	NA	NA							
2-nitrophenol	NA			NA		NA	NA	NA	NA						NCA	
2,4-dinitrophenol				NA		NA	NA	NA	NA						70	
phenol	NA			NA		NA	NA	NA	NA						3,500	
Base/Neutral Compounds, ug/l																
bis(2-chloroethyl)ether	NA			NA		NA	NA	NA	NA							0.30
1,2-dichlorobenzene	NA			NA		NA	NA	NA	NA						400	
1-3-dichlorobenzene	NA			NA		NA	NA	NA	NA						400	
1,4-dichlorobenzene	NA			NA		NA	NA	NA	NA						400	
isophorone	NA			NA		NA	NA	NA	NA						5,200	
naphthalene				NA		NA	NA	NA	NA						NCA	0.028
bis(2-ethylhexyl)phthal	10K			NA	ate	NA	NA	NA	NA						15,000	
benzyl butyl phthalate				NA		NA	NA	NA	NA			4K			NCA	
di-n-butyl phthalate				NA	1K	NA	NA	NA	NA						34,000	
di-n-octyl phthalate				NA		NA	NA	NA	NA						NCA	
Volatiles, ug/l																
benzene																6.6
carbon tetrachloride	14			5K												
chlorobenzene	NA														488	
1,2-dichloroethane	131	3	5		30K	23	29	33	28	609				260		9.4
1,1,1-trichloroethane	68.8	12	13	13	70	61	67	71	61					300	18,400	
1,1-dichloroethane	10K						4K								NCA	
1,1,2-trichloroethane	2,250	100	110	92		236	426	532	393	3,929		23	22	3,500		6.0
1,1,2,2-tetrachloroethane	325	293	273	110	120	97	171	229					900	18	18	870
chloroethane															NCA	

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Compound[a,b]	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83*	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	E&E Sampling Date 1/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] CH2M Sampling Date 10/83	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)																
chloroform	98.6	5	6	6	45K	43	49	55	48					380		1.9
1,1-dichloroethene	78.4	10	12	9	25K	26	55	64	34	2,117				170K		0.33
trans-1,2-dichloroethene	373	67	73	65	420	227	379	444	347			19	18	4,000	NCA	
1,2-dichloropropane	NA														NCA	
ethylbenzene															1,400	
methylene chloride		50.3					9K	10	9K					190K		1.9
bromodichloromethane																1.9
fluorotrichloromethane																1.9
chlorodibromomethane		10	12	6											NCA	
tetrachloroethene		10	12	6		60	155	211		324		8.1	7.5	140K		8.0
toluene		68	94	85	140				105						14,300	
trichloroethene					380	169	312	438	246	1,958		21	19	930		27
vinyl chloride	127															20
Pesticides, ug/l																
dieldrin				NA		NA	NA	NA	NA							0.00071
4,4'-DDT				NA		NA	NA	NA	NA							0.00024
4,4'-DDE				NA		NA	NA	NA	NA						NCA	
4,4'-DDD				NA		NA	NA	NA	NA						NCA	
a-endosulfan				NA		NA	NA	NA	NA						74	
b-endosulfan				NA		NA	NA	NA	NA						74	
endrin	NA			NA		NA	NA	NA	NA						1.0	
a-BHC				NA		NA	NA	NA	NA							0.092
b-BHC				NA		NA	NA	NA	NA							0.163
d-BHC	5K			NA		NA	NA	NA	NA						NCA	
g-BHC (lindane)	NA			NA		NA	NA	NA	NA							0.186
r-BHC				NA		NA	NA	NA	NA							

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Compound[a,b]	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	CH2M Sampling Date 4/83*	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	Weston Sampling Date 12/82	E&E Sampling Date 1/81	OEPA Sampling Date 4/81	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] CH2M Sampling Date 10/83	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l																
benzoic acid				NA												
2-methylphenol				NA												
4-methylphenol				NA												
acetone			46	35								440	490	730K		
2-butanone																
carbon disulfide																
4-methyl-2-pentanone																
o-xylene																
Dioxins																
2,3,7,8-tetrachlorodibenzo-p-dioxin				NA												

[a]NA denotes that compound was not analyzed for in this sample.
[b]K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c]1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d]NCA denotes insufficient data available upon which to derive a criterion.

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Table B-15
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-15
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] CH2M Sampling Date 10/83	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol	10K						3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether		70K	28	28	120K	100K		0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate							15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene	680							6.6
carbon tetrachloride								
chlorobenzene	1,400	1,600			2,000	1,700K	488	
1,2-dichloroethane	17,000	21,000	2,400	1,400	13,000	10,000		9.4
1,1,1-trichloroethane	60						18,400	
1,1-dichloroethane	2,900	3,800			2,000	1,800K	NCA	
1,1,2-trichloroethane	12,000	31,000	5,800	3,400	29,000	24,000		6.0
1,1,2,2-tetrachloroethane	6,000	19,000	1,600	910	9,400	7,400		1.7
chloroethane	250						NCA	

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Table B-15 (Page 2 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] CH2M Sampling Date 10/83	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform	2,800	5,800			3,300	2,700		1.9
1,1-dichloroethene	6,200	6,600	1,600	1,500	3,900	2,900		0.33
trans-1,2-dichloroethene	12,000	15,000	2,000	1,200	12,000	10,000	NCA	
1,2-dichloropropane	130						NCA	
ethylbenzene	14						1,400	
methylene chloride	450	1,600			2,700	2,500		1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene	900	750	1,000	1,200	1,500K	1,300K		8.0
toluene	1,300	1,400			1,900K	1,600K	14,300	
trichloroethene	4,600	8,100	3,000	2,400	9,100	7,500		27
vinyl chloride	6,100	5,100	1,200	900	6,500	5,000		20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Table B-15 (Page 3 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] CH2M Sampling Date 10/83	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol					34K	30K		
acetone					49,000	6,800		
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-16
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-16
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate			3K	2K			15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			280					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene								27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Table B-16 (Page 3 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone		110	530K					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

Table B-17
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-17
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate		7K		6K			15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane		1K					18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

Table B-17 (Page 2 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride		14		390				1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene	5						14,300	
trichloroethene								27
vinyl chloride		3K						20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Compound[a,b]	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			440	9,200				
2-butanone	23							
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

Table B-18
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-18
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol	NA							
2-nitrophenol	NA						NCA	
2,4-dinitrophenol							70	
phenol	NA						3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether	NA							0.30
1,2-dichlorobenzene	NA						400	
1-3-dichlorobenzene	NA						400	
1,4-dichlorobenzene	NA						400	
isophorone	NA						5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate	10K						15,000	
benzyl butyl phthalate	10K						NCA	
di-n-butyl phthalate	13						34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene		5K						6.6
carbon tetrachloride								
chlorobenzene	NA						488	
1,2-dichloroethane		75	55	50				9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane		26	22				NCA	
1,1,2-trichloroethane		170	218	150	230K			6.0
1,1,2,2-tetrachloroethane		10K						1.7
chloroethane							NCA	

Compound[a,b]	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform		5						1.9
1,1-dichloroethene		67	57		42K			0.33
trans-1,2-dichloroethene	10K	390	253	320			NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride	49.8		5K		80K			1.9
bromodichloromethane	NA							1.9
fluorotrichloromethane	NA							1.9
chlorodibromomethane	NA						NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene			14		77K			27
vinyl chloride	340	470	326	460	550			20
Pesticides, ug/l								
aldrin								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE	5K						NCA	
4,4'-DDD							NCA	
a-endosulfan	NA						74	
b-endosulfan							74	
endrin	NA						1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC	5K						NCA	
g-BHC (lindane)	NA							0.186
r-BHC								

Table B-18 (Page 3 of 3)

Compound[a,b]	E&E Sampling Date 4/81	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid	NA							
2-methylphenol	NA							
4-methylphenol	NA							
acetone	NA	126		27,000	540K			
2-butanone	NA							
carbon disulfide	NA							
4-methyl-2-pentanone	NA							
o-xylene	NA							
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin	NA							

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

Table B-19
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-19
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate			2K				15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			340	16				1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene				2K			14,300	
trichloroethene								27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone	53	730	4,900					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-20
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-20
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate							15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate		1K					34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane		8K					18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Compound[a,b]	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride		10K						1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene		12K						27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Table B-20 (Page 3 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	Weston Sampling Date 12/82	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone								
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

Table B-21
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-21
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate			4K				15,000	
benzyl butyl phthalate				7K			NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Table B-21 (Page 2 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			4K	9K				1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene	5K						14,300	
trichloroethene				2K				27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Table B-21 (Page 3 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone		650	170					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-22
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-22
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate			4K				15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			89K					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene								27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Table B-22 (Page 3 of 3)

Compound[a,b]	CH2M Sampling Date 4/83	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Weston Sampling Date 12/82	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			20,000					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone	10							
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-23
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-23
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone		860	350				5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate			3K				15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride		850	470K					
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane		350					NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles (continued)								
chloroform		1,800	1,200					1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene		34,000	7,700				NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride		550	690					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene		1,900						8.0
toluene							14,300	
trichloroethene		800	120K					27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid		300						
2-methylphenol								
4-methylphenol								
acetone		22,000	6,900					
2-butanone		33,000	7,500					
carbon disulfide								
4-methyl-2-pentanone		10,000	3,100					
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-24
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-24
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate			5K				15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene			23K					6.6
carbon tetrachloride			87K					
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane			67K				18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform		500	580					1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene			65K				NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			86K					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene		1,700	650					8.0
toluene							14,300	
trichloroethene			79K					27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Table B-24 (Page 3 of 3)

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			330K					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-25
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-25
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone			3K	5K			5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate				5K			15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene		650	500	450				6.6
carbon tetrachloride								
chlorobenzene		600	310	270			488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 10/83	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene			280	190			NCA	
1,2-dichloropropane							NCA	
ethylbenzene		350					1,400	
methylene chloride			49K	46K				1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene		300	140	140			14,300	
trichloroethene								27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	CH2M Sampling Date 10/83	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone		59	780K	960K				
2-butanone		10,000	1,000					
carbon disulfide								
4-methyl-2-pentanone								
o-xylene			230	160				
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-26
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-26
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol			16K				3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene			3K				NCA	0.028
bis(2-ethylhexyl)phthalate			2K				15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene		180	150					6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane		5						9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene		5	4K					0.33
trans-1,2-dichloroethene		89	73				NCA	
1,2-dichloropropane							NCA	
ethylbenzene		96	91				1,400	
methylene chloride			6K					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene			9K				14,300	
trichloroethene			3K					27
vinyl chloride		12	15					20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

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Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone		730	2,400					
2-butanone		200	200					
carbon disulfide								
4-methyl-2-pentanone								
o-xylene		79	91K					
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-27
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-27
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol			7K				3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene			8K				NCA	0.028
bis(2-ethylhexyl)phthalate			9K				15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene			430K					6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

Table B-27 (Page 2 of 3)

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene			400K				NCA	
1,2-dichloropropane							NCA	
ethylbenzene			1,100				1,400	
methylene chloride			1,000					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene								27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone								
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-28
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-28
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobbenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate			210				15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene			28					6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene		6	8K				NCA	
1,2-dichloropropane							NCA	
ethylbenzene			51				1,400	
methylene chloride			12					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene								27
vinyl chloride			5K					20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

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Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone		8,200	850					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene			11					
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-29
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-29
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol		110					3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate							15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene		1,800	240					6.6
carbon tetrachloride								
chlorobenzene			23K				488	
1,2-dichloroethane		300	120					9.4
1,1,1-trichloroethane		250					18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane		500	140					6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform		500	77K					1.9
1,1-dichloroethene		250	32K					0.33
trans-1,2-dichloroethene		4,700	680				NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride		700	96K					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene		250	69K					8.0
toluene							14,300	
trichloroethene		4,300	480					27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Compound[a,b]	Sampling Date	CH2M Sampling Date 7/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone		11,000	290K					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-30
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-30
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate							15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane			51					9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane			9K				NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene			9K					0.33
trans-1,2-dichloroethene			150				NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			7K					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene			15					27
vinyl chloride			16					20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

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Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			3,600					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-31
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-31
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate							15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			64K					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene								27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			2,200					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-32
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-32
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate			2K				15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			2K					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene								27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Table B-32 (Page 3 of 3)

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			850K					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-33
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-33
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate							15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane			140					9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane			59K				NCA	
1,1,2-trichloroethane			540					6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Table B-33 (Page 2 of 3)

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene			160					0.33
trans-1,2-dichloroethene			1,200				NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			25K					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene								27
vinyl chloride			870					20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant								
Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			1,100					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-34
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-34
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	CH2M Sampling Date 10/83	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether			2K	2K				0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate							15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane			490K	490K			NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

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Table B-34 (Page 2 of 3)

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene			1,200	1,200				0.33
trans-1,2-dichloroethene			16,000	16,000			NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			420K	130K				1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene								27
vinyl chloride			11,000	11,000				20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Table B-34 (Page 3 of 3)

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	CH2M Sampling Date 10/83	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone								
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table B-35
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-35
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate			2K				15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

Table B-35 (Page 2 of 3)

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles, ug/l (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			51K					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene								27
vinyl chloride								20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			2,500					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

Table B-36
ORGANIC ANALYSIS OF GROUNDWATER SAMPLES IN MONITORING WELL MW-36
CHEM-DYNE HYDROGEOLOGIC STUDY

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l								
2,3-dimethylphenol								
2-nitrophenol							NCA	
2,4-dinitrophenol							70	
phenol							3,500	
Base/Neutral Compounds, ug/l								
bis(2-chloroethyl)ether								0.30
1,2-dichlorobenzene							400	
1-3-dichlorobenzene							400	
1,4-dichlorobenzene							400	
isophorone							5,200	
naphthalene							NCA	0.028
bis(2-ethylhexyl)phthalate							15,000	
benzyl butyl phthalate							NCA	
di-n-butyl phthalate							34,000	
di-n-octyl phthalate							NCA	
Volatiles, ug/l								
benzene								6.6
carbon tetrachloride								
chlorobenzene							488	
1,2-dichloroethane								9.4
1,1,1-trichloroethane							18,400	
1,1-dichloroethane							NCA	
1,1,2-trichloroethane								6.0
1,1,2,2-tetrachloroethane								1.7
chloroethane							NCA	

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles (continued)								
chloroform								1.9
1,1-dichloroethene								0.33
trans-1,2-dichloroethene							NCA	
1,2-dichloropropane							NCA	
ethylbenzene							1,400	
methylene chloride			7K					1.9
bromodichloromethane								1.9
fluorotrichloromethane								1.9
chlorodibromomethane							NCA	
tetrachloroethene								8.0
toluene							14,300	
trichloroethene								27
vinyl chloride			18					20
Pesticides, ug/l								
dieldrin								0.00071
4,4'-DDT								0.00024
4,4'-DDE							NCA	
4,4'-DDD							NCA	
a-endosulfan							74	
b-endosulfan							74	
endrin							1.0	
a-BHC								0.092
b-BHC								0.163
d-BHC							NCA	
g-BHC (lindane)								0.186
r-BHC								

Table B-36 (Page 3 of 3)

Compound[a,b]	Sampling Date	Sampling Date	CH2M Sampling Date 10/83	Sampling Date	Sampling Date	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Sampling Date	Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Nonpriority Pollutant Hazardous Substances, ug/l								
benzoic acid								
2-methylphenol								
4-methylphenol								
acetone			260					
2-butanone								
carbon disulfide								
4-methyl-2-pentanone								
o-xylene								
Dioxins								
2,3,7,8-tetrachlorodibenzo-p-dioxin								

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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ATTACHMENT C

Chem-Dyne Site

Existing Well Inventory in the Vicinity of Chem-Dyne

INTRODUCTION

As part of the review of existing information on the Chem-Dyne site, an inventory of existing groundwater production wells was included. The well inventory included both active and abandoned wells.

SOURCES OF INFORMATION

The following sources of information were used to compile the well inventory:

- Draft "Phase B" Hydrogeologic Investigation and Preliminary Evaluation of Remedial Action Alternatives Feasibility, Roy F. Weston, Inc., June 1983.
- Personal interview and inspection with Bob Vaughn from the City of Hamilton Department of Water and Utilities. Inspection conducted with Phil Peters, meter man with water utility.
- Personal communication, Paul M. Plummer, engineer in the groundwater section of The Miami Conservency District.
- Personal communication, Billy L. Huston, Supervisor - Environmental Improvement, Champion Paper Division, Hamilton Mill.
- Personal communication, Tom Shannon, acting superintendent of the Hamilton South Filtration Plant.
- History of the City of Hamilton water supply system by George H. (Jack) Lowes, retired.
- Personal communication with representative of Beckett Paper, Kornylak Co., Vaughn Building Company, Ransohoff Company, and Ohio Casualty Insurance Group.
- Personal communication, John Jonas, director of maintenance for Mercy Hospital, Hamilton, Ohio.

LIMITATIONS OF INFORMATION

The following limitations to the well inventory should be recognized:

- Small private residential wells may exist in the residential areas along Second Street west of the power plant and the area south of Ford Boulevard. Prior to 1882, private water supply came from individual wells according to Lowes. However, the possibility of private wells existing in these

neighborhoods was considered very unlikely by both Vaughn and Peters. The only way to absolutely confirm the absence of these wells would be a door-to-door survey or direct mailing. Neither was done in this survey.

- Data on abandoned wells was generally not sought. These wells were visually located or recorded as reported as in the case of the Champion Paper well Nos. 2, 3, and 5. Detailed inspection or additional data research was not performed.

- Abandoned wells which were plugged and closed were not located by inspection. The Champion Paper well Nos. 2, 3 and 5, for example, were located based on the map of the Champion Paper Co. Baldwin-Lima-Hamilton area by Smith in 1960.

- Well logs readily available from the MCD were used. Additional logs were not sought from the Ohio DNR.

ACTIVE PRODUCTION WELLS

An inventory of active production wells within a one mile radius of the Chem-Dyne site was prepared by Roy F. Weston, Inc. In addition to the wells reported by Weston, two wells at Mercy Hospital, a small well at the Vaughn Building Company, another at the Ready Mix plant immediately north of the Ford Canal west of Third Street, and two wells at the Bonham Farm at 1234 N. Third Street immediately east of the N&W RR tracks were reported. Data on the active production wells in the vicinity of Chem-Dyne are presented in Table C-1. The general locations of these wells are shown in Figure C-1.

During the groundwater sampling conducted in three phases during the remedial investigation (RI) work by CH2M HILL in 1983, the following production wells were sampled:

- Vaughn Building Company
- Beckett Paper Company Parking Lot and Dayton Street wells
- Champion Paper well Nos. 1, 4 and 9
- Hamilton Electric Power Co. well No. 9

ABANDONED PRODUCTION WELLS

Several abandoned production wells are located in the vicinity of the Chem-Dyne site. Some of these wells have been closed and capped and others are simply abandoned in various conditions, with pump and motor in place, pump only in place, or simply as bare casing.

Table C-1
SUMMARY OF DATA AVAILABLE FOR ACTIVE PRODUCTION WELLS IN THE VICINITY OF THE CHEM-DYNE SITE

Production Well	Date Installed	Depth of Well Feet	Screen Length, Feet	Casing Diameter, Inches	Approximate Discharge Flow, gpm	Primary Water Use	Comments
Beckett Paper[h] Parking Lot Well	1964	175	30	26	1,000 (max)	Papermaking	Pump replaced in 1980. Sample tap on pump discharge piping.
Beckett Paper[h] Dayton Street Well	12/4/37	118	25	12	750 @ 90 psi 1,500 @ 25 psi	Papermaking	90 psi is typical production discharge pressure. Sample ta on pump discharge flange.
Beckett Paper[h] Buckeye Street Well	8/14/34	102	25	18	1,000 @ 95 psi 1,950 @ 35 psi	Papermaking	95 psi is typical production discharge pressure. No sampl tap available before discharg to common header.
Champion Paper[a] Well No. 1	1935	111	28	-	200	Papermaking and cooling	Sample tap on pump discharge piping. Pump removed from well for service in Oct. 1983
Champion Paper[a] Well No. 4	1923	181	30	-	800	Papermaking and cooling	Sample tap on pump discharge piping.
Champion Paper[a] Well No. 9	1955	120	30	-	300	Papermaking and cooling	Sample tap on pump discharge piping.
Champion Paper[a] Well No. 10	1956	135	10	-	800	Papermaking and cooling	Sample tap on pump discharge piping.
Vaughn Building Co.[g]	--	95	4	-	30	Building heating	Water reinjected into 60 foot deep well with 6 feet of No. 80 screen.
Hamilton Electric[a,g] Power Co. Well No. 8 (or No. 1)	1952	150	50	16	600	Bearing Cooling	Water used exclusively for bearing cooling. One well pumped with one as standby.
Hamilton Electric[a,g] Power Co. Well No. 9 (or No. 2)	1972	180	30	16	600	Bearing Cooling	Water used exclusively for bearing cooling. One well pumped with one as standby.
Ready Mix[c]	c. 1950	50	-	-	-	-	-
Hamilton North Filtration Plant Well No. 3[a,c]	1941	143	50	18	450	Public Water supply for Liberty and Union Township	Least productive well in the north well field.

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Table C-1 (continued)

Production Well	Date Installed	Depth of Well Feet	Screen Length, Feet	Casing Diameter, Inches	Approximate Discharge Flow, gpm	Primary Water Use	Comments
Hamilton North Filtration Plant Well No. 5[a,e]	1941	180	65	18	1,620	Public Water supply for Liberty and Union Township	All north plant wells are run every 1 to 2 weeks. During summer, well water pumped to the Headgate Rd. reservoir fo sale to Liberty and Union Townships; typically, 3 wells (7 mgd total) and sometimes 5 wells (10 mgd total) are operated once per week for 8 hours.
Hamilton North Filtration Plant Well No. 6[a,e]	1941	139	40	18	1,620	Public Water supply for Liberty and Union Township	
Hamilton North Filtration Plant Well No. 7[a,e]	1954	161	60	18	1,620	Public water supply for Liberty and Union Township	
Hamilton North Filtration Plant Well No. 8[a,e]	1950	167	62	18	1,620	Public water supply for Liberty and Union Township	
Bonham Farm[c]	1979-80	50	-	5 5/8	-		Submersible pump.
Bonham Farm[c]	-	-	-	5 5/8	-		Submersible pump.
Mercy Hospital Well No. 1	-	118	40	16 (casing) 12 (screen)	-	cooling water for air conditioning system	Rated to 1,000 gpm with 2 ft 11 inch drawdown. Discharge to storm sewer. Pumps wheneve temperature is above 55°F and flow regulated while pump run
Mercy Hospital Well No. 2	-	118	40	16 (casing) 12 (screen)	-	cooling water for air conditioning system	Rated to 1,000 gpm with 2 ft 11 inch drawdown. Discharge to storm sewer. Pumps wheneve temperature is above 55°F and flow regulated while pump run

GLT432/109-2

APPENDIX D

ROY F. WESTON

SOIL BORING LOGS

AND

WELL CONSTRUCTION DETAILS

CH2M HILL has not edited nor interpreted these materials and assumes no responsibility for their completeness or accuracy.

Information on the abandoned production wells was obtained primarily from Vaughn and Plummer. Available information on the abandoned wells is summarized in Table C-2 and the well locations are shown in Figure C-2.

According to records provided by Plummer of the MCD, two production wells were drilled on the Chem-Dyne site by the former owner Bendix Aviation in the 1950's. The well logs do not show the well locations accurately. CH2M HILL located and photographed one of the wells during a facility inspection in October 1983. The location of the second well was reported by Hannahs/OEPA as immediately west of the abandoned coal bin. The well is enclosed in a small shed.

GLT432/108

Table C-2

SUMMARY OF DATA AVAILABLE FOR ABANDONED PRODUCTION WELLS IN THE VICINITY OF THE CHEM-DYNE SITE

Abandoned Production Well	Date Installed	Depth of Well, Feet	Screen Length, Feet	Casing Diameter, Inches	Comments
Ohio Casualty Insurance Well No. BU39 (Log No. 2)[c,g]	1975	92	30	12	Well installed by Moody's of Dayton, Inc., and abandoned in 1982.
Ohio Casualty Insurance Old Building Well[c,g]	c. 1950	-	-	-	Sample tap in basement mechanical room. Well abandoned in 1982.
Ohio Casualty Insurance Diffuser Return Well (Log No. 1)[c,g]	1975	32	20	12	Well installed by Moody's of Dayton, Inc., and abandoned in 1982.
Ohio Casualty Insurance (Well Log No. 3)[c,g]	1975	92	15	12	Well installed by Moody's of Dayton, Inc., and abandoned in 1982.
Champion Papaer Well No. 2[c]	-	-	-	-	Well closed and capped.
Champion Paper Well No. 3[c]	-	-	-	-	Well closed and capped.
Champion Paper Well No. 5[c]	-	-	-	-	Well closed and capped.
Champion Paper (Formerly Baldwin-Lima-Hamilton) "Old Foundry Well"[b,d]	-	-	-	-	Well located on the east side of what is now a Champion Paper warehouse parking lot. No well data available from Champion Paper.
Champion Paper (Formerly Baldwin-Lima-Hamilton) "North Well"[d]	-	-	-	12(?)	Pump and motor in place but wiring disconnected. No well data available from Champion Paper.
Champion Paper (Formerly Baldwin-Lima-Hamilton) "South Well"[c]	-	100	-	-	No well data available from Champion Paper.

GLT432/110-1

REFERENCES

a. Draft "Phase B" Hydrogeologic Investigation and Preliminary Evaluation of Remedial Action Alternatives Feasibility, Roy F. Weston, Inc., June 1983.

b. Personal interview and inspection with Bob Vaughn from the City of Hamilton Department of Water and Utilities. Inspection conducted with Phil Peters, meter man with water utility.

c. Personal communication, Paul M. Plummer, engineer in the groundwater section of The Miami Conservency District.

d. Personal communication, Billy L. Huston, Supervisor - Environmental Improvement, Champion Paper Division, Hamilton Mill.

e. Personal communication, Tom Shannon, acting superintendent of the Hamilton South Filtration Plant.

f. History of the City of Hamilton water supply system by George H. (Jack) Lowes, retired.

g. Personal communication with representative of Beckett Paper, Kornylak Co., Vaughn Building Company, Ransohoff Company, and Ohio Casualty Insurance Group.

h. Shop and maintenance records of Beckett Paper Company.

i. Personal communication, John Jonas, director of maintenance for Mercy Hospital, Hamilton, Ohio.

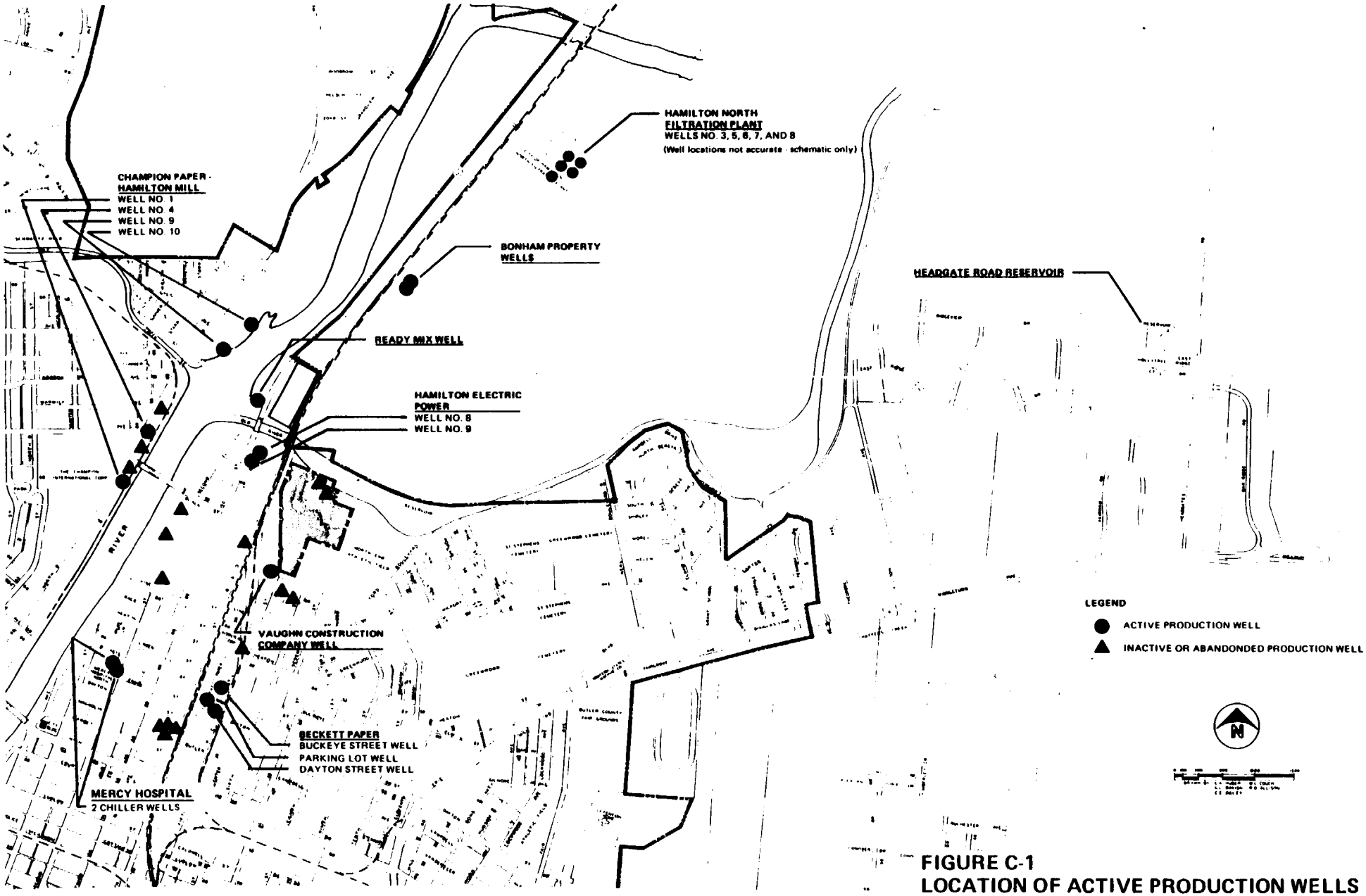


FIGURE C-1
LOCATION OF ACTIVE PRODUCTION WELLS IN VICINITY OF THE CHEM–DYNE SITE

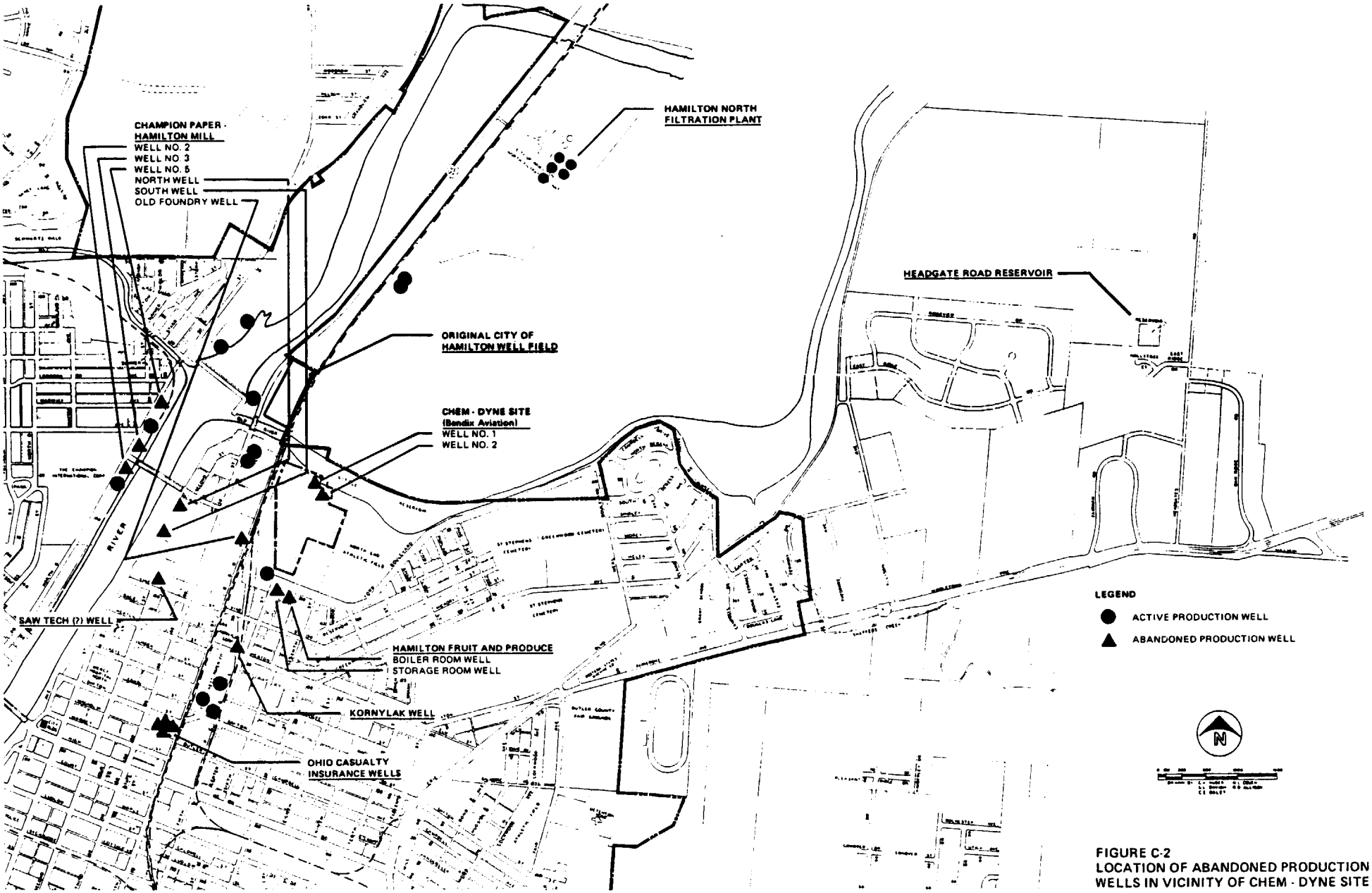


FIGURE C-2
LOCATION OF ABANDONED PRODUCTION WELLS IN VICINITY OF CHEM - DYNE SITE

Table C-2 (continued)

Abandoned Production Well	Date Installed	Depth of Well, Feet	Screen Length, Feet	Casing Diameter, Inches	Comments
Original City of Hamilton Well field[e,f]	1884	-	-	6	Several wells constructed from 1884 through 1929. Well installation reported as follows:
	1910	-	-	-	
	1913	-	-	-	
	1913-1918	-	-	12	
	1929	-	-	-	

Date	No. of Wells	Diameter
1884	20	6
1910	5	-
1913	2	-
1913-18	6	12
1929	"Several"	-

This well field was abandoned by 1934 when the North Filtration Plant began operation with its new field of six 18-inch wells and reservoir on Headgate Road.

Some well casings still in place and observed during inspection with Vaughn.

Chem-Dyne Site (Formerly Ford building, then Bendix Aviation) Well No. 1[c]	1952	125	20	18	Property presently owned by American Society for Environmental Education, Inc.; originally Ford Tractor factory. Well installed by Bendix Aviation.
Chem-Dyne Site (Formerly Ford building, then Bendix Aviation) Well No. 2[c]	1954	120	25	18	Same as above. Located and photographed by CH2M HILL during facility inspection. Well installed by Bendix Aviation.

Table C-2 (continued)

Abandoned Production Well	Date Installed	Depth of Well, Feet	Screen Length, Feet	Casing Diameter, Inches	Comments
Saw Tech (?)[b,c] (Formerly Gray Iron Foundry)	1972	97	20	8	Identification as a "Saw Tech" well is uncertain. Data from Miami Conservency District locates well in general area where Vaughn suspected a well belonging to Saw Tech. Actual inspection with Vaughn impossible because building was locked and unoccupied.
Hamilton Fruit and[b] Produce (551 N. 6th Street) "Boiler room well"	-	-	-	12	Pump and motor in place. Located 15 feet south of smokestack base. Wiring disconnected.
Hamilton Fruit and[b] Produce "Storage room well"	-	-	-	14	Bare casing only with refuse stuffed inside to within 10 feet of top flange. Located inside garage door approximately 100 feet east and 20 feet north of stack.
Kornylak[b,g]					Located at corner of Heaton and N&W RR tracks. Pump not used since 1940's; connected to a 1 MG reservoir underground.

GLT432/110-3

Well MW1

Well Construction Summary

Location or Coords: North Ballfield East of Site

Elevation: Ground Level 590.00 ft.

Top of Casing 501.09 ft

Drilling Summary:

Total Depth 60 ft. below ground surface

Borehole Diameter 6"

Driller Brooks GeoProbe

Rig Mobil 880

Bit(s) 5.6in. tri-cone roller

Drilling Fluid clean water

Surface Casing 6" steel (pulled upon completion)

Construction Time Log: 1982

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling:				
Installing 6" casing	11-1	0730	11-2	1700
Geophys. Logging:				
Casing:				
Well Installation	11-3	1230	11-3	1330
Bentonite and Filter Placement:	11-9	0730	11-9	1210
Cementing and Protective Casing:	11-9	1310	11-10	0830
Other:				

Well Design:

Basis: Geologic Log X Geophysical Log

Casing String(s): C=Casing S=Screen

+1.1'	50'	C1	
50'	60'	S1	

Casing: C1 Galvanized steel 4" diameter

C2

Screen: S1 0.020" slot galvanized steel (Johnson UOP) 4" diameter

S2

Centralizers

Filter Material No. 25-40 mix washed sand

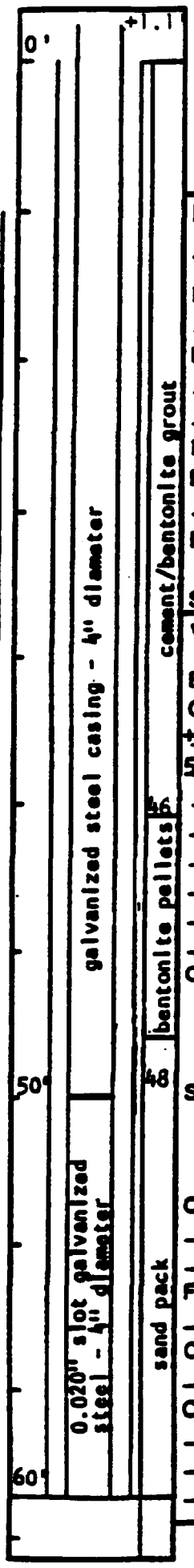
Cement Type I Portland

Other Powdered bentonite
Volclay bentonite pellets
Protective steel casing with padlock

Well Development:

Developed with air compressor for approximately two hours

Comments:



Project CHEM-DYNE 0300-91-29

Location Hamilton, Ohio

Personnel Tom Drew/Ron Neman

WESTON

Well MW2

Well Construction Summary

Location or Coords: North Ballfield
East of Site

Elevation: Ground Level 590.00 ft.
Top of Casing 591.49 ft

Drilling Summary:

Total Depth 34 ft. below ground surface
Borehole Diameter 6"

Driller Terra Testing

Rig CME 55
Bit(s) 3 in. tri-cone roller

Drilling Fluid clean water

Surface Casing 6" steel (pulled upon completion)

Construction Time Log: 1982

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling: Installing 6" casing	11-5	1000	11-6	1430
Geophys. Logging:				
Casing: Well Installation	11-6	1430	11-6	1515
Bentonite and Filter Placement:	11-6	1515	11-7	0800
Cementing and Protective Casing:	11-7	0800	11-7	
Other:				

Well Design:

Basis: Geologic Log X Geophysical Log

Casing String(s): C=Casing S=Screen

1.5'	24'	C1		-	
24'	34'	S1		-	
5	-			-	
	-			-	
	-			-	
	-			-	
	-			-	
	-			-	

Casing: C1 Galvanized steel 4" diameter
C2

Screen: 4" S1 0.020" slot galvanized steel (Johnson UOP) 4" diameter
S2

Centralizers

Filter Material No. 25-40 mix washed sand

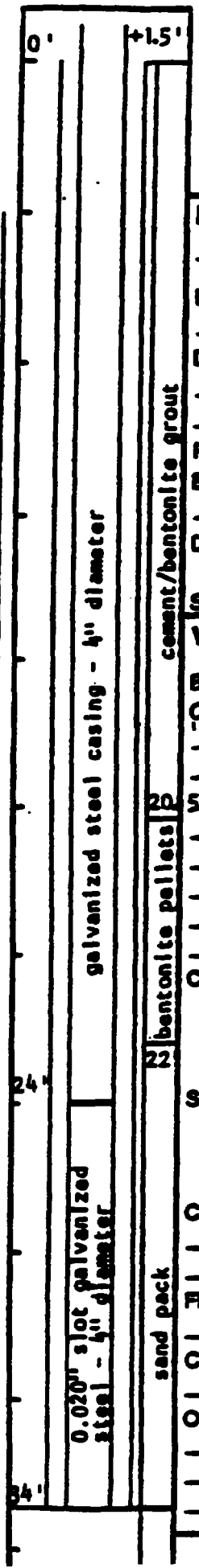
Cement Type I Portland

Other Powdered bentonite
Volclay bentonite pellets
Protective steel casing with padlock

Well Development:

Developed with air compressor for approximately two hours

Comments:



Location Hamilton, Ohio
Personnel Tom Drew/Ron Naman

Project CHEM-DYNE
0300-91-29

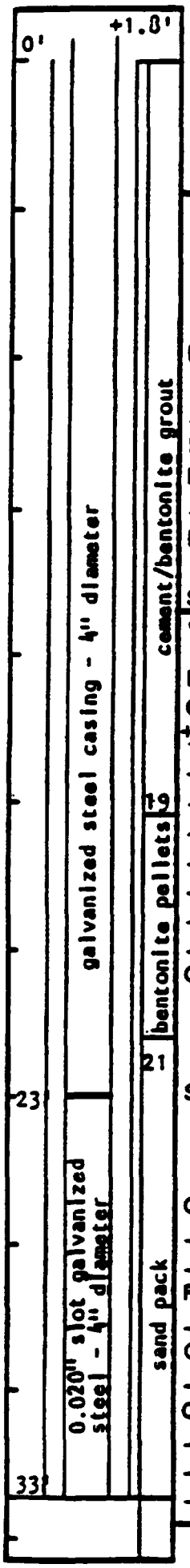
Well MW 3

Well Construction Summary

Location or Coords: Outside N.E. Corner site, South of Hydraulic Canal

Elevation: Ground Level 589.40

Top of Casing 591.15



Location Hamilton, Ohio

Personnel Tom Drew/Ron Naman

Project CHEM-DYNE 0300-91-29

Drilling Summary:

Total Depth 33 ft. below ground surface

Borehole Diameter 6"

Driller Tena Testing

Rig CME 55

Bit(s) 3 in. tri-core roller

Drilling Fluid clean water

Surface Casing 6" steel (pulled upon completion)

Well Design:

Basis: Geologic Log X Geophysical Log

Casing String(s): C=Casing S=Screen

+1.8'	23'	C1		
23'	33'	S1		

Casing: C1 Galvanized steel 4" diameter

C2

Screen: S1 0.020" slot galvanized steel (Johnson UOP) 4" diameter

S2

Centralizers

Filter Material No. 25-40 mix washed sand

Cement Type I Portland

Other Powdered bentonite
Volclay bentonite pellets
Protective steel casing with padlock

Construction Time Log: 1982

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling:				
Installing 6" casing	11-8	1730	11-9	1430
Geophys. Logging:				
Casing:				
Well Installation	11-9		11-9	
Bentonite and Filter Placement	11-9		11-9	
Cementing and Protective Casing:	11-9		11-9	
Other:				

Well Development:

Developed with air compressor for approximately two hours

Comments:

WESTON

Well MW8

Well Construction Summary

Location or Coords: South of Site Adjacent to Ford Blvd.

Elevation: Ground Level 596.50 ft.
Top of Casing 598.20 ft.

Drilling Summary:

Total Depth 40 ft.below ground surface
Borehole Diameter 6"

Driller Terra Testing

Rig CME 55
Bit(s) 3 in. tri-cone roller

Drilling Fluid clean water

Surface Casing 6" steel (pulled upon completion)

Construction Time Log: 1982

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling:				
Installing 6" casing	11-7	1130	11-8	1000
Geophys. Logging:	11-8	1000	11-8	1045
Casing:				
Well	11-8	1045	11-8	1200
Installation	11-8	1300	11-8	1510
Bentonite and Filter Placement:				
Cementing and Protective Casing:				
Other:				

Well Design:

Basis: Geologic Log X Geophysical Log

Casing String(s): C=Casing S=Screen

+1.7' - 29'	C1		
30' - 39'	S1		

Casing: C1 Galvanized steel 4" diameter

C2

Screen: S1 0.020" slot galvanized steel (Johnson UOP) 4" diameter

S2

Centralizers

Filter Material No. 25-40 mix washed sand

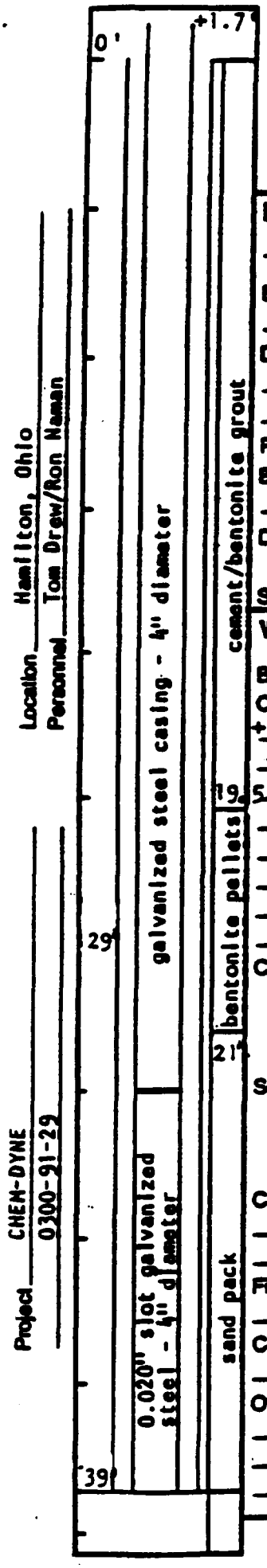
Cement Type I Portland

Other Powdered bentonite
Volclay bentonite pellets
Protective steel casing with padlock

Well Development:

Developed with air compressor for approximately two hours

Comments:



Project CHEM-DYNE 0300-91-29
Location Hamilton, Ohio
Personnel Tom Drew/Ron Naman

WESTON

Well MW12

Well Construction Summary

Location or Coords: West of Site on Ransohoff Property

Elevation: Ground Level 591.9 ft

Top of Casing 593.44 ft

Drilling Summary:

Total Depth 57 ft. below ground surface

Borehole Diameter 6"

Driller Brooks GeoProbe

Rig Mobil B80

Bit(s) 5 5/8 in. tri-cone roller

Drilling Fluid clean water

Surface Casing 6" steel (pulled upon completion)

Construction Time Log: 1982

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling: Installing 6" casing	11-19	0930	11-22	1430
Geophys. Logging:	11-22	1430	11-22	1530
Casing: Well Installation				
Bentonite and Filter Placement:	11-22	1530	12-2	0730
Cementing and Protective Casing:	12-2	0730	12-2	1300
Other:				

Well Design:

Basis: Geologic Log X Geophysical Log

Casing String(s): C=Casing S=Screen

+1.5' - 47' C1

47' - 57' S1

Casing: C1 Galvanized steel 4" diameter

C2

Screen: S1 0.020" slot galvanized steel (Johnson UOP) 4" diameter

S2

Centralizers

Filter Material No. 25-40 mix washed sand

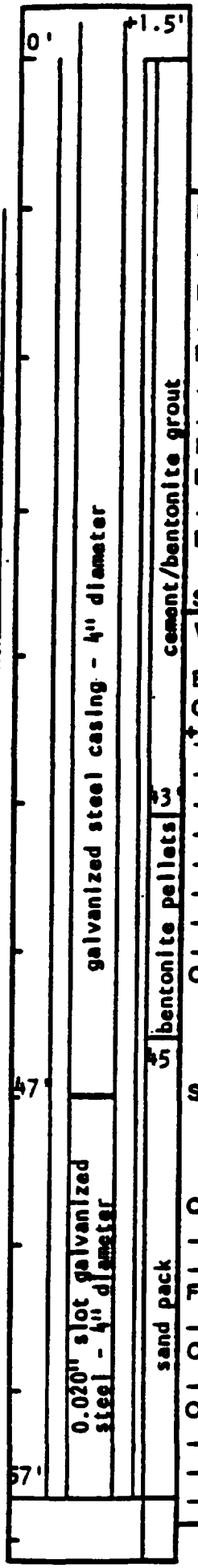
Cement Type I Portland

Other Powdered bentonite
Volclay bentonite pellets
Protective steel casing with padlock

Well Development:

Developed with air compressor for approximately two hours

Comments:



Location Hamilton, Ohio

Personnel Tom Drew/Ron Naman

Project CHEM-DYNE 0300-91-29

WESTON

Well MW15

Well Construction Summary

Location or Coords: Electric Plant Property, Adjacent Railroad Tracks

Elevation: Ground Level 595.4 ft.

Top of Casing 595.89 ft.

Drilling Summary:

Total Depth 38 ft. below ground surface

Borehole Diameter 6"

Driller Terra Testing

Rig CME 55

Bit(s) 3 in. tri-cone roller

Drilling Fluid clean water

Surface-Casing 6" steel (pulled upon completion)

Construction Time Log: 1982

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling:				
Installing 6" casing	11-22	0830	11-23	0930
Geophys. Logging:				
Casing:				
Well Installation	11-23	0930	11-23	1030
Bentonite and Filter Placement:	11-23	1030	11-23	1230
Cementing and Protective Casing:	11-23		11-23	
Other:				

Well Design:

Basis: Geologic Log X Geophysical Log

Casing String(s): C=Casing S=Screen

+1.5'	28.5'	C1	
28.5'	38.5'	S1	

Casing: C1 Galvanized steel 4" diameter

C2

Screen: S1 0.020" slot galvanized steel (Johnson UOP) 4" diameter

S2

Centralizers

Filter Material No. 25-40 mix washed sand

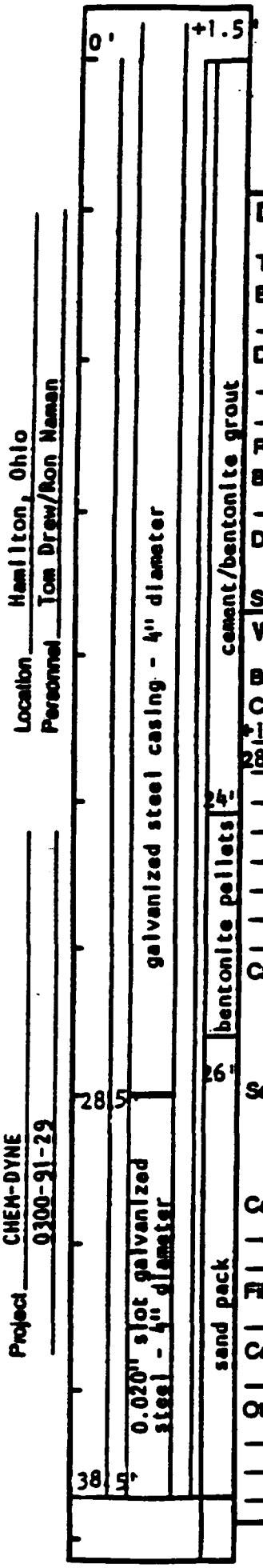
Cement Type I Portland

Other Powdered bentonite
Volclay bentonite pellets
Protective steel casing with padlock

Well Development:

Developed with air compressor for approximately two hours

Comments:



Project CHEM-DYNE 0300-91-29

Location Hamilton, Ohio

Personnel Tom Drew/Ron Naman

WESTON

Well MW16

Well Construction Summary

Location or Coords: On Kornylak Property, Adjacent Vine Street

Elevation: Ground Level 593.9 ft.
Top of Casing 595.09 ft.

Drilling Summary:

Total Depth 39 ft. below ground surface
Borehole Diameter 6"

Driller Brooks GeoProbe

Rig Mobil B80
Bit(s) 5-6 in. tri-cone roller

Drilling Fluid clean water

Surface Casing 6" steel (pulled upon completion)

Construction Time Log: 1982

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling: Installing 6" casing	12-2	1445	12-4	
Geophys. Logging:				
Casing: Well Installation	12-4		12-4	
Bentonite and Filter Placement:	12-4		12-4	
Cementing and Protective Casing:	12-5		12-5	
Other:				

Well Design:

Basis: Geologic Log X Geophysical Log

Casing String(s): C=Casing S=Screen

+1.2' - 29.0' C1
29.0' - 39.0' S1

Casing: C1 Galvanized steel 4" diameter
C2

Screen: S1 0.020" slot galvanized steel (Johnson UOP) 4" diameter
S2

Centralizers

Filter Material No. 25-40 mix washed sand

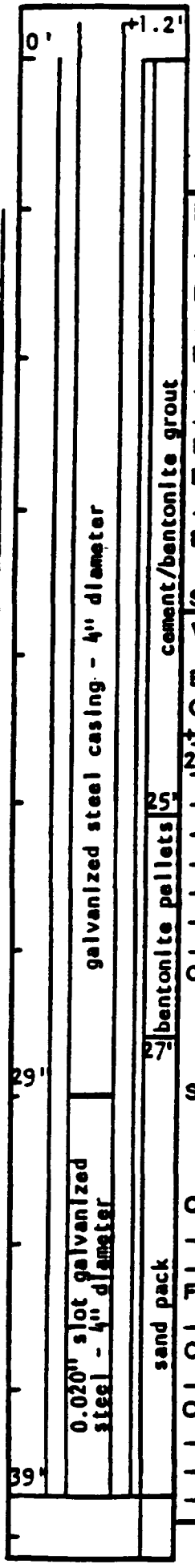
Cement Type I Portland

Other Powdered bentonite
Volclay bentonite pellets
Protective steel casing with padlock

Well Development:

Developed with air compressor for approximately two hours

Comments:



Location Hamilton, Ohio
Personnel Tom Drew/Ron Naman

Project CHEM-DYNE
0300-91-29

WESTON

Well MW17

Well Construction Summary

Location or Coords: On Champion Paper Property, 3rd Street

Elevation: Ground Level 595.8 ft.

Top of Casing 597.55 ft.

Drilling Summary:

Total Depth 42 ft. below ground surface

Borehole Diameter 6"

Driller Terra Testing

Rig CME 55

Bit(s) 3 in. tri-cone roller

Drilling Fluid clean water

Surface Casing 6" steel (pulled upon completion)

Construction Time Log: 1982

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling:				
Installing 6" casing	11-17	0830	11-18	1300
Geophys. Logging:				
Casing:				
Well Installation	11-18	1300	11-18	1400
Bentonite and Filter Placement:	11-18	1400	11-18	1600
Cementing and Protective Casing:	11-18	1600	11-19	1030
Other:				

Well Design:

Basis: Geologic Log X Geophysical Log

Casing String(s): C=Casing S=Screen

+1.8' - 32' C1

32' - 42' S1

Casing: C1 Galvanized steel 4" diameter

C2

Screen: S1 0.020" slot galvanized steel (Johnson UOP) 4" diameter

S2

Centralizers

Filter Material No. 25-40 mix washed sand

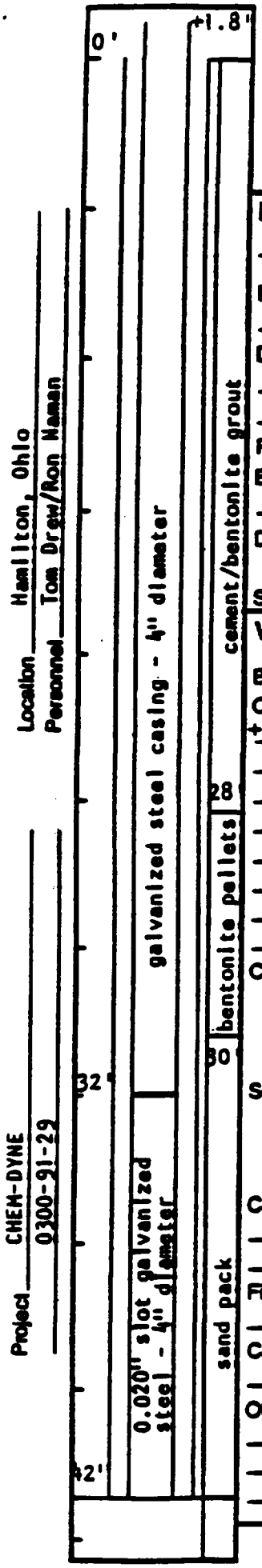
Cement Type I Portland

Other Powdered bentonite
Volclay bentonite pellets
Protective steel casing with padlock

Well Development:

Developed with air compressor for approximately two hours

Comments:



Location Hamilton, Ohio

Personnel Tom Drew/Ron Naman

Project CHEM-DYNE 0300-91-29

WESTON

Well MW19

Well Construction Summary

Location or Coords: On Champion Paper Property at Black Street Bridge

Elevation: Ground Level 590.4 ft.

Top of Casing 591.23 ft.

Drilling Summary:

Total Depth 67 ft. below ground surface

Borehole Diameter 6"

Driller Brooks GeoProbe

Rig Mobil B80

Bit(s) 5.6in. tri-cone roller

Drilling Fluid clean water

Surface Casing 6" steel (pulled upon completion)

Construction Time Log: 1982

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling: Installing 6" casing	12-6	0830	12-9	1530
Geophys. Logging:				
Casing: Well Installation	12-9	1530	12-9	1615
Bentonite and Filter Placement:	12-9	1615	12-9	1730
Cementing and Protective Casing:	12-10	0815	12-10	1100
Other:				

Well Design:

Basis: Geologic Log X Geophysical Log ____

Casing String(s): C=Casing S=Screen

+0.8'	57'	C1			
57'	67'	S1			

Casing: C1 Galvanized steel 4" diameter

C2

Screen: S1 0.020" slot galvanized steel (Johnson UOP) 4" diameter

S2

Centralizers

Filter Material No. 25-40 mix washed sand

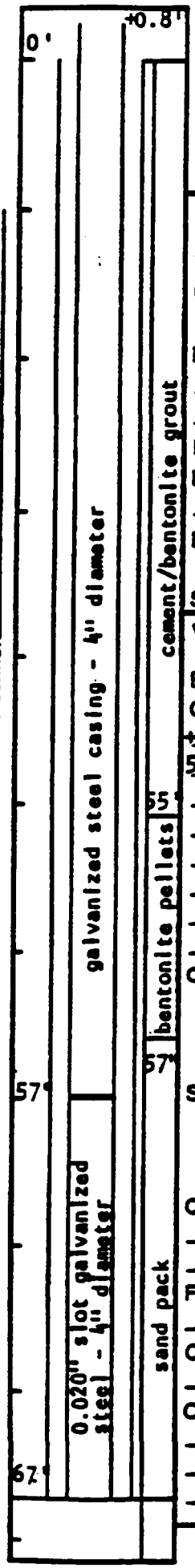
Cement Type I Portland

Other Powdered bentonite
Volclay bentonite pellets
Protective steel casing with padlock

Well Development:

Developed with air compressor for approximately two hours

Comments:



Location Hamilton, Ohio

Personnel Tom Drew/Ron Naman

Project CHEM-DYNE 0300-91-29

WESTON

Well MW20

Well Construction Summary

Location or Coords: On Champion Paper Property at Block Street Bridge

Elevation: Ground Level 590.60 ft.
Top of Casing 591.80 ft.

Drilling Summary:

Total Depth 40 ft. below ground surface
Borehole Diameter 6"

Driller Terra Testing

Rig CME 55
Bit(s) 3 in. tri-cone roller

Drilling Fluid clean water

Surface Casing 6" steel (pulled upon completion)

Well Design:

Basis: Geologic Log X Geophysical Log

Casing String(s): C=Casing S=Screen

+1.2'	20.0'	C1			
20.0'	40'	S1			

Casing: C1 Galvanized steel 4" diameter
C2

Screen: S1 0.020" slot galvanized steel (Johnson UOP) 4" diameter
S2

Centralizers

Filter Material No. 25-40 mix washed sand

Cement Type I Portland

Other Powdered bentonite
Volclay bentonite pellets
Protective steel casing with padlock

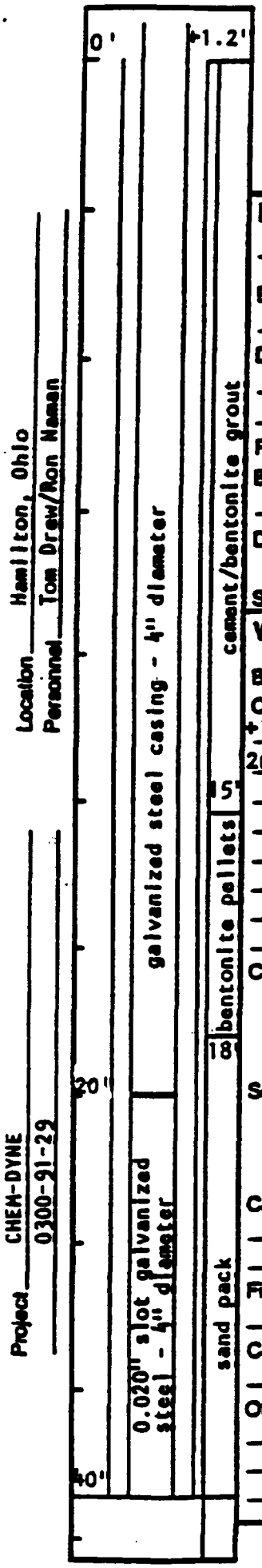
Construction Time Log: 1982

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling: Installing 6" casing	11-19	1446	11-21	0845
Geophys. Logging:				
Casing: Well Installation	11-21	0845	11-21	0920
Bentonite and Filter Placement:	11-21	0930	11-21	1130
Cementing and Protective Casing:	11-21	1230	11-21	1415
Other:				

Well Development:

Developed with air compressor for approximately two hours

Comments:



Project CHEM-DYNE 0300-91-29
Location Hamilton, Ohio
Personnel Tom Drew/Ron Nenan

WESTON

Well MW21

Well Construction Summary

Location or Coords: In Park at Confluence Miami River & Hydraulic Canal

Elevation: Ground Level 596.4 ft.

Top of Casing 597.85 ft.

Drilling Summary:

Total Depth 46.5ft. below ground surface

Borehole Diameter 6"

Driller Terra Testing

Rig CME 55

Bit(s) 3 in. tri-cone roller

Drilling Fluid clean water

Surface Casing 6" steel (pulled upon completion)

Well Design:

Basis: Geologic Log X Geophysical Log

Casing String(s): C=Casing S=Screen

+1.5'	26.5'	C1			
26.5'	46.5'	S1			

Casing: C1 Galvanized steel 4" diameter

C2

Screen: S1 0.020" slot galvanized steel (Johnson UOP) 4" diameter

S2

Centralizers

Filter Material No. 25-40 mix washed sand

Cement Type I Portland

Other Powdered bentonite
Volclay bentonite pellets
Protective steel casing with padlock

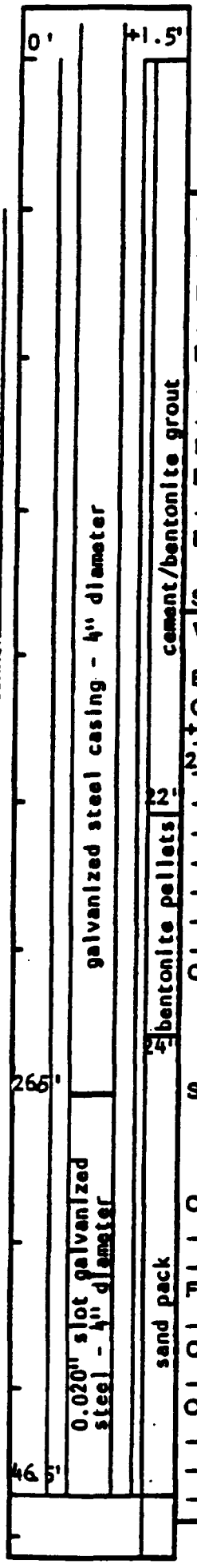
Construction Time Log: 1982

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling: Installing 6" casing	11-11	1000	11-15	1300
Geophys. Logging:				
Casing: Well Installation	11-15	1400	11-15	1555
Bentonite and Filter Placement:	11-15	1555	11-16	0930
Cementing and Protective Casing:	11-16	0930	11-16	1330
Other:				

Well Development:

Developed with air compressor for approximately two hours

Comments:



Location Hamilton, Ohio
Personnel Tom Drew/Ron Naman
Project CHEM-DYNE 0300-91-29

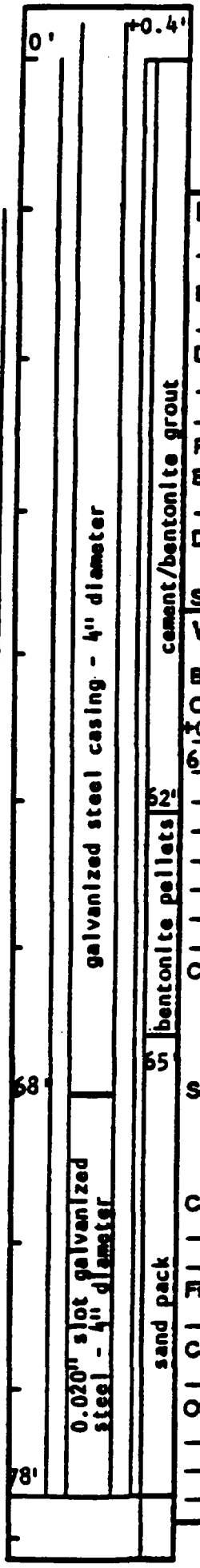
WESTON

Well MW22

Well Construction Summary

Location or Coords: In Park at Confluence Miami River & Hydraulic Canal

Elevation: Ground Level 597.0 ft.
Top of Casing 597.35 ft.



Project CHEM-DYNE 0300-91-29
Location Hamilton, Ohio
Personnel Tom Drew/Ron Nenan

Drilling Summary:

Total Depth 78 ft. below ground surface
Borehole Diameter 6"
Driller Brooks GeoProbe
Rig Mobil 880
Bit(s) 5.6 in. tri-cone roller
Drilling Fluid clean water
Surface Casing 6" steel (pulled upon completion)

Well Design:

Basis: Geologic Log X Geophysical Log ___
Casing String(s): C=Casing S=Screen

+0.4'	68'	C1			
68'	78'	S1			

Casing: C1 Galvanized steel 4" diameter
C2
Screen: S1 0.020" slot galvanized steel (Johnson UOP) 4" diameter
S2
Centralizers
Filter Material No. 25-40 mix washed sand
Cement Type I Portland
Other Powdered bentonite
Volclay bentonite pellets
Protective steel casing with padlock

Construction Time Log: 1982

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling: Installing 6" casing	11-10	1420	11-16	1500
Geophys. Logging:				
Casing: Well Installation	11-16	1500	11-16	1645
Bentonite and Filter Placement:	11-16	1645	11-17	0900
Cementing and Protective Casing:	11-17	0930	11-17	1200
Other:				

Well Development:

Developed with air compressor for approximately two hours

Comments:

WESTON

WESTON

DRILLING LOG

WELL NUMBER: W-1
OWNER:
LOCATION: North End Ballfield
ADDRESS: Hamilton, Ohio
TOTAL DEPTH: 60.5'
SURFACE ELEVATION:
WATER LEVEL:
DRILLING COMPANY: Mideastern Geotech
DRILLING METHOD: Auger
DATE DRILLED: 10-19 10-20-82
DRILLER: Phil Clough
HELPER: Randy Parsons
LOG BY: R. Naman/T. Drew

SKETCH MAP

NOTES:

DEPTH (FEET)	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE BLOWS*	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0					Auger to 14.5' Due to existing log for site.
14					
15				3	Olive gray (5Y5/2) silty clay, firm.
16		1	SS	6 8	
					@ 18.5'. Change to gravelly cuttings.
24					
25				23	Yellowish brown (10YR5/6) f. gravelly m.-c. Sand.
26		2	SS	35 41	
					Water @ 27'
29					
30		3	SS	50/5	Dark to light yellowish brown (10YR5/4 to 5/6) grades f.-m. sand to f. gravel @ base of sample.
34					
35		4	SS	50/5	Yellowish brown (10YR5/4), m. sand.
39					
40				34	Yellowish brown (10YR5/6), clayey f.-c. sand, some f. gravel.
41		5		55 50/5	
43					

* A.S.T.M. D1586

WESTON

DRILLING LOG

WELL NUMBER: W-1
LOCATION: North End Ballfield
SURFACE ELEVATION:
DRILLING COMPANY: Mideastern Geotech
DRILLER: Phil Clough
LOG BY: R. Naman/T. Drew

OWNER:
ADDRESS: Hamilton Ohio
TOTAL DEPTH: 60.5'
WATER LEVEL:
DRILLING METHOD: Auger
DATE DRILLED: 10-19 10-20-82
HELPER: Randy Parsons

SKETCH MAP

NOTES:

DEPTH (FEET)	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE BLOWS*	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
43					
44					
45		6	SS	56/5	Yellowish brown (10YR5/4), c. sandy f. gravel, trace silt/clay, trace c. gravel.
49					
50		7	SS	27 57/5	Same as sample 6.
51					
54					
55		8	SS	50 50/4	Yellowish brown (10YR5/6), f. gravelly, m.-c. sand, trace silt/clay, trace c. gravel.
56					
59					
60		9	SS	46 54	Same as sample 8.
61					Discontinue sampling at 60.5'. Construct MW-1 in borehole.

* A.S.T.M. D1586

WESTON

DRILLING LOG

WELL NUMBER: W-2
LOCATION: Kornylak Property
SURFACE ELEVATION:
DRILLING COMPANY: Mideastern Geotech
DRILLER: Phil Clough
LOG BY: R. Naman/T. Drew

OWNER:
ADDRESS: Hamilton, Ohio
TOTAL DEPTH: 44.8'
WATER LEVEL:
DRILLING METHOD: Auger
DATE DRILLED: 10-22-82
HELPER: Randy Parsons

SKETCH MAP

NOTES:

DEPTH (FEET)	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE BLOWS*	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0					Auger to 4.5'
4					
5				3	Black (10YR2/1), sand and fines, fill
		1	SS	3 3	
6					
9					
10				1 11	
11		2	SS	8	Same as Sample 1.
14					
15				2	Reddish brown (5YR5/3), m.-c. sand, trace gravel, fill
		3	SS	3 2	
16					
19					
20			SS		No penetration.
24					
25				35	Yellowish brown (10YR5/6), f. gravelly m. sand, trace silt/clay, irregular chest fragments
		4	SS	65 44	
26					
28					

* A.S.T.M. D1586

WESTON

DRILLING LOG

WELL NUMBER: W-2
OWNER:
LOCATION: Kornylak Property
ADDRESS: Hamilton Ohio
TOTAL DEPTH: 44.8'
SURFACE ELEVATION:
WATER LEVEL:
DRILLING COMPANY: Mideastern Geotech
DRILLING METHOD: Auger
DATE DRILLED: 10-22-82
DRILLER: Phil Clough
HELPER: Randy Parsons
LOG BY: R. Naman/T. Drew

SKETCH MAP

NOTES:

DEPTH (FEET)	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE BLOWS*	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
28					
29					Light yellowish brown (10YR6/4), f. gravelly m.-c. sand.
30		5	SS	21 36 62	
31					DTW - 29.8'
34					Yellow brown (10YR5/6), m.-c. sandy f. gravel, trace clay/silt, trace c. gravel at bottom of sample.
35		6	SS	41 63 120	
36					DTW - 32.3'
39					Pale yellowish brown (10YR6/4), to very pale brown (10YR7/4) m.-c. sand to f. gravel at base of sample.
40		7	SS	55 88 61	
41					DTW - 33.4'
44		8	SS	123/4	Same as Sample 7.
45					DTW - 33.8' (10-22-82) DTW - 32.0' (10-25-82)
					Discontinue sampling @ 44.8'.
					Borehole backfilled to ground surface with cement/bentonite grout.

* A.S.T.M. D1586

WESTON

DRILLING LOG

WELL NUMBER: W-3
OWNER:
LOCATION: Park Adjacent to Great Miami River
ADDRESS: Hamilton, Ohio
TOTAL DEPTH: 81'
SURFACE ELEVATION:
WATER LEVEL:
DRILLING COMPANY: Mideastern Geotech
DRILLING METHOD: Auger
DATE DRILLED: 10-25 10-26-82
DRILLER: Phil Clough
HELPER: Randy Parsons
LOG BY: R. Naman/T. Drew

SKETCH MAP

NOTES:

DEPTH (FEET)	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE BLOWS*	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0					Auger to 4.5'
4					
				6	Yellowish brown (10YR5/4), f. gravelly f.-c. sand, trace silt/clay.
5		1	SS	7	
				8	
6					
9					
				10	Reddish brown (5YR4/4) to dark gray (5YR4/1) fill.
10		2	SS	11	
				18	
11					
14					
				3	Block (10YR2/1) fill.
15		3	SS	5	
				7	Bottom 2" yellowish brown (10YR5/4), silty clay.
16					
19					
				3	Yellowish brown (10YR5/6), v.f. sandy silt, some clay.
20		4	SS	6	
				6	
21					
24					
				3	Yellowish brown (10YR5/6), silty f. sand, trace clay.
25		5	SS	3	
26				3	

* A.S.T.M. D1586

WESTON

DRILLING LOG

WELL NUMBER: W-3
LOCATION: Park Adjacent to Great Miami River
SURFACE ELEVATION:
DRILLING COMPANY: Mideastern Geotech
DRILLER: Phil Clough
LOG BY: R. Naman/T. Drew

OWNER:
ADDRESS: Hamilton, Ohio
TOTAL DEPTH 81'
WATER LEVEL:
DRILLING METHOD: Auger
DATE DRILLED: 10-25 10-26-82
HELPER: Randy Parsons

SKETCH MAP

NOTES:

DEPTH (FEET)	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE BLOWS*	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
26					@ 27' sand/gravel cuttings.
29					Light yellowish brown (10YR6/4), f. gravelly m. sand, trace c. gravel.
30				18	
		6	SS	26	
31				24	
34					
35				32	Yellowish brown (10YR5/6) m.-c. sandy f.-c. gravel.
		7	SS	55	
36				56	
					Water @ 37.5'
39					Yellowish brown (10YR5/6), f.-c. gravel, trace silt/clay, contains fossils.
40				45	
		8	SS	82	
41				95	
44					Yellowish brown (10YR5/6), f. gravelly c. sand, trace c. gravel.
45				36	
		9	SS	62	
46				44	
					DTW-38.8'
49					
50				19	
		10	SS	55	Yellowish brown (10YR5/6), c. sandy f. gravel, trace silt/clay, trace c. gravel.
51				41	

* A.S.T.M. D1586

WESTON

DRILLING LOG

WELL NUMBER: W-3
OWNER:
LOCATION: Park adjacent to Great Miami River
ADDRESS: Hamilton, Ohio
TOTAL DEPTH: 81'
SURFACE ELEVATION:
WATER LEVEL:
DRILLING COMPANY: Mideastern Geotech
DRILLING METHOD: Auger
DATE DRILLED: 10-25 10-26-82
DRILLER: Phil Clough
HELPER: Randy Parsons
LOG BY: R. Naman/T. Drew

SKETCH MAP

NOTES:

DEPTH (FEET)	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE BLOWS*	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
51					
54					
55				34	Reddish, yellow (7.5YR7/6), silty v.f. sand.
56		11	SS	70 78	DTW - 38.9'
59					
60				27	Same as Sample 11.
61		12	SS	50 54	DTW - 46.2'
64					
65				6	Same as Sample 12.
66		13	SS	11 18	
69					DTW - 47.1'
70				13	Top sample brown, (10YR5/3), clayey silt, trace sand @ 70.5', brown, silty c. sand.
71		14	SS	53 163	DTW - 49.3'
74					
75				8	
76		15	SS	50 61	Light yellowish brown (10YR6/4), f. gravelly m.-c. sand, trace silt/clay.

* A.S.T.M. D1586

WESTON

DRILLING LOG

WELL NUMBER: W-3
OWNER:
LOCATION: Park Adjacent to Great Miami River
ADDRESS: Hamilton, Ohio
TOTAL DEPTH: 81'
SURFACE ELEVATION:
WATER LEVEL:
DRILLING COMPANY: Mideastern Geotech
DRILLING METHOD: Auger
DATE DRILLED: 10-25 10-26-82
DRILLER: Phil Clough
HELPER: Randy Parsons
LOG BY: R. Naman/T. Drew

SKETCH MAP

NOTES:

DEPTH (FEET)	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE BLOWS*	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
76					DTW - 47.5'
79					Same as Sample 15, more clay bottom sample.
80		16	SS	30 75 63	
81					DTW - 45.4'
					Discontinue sampling @ 81'. Borehole backfilled to ground surface with cement/bentonite grout.

* A.S.T.M. D1586

WESTON

DRILLING LOG

WELL NUMBER: W-4
OWNER:
LOCATION: Adjacent to MW-13
ADDRESS: Hamilton, Ohio
TOTAL DEPTH
SURFACE ELEVATION:
WATER LEVEL:
DRILLING COMPANY: Mideastern Geotech
DRILLING METHOD: Auger
DATE DRILLED: 10-27-82
DRILLER: Phil Clough
HELPER: Randy Parsons
LOG BY: R. Naman/T. Drew

SKETCH MAP

NOTES:

DEPTH (FEET)	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE TYPE*	SAMPLE BLOWS*	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0					Auger to 29.5'. Due to existing log for site.
29					Light olive gray (5Y6/2), C. sandy f. gravel, trace c. gravel and clay/silt.
30		1	SS	12 27 56	
31					DTW - 28.1'
34					
35		2	SS	5 11 15	Olive gray (5Y5/2), silty clay, very stiff.
36					
39					Olive gray (5Y5/2), silty clay, trace c. sand and f. gravel, very stiff, partings with tan silt.
40		3	SS	15 31 56	
41					DTW - 28.5'
44					
45		4	SS	28 177	Olive gray (5Y5/2), c. sandy f. gravel, trace c. gravel and silt/clay
46					DTW - 31.9'
49					
50		5	SS	35 75 84	Olive gray (5Y5/2), m.-c. sand, some f. gravel. DTW - 32.2'
51					

* A.S.T.M. D1586

WESTON

DRILLING LOG

WELL NUMBER: W-4
OWNER:
LOCATION: Adjacent to MW-13
ADDRESS: Hamilton, Ohio
TOTAL DEPTH: 61.0'
SURFACE ELEVATION:
WATER LEVEL:
DRILLING COMPANY: Mideastern Geotech
DRILLING METHOD: Auger
DATE DRILLED: 10-27-82
DRILLER: Phil Clough
HELPER: Randy Parsons
LOG BY: R. Naman/T. Drew

SKETCH MAP

NOTES:

DEPTH (FEET)	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE BLOWS*	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
51					
54					
				10	Same as sample 5.
55		6	SS	40	
56				66	
59					Olive gray (5Y5/2), g.-c. gravelly m.-c. sand,
60				14	some of gravel is pink granite.
		7	SS	41	
61				62	
					Discontinue sampling at 61'. Borehole backfilled to ground surface with cement/bentonite grout.

* A.S.T.M. D1586

WESTON

DRILLING LOG

WELL NUMBER: W-5
OWNER:
LOCATION: Electric Power Plant
ADDRESS: Hamilton, Ohio
TOTAL DEPTH: 41'
SURFACE ELEVATION:
WATER LEVEL:
DRILLING COMPANY: Mideastern Geotech
DRILLING METHOD: Auger
DATE DRILLED: 10-27-82
DRILLER:
HELPER:
LOG BY:

SKETCH MAP

NOTES:

DEPTH (FEET)	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE BLOWS*	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0					Coal at surface.
4					
				4	Blank (10YR2/1),m.-c. sand, trace f.-v.c. gravel, contains coal fines.
5		1	SS	4 10	
6					
9					
				3	Top 4 in. yellowish brown f. sand. Middle yellowish brown (10YR5/4), clayey silt.
10		2	SS	3 15	Btoom 4 in. black (10YR2/1), coal fines and fragments.
11					
14					
				3	Black (10YR2/1), coal fines and fragments, trace f.
15		3	SS	3 3	gravel, some orange chips.
16					
19					
				1	Very drak gray (5Y3/1), silty clay with interbeds of black coal fragments.
20		4	SS	2 4	
21					
24					
				WT.	Olive gray (5Y5/2) silty clay, firm, contains roots and shell fragments.
25		5	SS	ROD 2	At 26 ft. sand/gravel cuttings.
26					

* A.S.T.M. D1586

WESTON

DRILLING LOG

WELL NUMBER: W-5
OWNER:
LOCATION: Electric Power Plant
ADDRESS: Hamilton Ohio
TOTAL DEPTH: 41'
SURFACE ELEVATION:
WATER LEVEL:
DRILLING COMPANY: Mideastern Geotech
DRILLING METHOD: Auger
DATE DRILLED: 10-27-82
DRILLER: Phil Clough
HELPER: Randy Parsons
LOG BY:

SKETCH MAP

NOTES:

DEPTH (FEET)	GRAPHIC LOG	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE BLOWS*	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
26					
29					Olive gray (5Y5/2), f. gravelly m.-c. sand, trace clay.
				43	
30		6	SS	55	
				34	
31					DTW - 28.8'
34					
		7	SS	67/3	No recovery - DTW - 31.2'
35					
39					
				48	Yellowish brown (10YR5/4), c. sandy f. gravel, some clay,
40		8		53	trace c. gravel.
				64	DTW - 32.0'
41					
					Discontinue sampling @ 41'.
					DTW - 31.8' on 10-28-82.
					Borehold backfilled to ground surface with
					cement/bentonite grout.

* A.S.T.M. D1586

MEMORANDUM

TO: File

FROM: John T. Fleissner/GLO

DATE: April 25, 1983
(Revised December 12, 1983)

SUBJECT: Chem-Dyne Site Remedial Investigation
Initial Groundwater, Soil, Surface Water and Sediment Investigation
Phase I - Subtask 3-1

JOB NO: W65310.C0

INTRODUCTION

A soil and groundwater sampling effort was performed from April 4 through 13, 1983, at the Chem-Dyne site in Hamilton, Ohio. Sampling was performed both onsite and offsite by personnel from CH2M HILL and Environment and Ecology, Inc. (E&E) as planned by U.S. EPA personnel. This work was performed in partial satisfaction of Contract No. 68-01-6692, Work Assignment No. 21.5M10.0, Subtask 3-1. To expedite completion of this portion of the Work Assignment, verbal authorization from the Contract Officer was received pursuant to CH2M HILL letter of March 31, 1983.

PURPOSE

The purpose of the sampling effort was to gather additional data to investigate seasonal variations of groundwater levels and contamination at the site and document conditions prior to Superfund removal (IRM) activities scheduled to begin May 1. The general scope and timing of this sampling activity was determined by U.S. EPA.

SCOPE

The scope of the sampling effort at the Chem-Dyne site included the following samples:

- One private well (Vaughn Building Company)
- Twenty-one groundwater wells (monitoring well MW-14 was not sampled)
- Six groundwater field blanks
- Two laboratory blanks
- Three groundwater duplicate samples

- Ten onsite soils
- Four offsite soils
- Two surface water (Ford Hydraulic Canal)
- One sediment (Ford Hydraulic Canal)
- One storm sewer water

All groundwater samples were taken from existing groundwater wells. Based on the available mapping of the site vicinity, 4 of the groundwater wells are onsite and 18 groundwater wells are offsite. One of the offsite wells, MW-14, could not be sampled.

All of the water and soil samples were analyzed for the inorganic and organic constituents included in the routine analytical packages by the U.S. EPA contract laboratories. All samples collected during this effort were analyzed by California Analytical Laboratories, Inc., 5895 Power Inn Rd., Sacramento, California 95824.

In addition to the routine analysis, six of the onsite soil samples were also collected for special analytical services (SAS) to determine 2, 3, 7, 8-TCDD, i.e., dioxin. The special analytical service was arranged by U.S. EPA who also selected the "isomer specific" analysis. The SAS laboratory selected was California Analytical Laboratories, Inc.

PERSONNEL

The sampling team included personnel from CH2M HILL and E&E, Inc. as follows:

CH2M HILL

Larry A. Holm, Project Manager/GLO
John T. Fleissner, Project Engineer/GLO
Bill Faught/CVO
Tom A. Gilgenbach/GLO

E&E, Inc.

George Gartseff
Fred Swed
Nancy Aungst

Additional personnel from the U.S. EPA and Ohio EPA were also involved in the sampling effort. Mr. Joseph F. Keeley, U.S. EPA, was at the site April 4 through midday April 6. Keeley directed the sampling procedures and protocol for groundwater sampling. He delivered the Johnson-Keck submersible pump used to purge and sample the monitoring wells. Mr. Don Bruce, U.S. EPA, and David Strayer, OEPA, were onsite April 12 and selected all locations for soil sampling on and offsite. Bruce also selected the depth of

each soil sample and the analysis to be performed on all samples. Finally, Bruce also selected the locations for canal water and sediment samples from the Ford Hydraulic Canal north of the Chem-Dyne site.

GROUNDWATER SAMPLING PROCEDURE

MONITORING WELL SELECTION

The monitoring wells sampled during this effort were received by Joe Keeley, U.S. EPA. These monitoring wells included wells installed in 1981 by E&E, Inc. during FIT activities and wells installed by Roy F. Weston in 1982.

Monitoring wells installed by E&E, Inc. were 2-inch diameter wells. Well logs were available for each of these wells. The monitoring wells installed by Roy F. Weston were 4-inch diameter wells. Well logs were not available for these wells at the time of this sampling effort.

The locations of all monitoring wells are shown in Figure 1.

MONITORING WELL SAMPLING

General Well Sampling Strategy

The general well sampling strategy was to obtain a representative sample of the local groundwater and minimize contamination of both the monitoring well and the sample.

Before sampling began, Joe Keeley suggested the order of well sampling based upon sampling the least contaminated wells first and moving progressively toward the most contaminated wells. The order of monitoring well sampling determined by Keeley was as follows:

1.	MW-1	12.	MW-16
2.	MW-2	13.	MW-8
3.	MW-3	14.	MW-11
4.	MW-21	15.	MW-4
5.	MW-22	16.	MW-7
6.	MW-20	17.	MW-13
7.	MW-19	18.	MW-12
8.	MW-14	19.	MW-5
9.	MW-15	20.	MW-6
10.	MW-17	21.	MW-9
11.	MW-18	22.	MW-10

Well Sampling Equipment

Two types of sampling equipment were used to sample the monitoring wells. A stainless steel submersible pump (Johnson-Keck Model SP-81, Serial Number 141) was used to

purge and pump out samples (except volatile organics) at most of the monitoring wells.

A 2-inch stainless steel bailer was used for monitoring wells MW-9 and MW-6 because the submersible pump did not fit all the way down the well into the screen section. The bailer was also used at MW-5 based on experience at MW-6. (At MW-14, the bailer was also tried but failed to pass down through the well to the screen section. Thus, MW-14 was not sampled.)

Well Depth and Water Surface Measurement

Before purging the monitoring wells, the total depth of the well and the location of the groundwater surface were measured. The total depth was sounded with a stainless steel weight and monofilment line. The water surface was measured with an M-scope. A fiberglass or steel tape was used for measurement of the sounding and M-scope wire. All measurements were made from the top of the well casing. Table 1 contains the well measurement data from both this Phase I work and previous work by Roy F. Weston in December 1982.

The well sounding equipment and M-scope were decontaminated after each use by rinsing the equipment through the TSP, acetone solution, and distilled water described on the next page.

Well Purging

Each monitoring well was purged prior to taking the groundwater sample. For simplicity, the volume of purge water at each well was based on the total depth of the well, either shallow or deep, and either one 15-minute duty cycle or three consecutive 15-minute duty cycles, respectively, of the sampling pump. This procedure was selected by Keeley.

The routine for pump operation during well purging was based on the constraints of the pump itself. The submersible pump has a normal duty cycle of 15 minutes and an approximate discharge flow rate of 1.0 gpm. After 15 minutes of operation, the pump must be idle for a minimum of 5 minutes for pump and motor cooling. The pump was operated for either one or three duty cycles, depending upon the well volume, prior to sampling.

During well purging, the pump was periodically moved within the water column from top to bottom to distribute the source of purge suction.

Well purge water from each well was collected in 55-gallon drums, each of which was disposed of on Chem-Dyne site within the locked site fence.

Well Sampling

Most of the monitoring wells were sampled with the submersible pump. At these wells, the submersible pump was used to take the samples for base/neutral, acid, and pesticide organics, metals, and cyanide. At three wells MW-13, MW-12, and MW-10, the pump was also used to take a duplicate set of samples for volatile organics. As the routine procedure, samples for volatile organic analysis were taken with the stainless steel bailer at all monitoring wells.

Three of the monitoring wells, MW-9, MW-6, and MW-5, were purged and sampled completely with the stainless steel bailer. The bailer was used only when the submersible pump could not be used.

Samples were collected by filling the sample bottles directly from the sampling pump discharge line or the bailer. All sample fractions for metals analysis were filtered through a 0.45u filter prior to preservation. Sample fractions for metals were preserved with nitric acid and fractions for cyanide were preserved with sodium hydroxide.

Decontamination

Decontamination procedures included steps to avoid contamination of the sample and well and to minimize carry over of contaminants from one well to another. In summary, the steps used to minimize contamination were as follows:

- Sample from the least to most contaminated wells based on previous groundwater data.
- Decontaminate the outside of all equipment used in the wells including depth sounding weight and line, M-scope, sampling pump (or bailer) and discharge line after each well sampling.
- Decontaminate the inside of the submersible pump by pumping decontamination solutions in sequence through the pump after each well sampling.
- Purge each monitoring well prior to sampling. This not only removes stagnant water in the well but also pumps out any contamination carried into the well and pumps decontamination solution out of the pump discharge line.

Three solutions were used in sequence to decontaminate well sampling equipment. These solutions were trisodium phosphate and distilled water, acetone and distilled water (approximately 20 percent acetone V/V), and distilled water rinse. To decontaminate the inside of the sampling pump and line, each solution was pumped for 60 seconds through the pump and discharge line. Decontamination solutions were typically used for two wells and then disposed of.

The decontamination procedure for gloves used to handle equipment was washing in TSP solution followed by tap water rinse.

The spent decontamination solutions were combined with the purge water in 55-gallon drums and disposed of onsite. Each drum was marked with the date and the words "Purge and Decon H_2O" using orange spray paint.

SOIL SAMPLING PROCEDURE

SOIL SAMPLE LOCATION SELECTION

All offsite soil sampling locations were selected on Tuesday, April 12 by Don Bruce of U.S. EPA with David Strayer of OEPA. They selected the soil sample locations based on their knowledge of the site history and former operations.

Offsite Sampling Locations

Soil samples were taken at four offsite locations:

- A backyard garden at a private residence, 547 N. Fifth St.
- Vicinity of second base on hardball diamond in southeast corner of athletic field east of the site.
- South of the Nimrod Industries building truck parking area, in the northwest corner of the cleared field.
- Same as above; in the northeast corner of the cleared field.

These offsite sampling locations are shown in Figure 2.

At each of the four offsite locations, soil samples were taken from the top layer of soil, approximately 0 to 2 inches in depth. The soil in a 1-square foot area was mixed with a stainless steel spoon to homogenize the sample. After mixing, two 8-ounce wide-mouth glass sample jars were

alternately filled with spoonfuls of soil until each jar was filled.

Onsite Soil Sampling Locations

Onsite soil sampling locations were selected by Bruce and Strayer accompanied by Aungst who performed continuous air monitoring by HNU because all three worked using air purifying respirators. Onsite sampling locations were staked and flagged. Locations were recorded on the established site grid coordinate plan which is shown in Figure 3. The onsite soils sampling work was performed late Tuesday and Wednesday afternoon, after both Bruce and Strayer left the site.

SOIL SAMPLING

General Strategy

All soil sampling, both onsite and offsite, was performed as directed by Don Bruce, U.S. EPA. In general, offsite samples were all taken first followed by onsite samples which were taken over a period of 2 days. A summary of the soil sample locations, depths, analysis, and comments is given in Table 2.

Equipment

Soil sampling equipment consisted of stainless steel spoons, a small shovel, and wide-mouth 8-ounce sample jars. Soil samples were simply prepared and placed in the jars using the stainless steel spoons. If the sample was taken below the surface, then the small shovel was used to excavate to the desired sampling depth.

SAMPLING AND DECONTAMINATION TECHNIQUES

Soil samples were collected by filling the 8-ounce wide-mouth glass jars (either two or three jars total for each location) alternately by using a stainless steel spoon. After each jar was filled approximately three-fourths full, it was covered with a teflon-lined cap. After sampling at each location, the stainless steel spoon was either discarded or decontaminated. When the shovel was used to excavate to a shallow depth prior to sampling, the shovel was decontaminated after use at each sampling location.

The decontamination procedure used for the shovel and stainless steel spoons consisted of washing in TSP solution, rinse in pure acetone, and a final rinse in distilled water.

CANAL AND STORM SEWER SAMPLING PROCEDURE

CANAL SAMPLING

Two water samples and one sediment sample were taken from the Ford Hydraulic Canal north of the Chem-Dyne site. The purpose of these samples was to look for any contamination in the canal potentially caused by drainage from the Chem-Dyne site.

Sampling Locations

The water and sediment sampling locations were chosen to obtain samples upstream and downstream of the storm sewer discharge from the Chem-Dyne site. Locations were selected by Don Bruce. One upstream water sample was taken and one water and sediment samples were taken downstream. The approximate locations of the canal samples are shown in Figure 2.

The location of the storm sewer shutoff gate vault is also shown in Figure 2.

Sampling Technique

The canal water samples were obtained by dipping the respective sample bottles directly into the canal water from the shore. Water samples were taken approximately 1 to 2 feet from the shore in moving water.

The canal sediment sample was obtained by scooping sediment from the canal near the north shore by using a stainless steel spoon. Sample jars were filled alternately until each was three-fourths filled.

STORM SEWER SAMPLING

In addition to the canal samples, one water sample was collected from the storm sewer which drains beneath the Chem-Dyne site.

The water sample from the storm sewer was collected from the vault for the shutoff gate, immediately north of the site. The location of the vault is shown in Figure 2.

The storm sewer drainage water was collected by placing a 3-gallon plastic pail, lowered on a rope, near the stormwater discharge pipe visible in the shutoff gate, immediately north of the site.

SAMPLING CHRONOLOGY

The following chronology summarizes the major activities and events for each day of site sampling work at Chem-Dyne from April 4 through April 14.

April 4, 1983, Monday

The sampling team traveled to the site. Holm met with Keeley and visited the site and vicinity to locate onsite and offsite wells. Holm and Keeley also discussed the general approach to well sampling and summarized the known information on the monitoring wells.

April 5, 1983, Tuesday

Team: Larry Holm, CH2M HILL
John T. Fleissner, CH2M HILL
Tom Gilgenbach, CH2M HILL
Bill Faught, CH2M HILL
George Gartseff, E&E Inc.
Fred Swed, E&E Inc.
Nancy Aungst, E&E Inc.
Joe Keeley, U.S. EPA

Samples obtained: None. Tuesday was used for site setup and preparation.

Comments: None.

April 6, 1983, Wednesday

Team: Same as Tuesday. Keeley forced to leave site at noon because of personal situation at home.

Samples obtained: Vaughn Building Company private well.

MW-2
MW-1
MW-3
Distilled water blank
Pumped distilled water blank
Field blank

Comments: MW-2 was sampled before MW-1 because team set up first at MW-2. For MW-3, the filtered sample was preserved and marked for CN analysis and the unfiltered sample was preserved for metals.

April 7, 1983, Thursday

Team: Larry Holm, CH2M HILL
John T. Fleissner, CH2M HILL
Tom Gilgenbach, CH2M HILL
Bill Faught, CH2M HILL
George Gartseff, E&E Inc.
Fred Swed, E&E Inc.
Nancy Aungst, E&E Inc.

Samples obtained: MW-21
MW-22
MW-20
MW-19
Field Blank

Comments: Joe Baker and Don Bishop from Miami Conservancy District, arrived at MW-22 and gave Fleissner the key to the storm sewer vault.

April 8, 1983, Friday

Team: Same as Thursday, April 7, 1983.

Samples obtained: MW-15
(MW-14 attempted but no sample obtained)
MW-17
MW-18
Field Blank

Comments: MW-14 was discovered to have approximately 18 inches of static water; however, neither sampling pump nor bailer would fit into the well screen section. MW-14 also found unlocked and uncovered.

April 9 and 10, 1983, Saturday and Sunday

Sampling crew remained in Cincinnati. CH2M HILL personnel purchased disposables and laundered coveralls on Saturday.

April 11, 1983, Monday

Team: Same as Friday, April 8, 1983.

Samples obtained: MW-16
MW-8
MW-4
MW-11
MW-7
MW-13
MW-12
Field blank

Comments: Five coolers shipped from the site via Federal Express.

April 12, 1983, Tuesday

Team: Same as Monday, April 11, 1983.

Don Bruce, U.S. EPA
David Strayer, Ohio EPA

Samples obtained: OS-1 (offsite soil)
OS-2 (offsite soil)
OS-3 (offsite soil)
OS-4 (offsite soil)
MW-10
MW-9
SS-1 (onsite soil)
SS-2 (onsite soil)
SS-3 (onsite soil)
SS-4 (onsite soil)
Field blank

Comments: Onsite and offsite soil sampling locations selected by Don Bruce and Dave Strayer. Onsite locations were staked and flagged by Bruce and Strayer.

April 13, 1983, Wednesday

Team: Same as Monday, April 11, 1983

Don Bruce, U.S. EPA

Samples obtained: Upstream canal water
Downstream canal sediment
Storm sewer water
MW-6
MW-5
Field blank
SS-5 (onsite soils)
SS-6 (onsite soils)
SS-7 (onsite soils)
SS-8 (onsite soils)
SS-9 (onsite soils)
SS-10 (onsite soils)

Comments: Bruce left site at approximately 1310. Onsite soils sample locations were staked and flagged by Bruce and Strayer on the previous day.

FIELD DATA SUMMARIES

The field data are presented on several tables which follow. These data are included without observations or evaluation since more data will be generated from future sampling efforts. Data evaluation will be performed after all data are available under Task 5, Site Investigation Analysis in the final work plan.

The field data summaries include the following tables and figures:

- Figure 1 - Monitoring Well Locations

- Figure 2 - Offsite Soil, Storm Sewer, and Ford Hydraulic Canal Sampling Locations
- Figure 3 - Onsite Soil Sampling Locations
- Table 1 - Monitoring Well Data Summary
- Table 2 - Onsite and Offsite Soil Sample Data Summary
- Table 3 - Inorganic Analysis of Groundwater and Surface Water
- Table 4 - Organic Analysis of Groundwater and Surface Water
- Table 5 - Inorganic Analysis of Soil and Sediment
- Table 6 - Organic Analysis of Onsite Soil
- Table 7 - Organic Analysis of Offsite Surface Soils
- Table 8 - Organic Analysis of Ford Canal Sediment and Water
- Tentatively Identified Compounds detected in soil and groundwater samples are presented in Appendix B.

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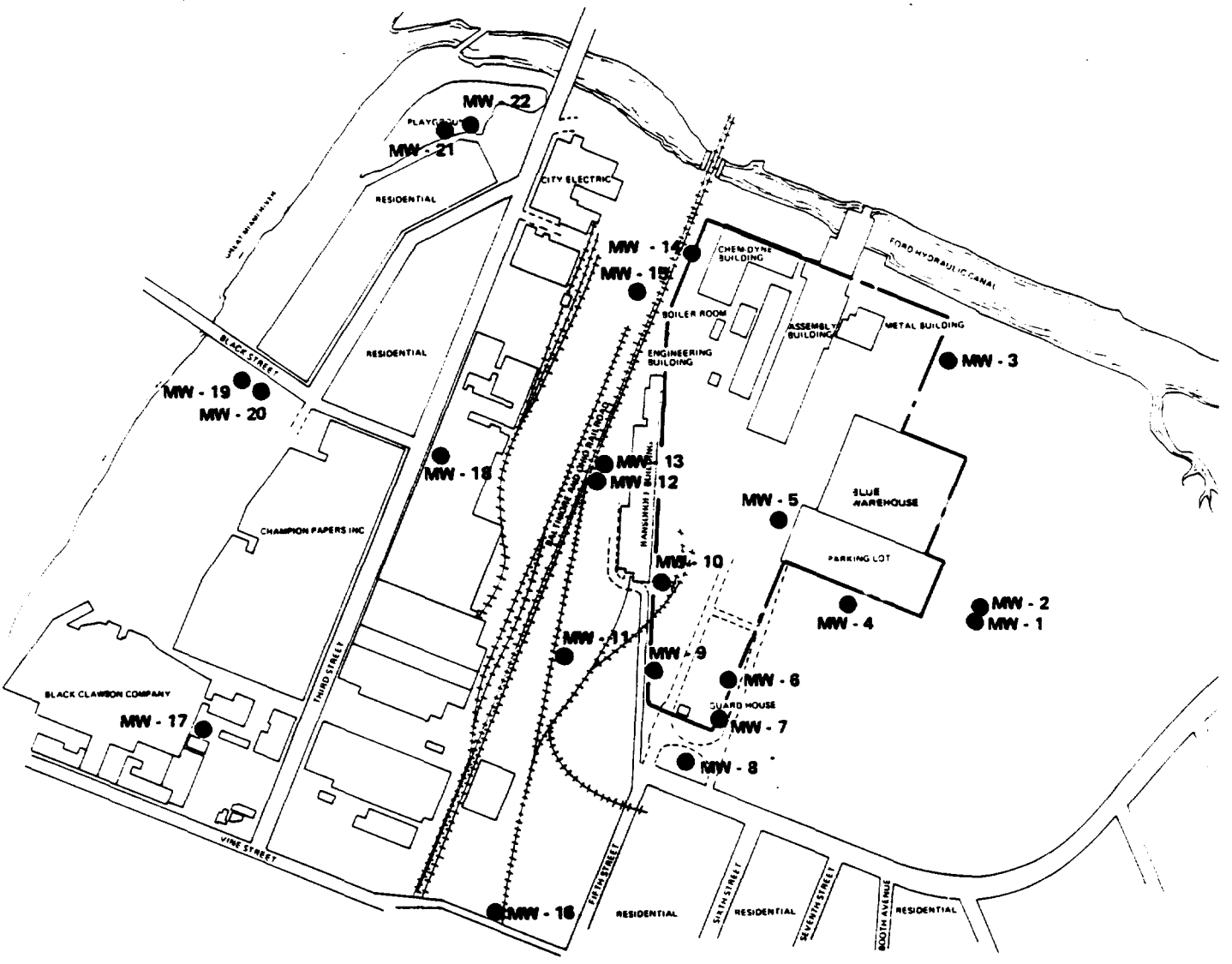


LEGEND

● WELL LOCATION

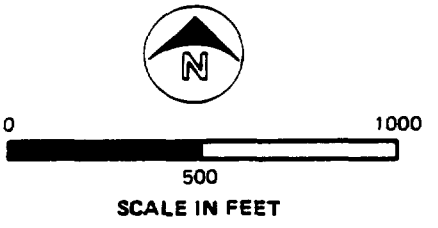
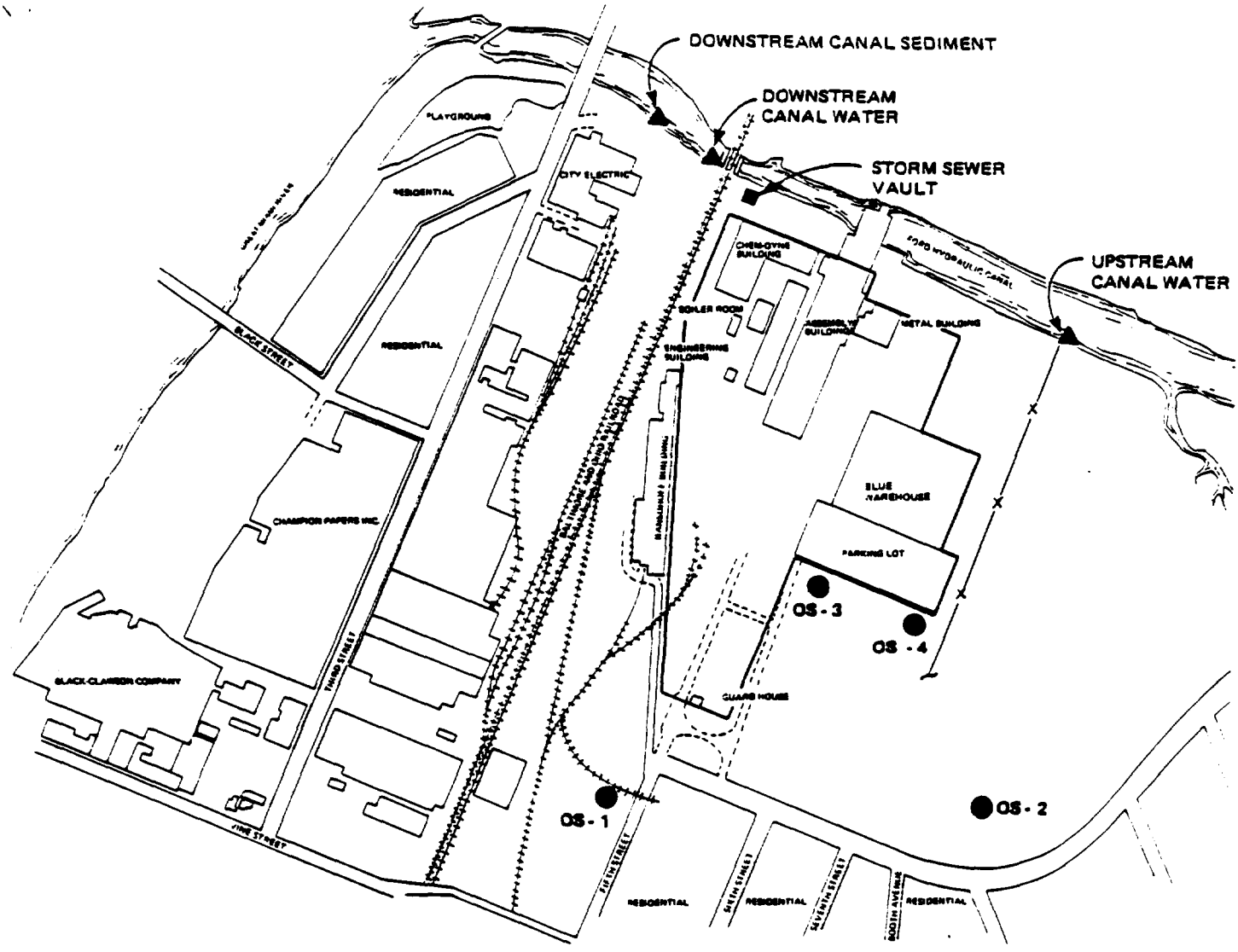


FIGURE 1
MONITORING WELL LOCATIONS
APRIL 6 - 12, 1983
TM SUBTASK 3-1



LEGEND

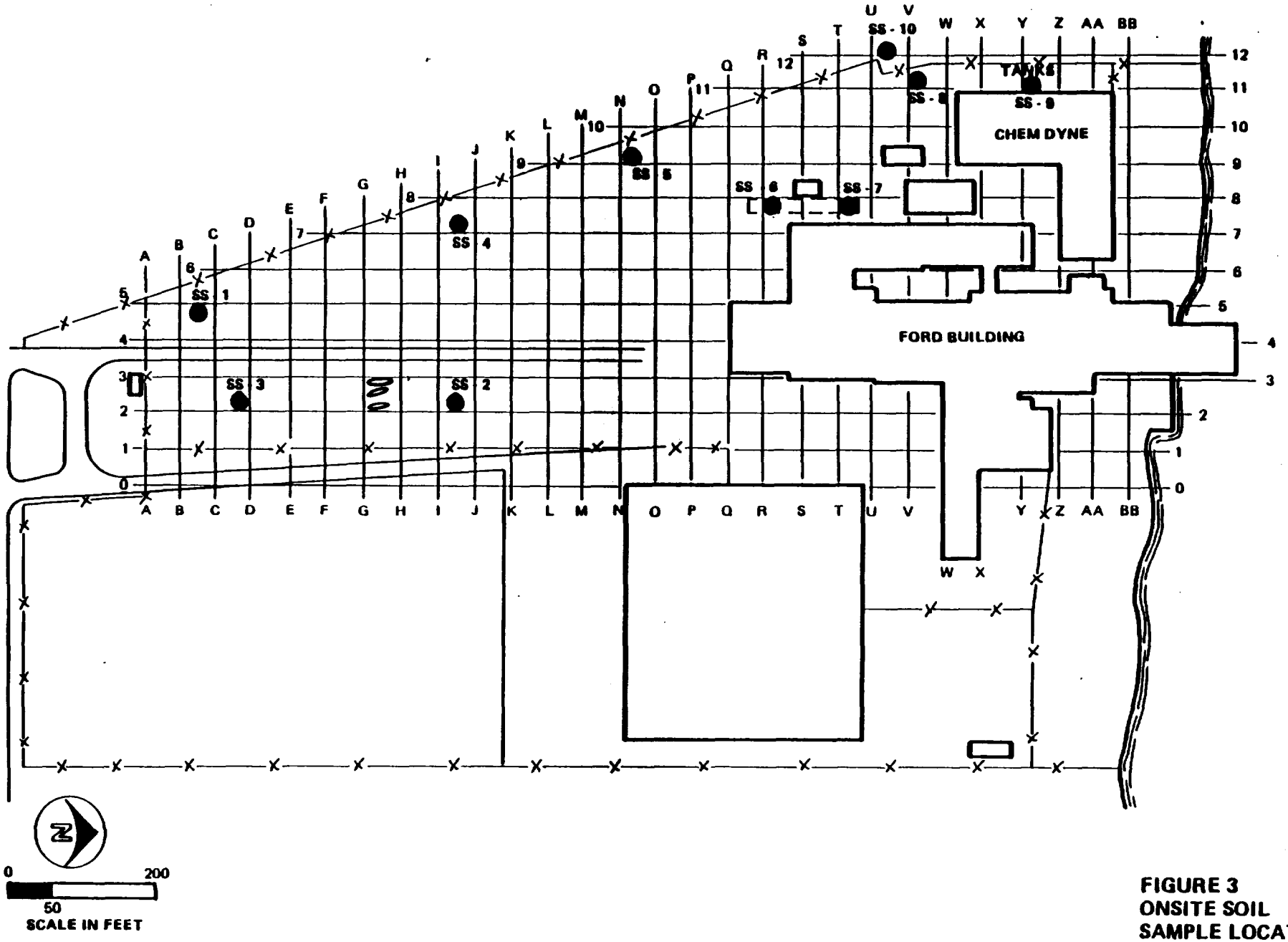
● SAMPLING LOCATION

N

1000

500

FIGURE 2
OFFSITE SOIL, STORM SEWER, AND FORD HYDRAULIC CANAL SAMPLING LOCATIONS
APRIL 11 - 12, 1983
TM SUBTASK 3-1



NOTE: Grids are 50 ft. O.C. to O.C.,

FIGURE 3
ONSITE SOIL
SAMPLE LOCATIONS
APRIL 11 - 12, 1983
TM SUBTASK 3-1

Table 1
PHASE I MONITORING WELL DATA SUMMARY CHEM-DYNE SITE
APRIL 6-12, 1983
HAMILTON, OHIO W65310.CO

WELL NUMBER		PREVIOUS DATA			NEW DATA					
MW-	As-Installed	Elevation Top of Casing (feet)	Estimated Static Water Volume (cubic/feet)	Water Elevation[a] (feet)	Elevation Top of Casing (feet)	Date of Measurement	Static Water Elevation[b] (feet)	Elevation bottom of well (feet)	Initial HNU Reading in Casing (ppm)	Comments
MW-1	(Weston)	591.09	2.8	563.59	591.12	4/6/83	564.29	530.00	Less than 1.0	-
MW-2	(Weston)	591.49	0.54	563.67	591.52	4/6/83	564.44	556.40	Less than 1.0	-
MW-3	(Weston)	591.15	0.51	563.95	591.14	4/6/83	564.64	554.97	Less than 1.0	-
MW-4	B-9	593.20	0.04	563.44	592.89	4/11/83	564.14	559.31	Less than 1.0	-
MW-5	B-16	591.91	-	563.60	591.62	4/12/83	564.62	557.04	-	Cover in place but no padlock
MW-6	B-14	592.49	0.04	562.79	592.19	4/12/83	564.52	560.61	14.0	Padlock in place but no cover
MW-7	B-8	593.59	0.10	563.36	593.30	4/11/83	564.38	559.13	5.0 to 10	-
MW-8	(Weston)	598.20	0.35	563.20	597.91	4/11/83	563.91	556.83	1.0 to 2.0	-
MW-9	B-15	593.11	-	563.26	592.83	4/12/83	563.83	558.16	3.0	-
MW-10	B-17	591.84	0.14	563.27	591.58	4/12/83	564.50	556.00	-	-
MW-11	B-12	598.66	0.13	563.05	598.36	4/11/83	564.19	558.69	2.0 to 2.5	-
MW-12	(Weston)	593.44	2.65	563.11	593.18	4/11/83	564.35	534.76	12.5	-
MW-13	B-11	593.47	0.08	563.30	593.20	4/11/83	564.28	560.20	Less than 1.0	-
MW-14	B-25	594.66	-	563.62	594.39	4/8/83	564.14	562.81	-	Bare casing; no lock cover
MW-15	(Weston)	595.89	0.16	563.41	595.56	4/8/83	563.89	555.56	10 to 17	-
MW-16	(Weston)	595.09	0.17	562.42	594.82	4/11/83	563.24	553.74	1.0 to 2.0	-
MW-17	(Weston)	597.55	0.45	560.68	597.32	4/8/83	561.15	553.32	Less than 1.0	-
MW-18	B-3	596.90	0.10	562.42	594.65	4/8/83	563.32	556.73	5.0 to 6.0	-
MW-19	(Weston)	591.23	2.75	560.72	591.42	4/7/83	559.79	524.71	9.0	-
MW-20	(Weston)	591.80	0.88	561.89	592.02	4/7/83	562.60	551.19	1.0 to 2.0	No casing cover in place
MW-21	(Weston)	597.87	0.92	561.39	598.06	4/7/83	562.23	549.81	Less than 1.0	-
MW-22	(Weston)	597.35	3.57	560.31	597.57	4/7/83	560.90	522.57	7.0 to 8.0	-

[a] Water elevation before pumping December 6, 7, and 8, 1982.
[b] Water elevation before pumping April 6, 7, 8, 11 and 12, 1983.
[c] Previous elevation was used in this calculation as the standpipe was sawed off after measuring the water level and prior to the survey.

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Table 2
OFFSITE AND ONSITE SOIL SAMPLE DATA SUMMARY
CHEM-DYNE SITE
APRIL 11-12, 1983
HAMILTON, OHIO
W65310.CO

Soil Sample Number	General Location Description	Approximate Sample Depth, in.	Selected Analysis[a]	Comments
OFFSITE SOIL SAMPLES				
OS-1	Backyard garden 547 N. Fifth St.	0-2	A, B	-
OS-2	2nd base SE corner field	0-2	A, B	-
OS-3	South of Nimrod NW corner of field	0-2	A, B	Very compacted granular fill could not sample deeper
OS-4	South of Nimrod NE corner of field	0-2	A, B	Very compacted granular fill could not sample deeper
ONSITE SOIL SAMPLES				
SS-1	Grid B-4	6"	A, B	HNU <1.0 ppm imm above soil
SS-2	Grid I-2	6"	A, B	HNU <1.0
SS-3	Grid C-2	6"	A, B	HNU <1.0; some clayey mat
SS-4	Grid I-7	0-2	A, B	Sample from under water
SS-5	Grid N-9	0-2	A, B, C	-
SS-6	Grid R-7	0-2	A, B, C	-
SS-7	Grid T-7	0-2	A, B, C	-
SS-8	Grid V-11	0-2	A, B, C	-
SS-9	Grid Y-11	0-2	A, B, C	-
SS-10	Grid U-12	0-2	A, B, C	

Notes:

a)
A - Routine CLP analysis for organics in soil.
B - Routine CLP analysis for inorganics in soil.
C - Special analytical service for 2,3,7,8 - TCDD in soil.

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Table 3 (Page 1 of 3)
SUMMARY OF INORGANIC ANALYSES OF GROUNDWATER AND SURFACE WATER AT CHEM-DYNE
PHASE I - HYDROGEOLOGIC STUDY
CASE NO. 1608
April 4-14, 1983
W65310.CO

Constituent[a]	MW-1	MW-2	MW-3[b]	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	Duplicate MW-10	MW-11	MW-12	Duplicate MW-12	MW-13
Aluminum	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200
Chromium	< 10	< 10	12	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Barium	< 100	< 100	150	650	400	190	160	180	420	370	360	< 100	1,600	1,700	190
Beryllium	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Cadmium	< 1	< 1	1.5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Copper	< 50	54	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Iron	< 50	2,200	7,800	4,200	< 50	< 50	1,940	7,400	< 50	4,700	5,200	< 50	7,700	8,150	< 50
Lead	< 5	< 5	96	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Nickel	< 40	< 40	< 40	< 40	75	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
Manganese	< 15	120	220	260	2,100	550	2,750	48	74	2,200	2,300	48	120	120	260
Zinc	1,900	1,100	5,800	31	150	1,400	32	3,100	190	78	90	43	5,900	6,500	38
Boron	360	350	430	280	600	450	300	340	410	700	720	560	540	550	540
Vanadium	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200
Arsenic	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	14	13	< 10	< 10	< 10	< 10
Antimony	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Selenium	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Thallium	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0.25	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	2.5	< 0.2	< 0.2	1.1
Tin	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Silver	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Cyanide	< 10	< 10	< 10	< 10	< 10	14	< 10	< 10	23	14	42	< 10	< 10	19	< 10

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Table 3 (Page 2 of 3)
SUMMARY OF INORGANIC ANALYSES OF GROUNDWATER AND SURFACE WATER AT CHEM-DYNE
PHASE I - HYDROGEOLOGIC STUDY
CASE NO. 1608
April 4-14, 1983
W65310.CO

Constituent[a]	Duplicate MW-13	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-21	MW-22	Ford Canal Upstream	Ford Canal Downstream	Storm Sewer Gate Vault	Vaughn Well[c]
Aluminum	< 200	330	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200
Chromium	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Barium	190	125	< 100	320	< 100	122	110	< 100	130	< 100	< 100	140	130
Beryllium	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Cadmium	< 1	< 1	< 1	< 1	1.4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cobalt	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Copper	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	14,000
Iron	< 50	16,000	< 50	980	180	1,400	< 50	53	< 50	< 50	< 50	< 50	5,400
Lead	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	17
Nickel	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
Manganese	240	1,100	360	700	470	110	< 15	< 15	98	24	20	310	220
Zinc	25	1,800	690	2,580	90	350	1,900	2,500	570	18	20	600	58
Boron	530	750	190	240	760	420	350	330	380	360	390	920	420
Vanadium	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200
Arsenic	< 10	17	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Antimony	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Selenium	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Thallium	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Mercury	< 0.2	< 0.2	< 0.2	0.33	0.49	< 0.2	< 0.2	< 0.2	< 0.2	0.2	2.25	< 0.2	< 0.2
Tin	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Silver	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Cyanide	< 10	< 10	< 10	< 10	< 10	42	14	< 10	< 10	42	46	33	14

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Table 3 (Page 3 of 3)

SUMMARY OF INORGANIC ANALYSES OF GROUNDWATER AND SURFACE WATER AT CHEM-DYNE

PHASE I - HYDROGEOLOGIC STUDY

CASE NO. 1608

April 4-14, 1983

W65310.CO

Constituent[a]	INTERIM PRIMARY DRINKING WATER STANDARDS[b] Maximum Concentration	EPA AMBIENT WATER QUALITY CRITERION (for protection of freshwater aquatic life)[c,d,e] Acute	Chronic
Aluminum			
Chromium	50		
Barium	1,000		
Beryllium		NCA	NCA
Cadmium	10	(12)	(0.10)
Cobalt			
Copper		(77)	(5.6)
Iron			
Lead	50	(872)	(87)
Nickel		(5,067)	(263)
Manganese			
Zinc		(969)	47
Boron			
Vanadium			
Arsenic	50	440	NCA
Antimony		NCA	NCA
Selenium	10	260	35
Thallium		NCA	NCA
Mercury	2	4.1	0.2
Tin			
Silver	50	(40)*	NCA
Cyanide		52	3.5

[a]All concentrations are expressed as ug/l.
[b]Safe Water Drinking Act of 1974.
[c]1980 EPA AMBIENT WATER QUALITY CRITERIA.
[d]Values within parentheses are derived from the following equations: Calculations assume water hardness value of 378 mg/l

Cadmium: acute = e exp (1.05 [ln (hardness)] - 3.73)
chronic = e exp (1.05 [ln (hardness)] - 8.53)
Copper: acute = e exp (0.94 [ln (hardness)] - 1.23)
Lead: acute = e exp (1.22 [ln (hardness)] - 0.47)
chronic = e exp (2.35 [ln (hardness)] - 9.48)
Nickel: acute = e exp (0.76 [ln (hardness)] + 4.02)
chronic = e exp (0.76 [ln (hardness)] + 1.06)
Silver: acute = e exp (1.72 [ln (hardness)] - 6.52)
Zinc: acute = e exp (0.83 [ln (hardness)] + 1.95)

[e]NCA denotes no criterion available.

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Table 4 (page 1 of 9)
SUMMARY OF PRIORITY POLLUTANT ORGANIC ANALYSIS OF GROUNDWATER AND SURFACE WATER
AT CHEM-DYNE PHASE I - HYDROGEOLOGIC STUDY
CASE NO. 1608
APRIL 6-13, 1983
N65310.CO

MONITORING WELL

Compound[a,b]	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	Duplic. MW-10	Pumped VOA MW-10	MW-11	MW-12	Duplic. MW-12	Pumped VOA MW-12
Acid Compounds, ug/l																
2,4-dimethylphenol												NA				NA
2-nitrophenol							20K					NA				NA
2,4-dinitrophenol												NA				NA
phenol							10K			320	260	NA				NA
Base/Neutral Compounds, ug/l																
bis(2-chloroethyl)ether												NA				NA
1,2-dichlorobenzene										110	100	NA				NA
1-3-dichlorobenzene										10K	10K	NA				NA
1,4-dichlorobenzene										11	11	NA				NA
isophorone										10K	10K	NA				NA
hexachlorocyclopentadiene							10K					NA				NA
naphthalene										10K		NA				NA
bis(2-ethylhexyl)phthalate					170	290	10K		260	10K		NA				NA
benzyl butyl phthalate												NA				NA
di-n-butyl phthalate										10K		NA				NA
di-n-octyl phthalate												NA				NA
Volatiles, ug/l																
benzene			5K	5K	39	55	360			340	460	460				
carbon tetrachloride					25	5,100	1,100		1,200	230	480	410				
chlorobenzene							110			100K	110	110				
1,2-dichloroethane					28	165				2,400	3,500	3,400				
1,1,1-trichloroethane					90	120	1,400			3,400	5,800	5,700				
1,1-dichloroethane				140	32		94			240	330	340				
1,1,2-trichloroethane					45	25				6,400	7,200	7,500			19	5
1,1,2,2-tetrachloroethane					62		63			5,100	5,300	5,800			10K	10K
chloroethane				690												
chloroform					180	15,000	5,000		440	1,500	2,200	2,200				

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Table 4 (Page 2 of 9)

MONITORING WELL

Compound[a,b]	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	Duplic. MW-10	Pumped VOA MW-10	MW-11	MW-12	Duplic. MW-12	Pumped VOA MW-12
Volatiles (continued)																
1,1-dichloroethene					37		17			1,000	1,800	1,800		5K	5K	
trans-1,2-dichloroethene				890	100					33,000	32,000	32,000		51	50	7
1,2-dichlorpropane							300				40	100K				
ethylbenzene										520	860	920				
methylene chloride											280	260				
bromodichloromethane						55										
fluortrichloromethane												100K				
chlorodibromomethane																
tetrachloroethene		5K			60					2,300	2,900	2,900		9	10	5K
toluene				5	8		20			4,200	4,800	5,000	6	12	18	7
trichlorethene				75	92					10,000	9,500	9,600		44	43	10
vinyl chloride				10							350	120		10K	10K	
Pesticides, ug/l																
dieldrin							5K					NA				NA
4,4'-DDT							5K					NA				NA
4,4'-DDE												NA				NA
4,4'-DDD												NA				NA
a-endosulfan												NA		0.08		NA
b-endosulfan							5K					NA				NA
endrin												NA				NA
a-BHC												NA				NA
b-BHC				0.10			5K					NA				NA
d-BHC							5K					NA				NA
g-BHC (lindane)												NA				NA
r-BHC												NA				NA
Nonpriority Pollutants Hazardous Substances, ug/l																
benzoic acid				100K						190	190	NA				NA
2-methylphenol										11	11	NA				NA
4-methylphenol										50	50	NA				NA
acetone				50	130	650	27,000				200	300	30		92	
2-butanone							4,500				550	930				

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Table 4 (Page 3 of 9)

MONITORING WELL

Compound[a,b]	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	Duplic. MW-10	Pumped VOA MW-10	MW-11	MW-12	Duplic. MW-12	Pumped VOA MW-12
Nonpriority Pollutants (continued)																
carbon disulfide							200									
4-methyl-2-pentanone							200			240	340	390				
o-xylene										640	990	1,100				
Dioxins																
2,3,7,8-tetrachlorodibenzo -p-dioxin												NA				NA

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Compound[a,b]	MONITORING WELL													
	MW-13	Duplic. MW-13	Pumped VOA MW-13	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-21	MW-22	Ford Canal Upstream	Downstream	Storm Sewer Gate Vault
Acid Compounds, ug/l														
2,4-dimethylphenol			NA											
2-nitrophenol			NA											
2,4-dinitrophenol			NA											
phenol			NA	10K										
Base/Neutral Compounds, ug/l														
bis(2-chloroethyl)ether			NA											
1,2-dichlorobenzene			NA											
1-3-dichlorobenzene			NA											
1,4-dichlorobenzene			NA											
isophorone			NA											
hexachlorocyclopentadiene			NA											
naphthalene			NA											
bis(2-ethylhexyl)phthalate			NA											
benzyl butyl phthalate			NA											
di-n-butyl phthalate			NA											
di-n-octyl phthalate			NA											
Volatiles, ug/l														
benzene				680			5K							5K
carbon tetrachloride			5K											
chlorobenzene				1,400										5K
1,2-dichloroethane	3	5		17,000			75							33
1,1,1-trichloroethane	12	13	13	60										21
1,1-dichloroethane				2,900			26							5K
1,1,2-trichloroethane	100	110	92	12,000			170							26
1,1,2,2-tetrachloroethane	100	120	97	6,000			10K							20
chloroethane				250										
chloroform	5	6	6	2,800			5							24
1,1-dichloroethene	10	12	9	6,200			26							
trans-1,2-dichloroethene	67	73	65	12,000			67							6

Table 4 (Page 5 of 9)

Compound[a,b]	MONITORING WELL													
	MW-13	Duplic. MW-13	Pumped VOA MW-13	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-21	MW-22	Ford Canal Upstream	Ford Canal Downstream	Storm Sewer Gate Vault
Volatiles (continued)														
1,2-dichlorpropane				130			390							
ethylbenzene				14										
methylene chloride	50.3			450										
bromodichloromethane														
fluortrichloromethane														
chlorodibromomethane	10	12	6											
tetrachloroethene	10	12	6	900										12
toluene	68	94	85	1,300		5K			5K	5K			5K	6 5
trichlorethene				4,600										19
vinyl chloride				6,100			470							
Pesticides, ug/l														
dieldrin			NA											0.05K
4,4'-DDT			NA											
4,4'-DDE			NA											
4,4'-DDD			NA											
a-endosulfan			NA											
b-endosulfan			NA											
endrin			NA											0.05
a-BHC			NA											
b-BHC			NA											
d-BHC			NA											
g-BHC (lindane)			NA											
r-BHC			NA											
Nonpriority Pollutants Hazardous Substances, ug/l														
benzoic acid			NA											
2-methylphenol			NA											
4-methylphenol			NA									19		
acetone			35				126	53						
2-butanone						23								

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Compound[a,b]	MONITORING WELL MW-13	Duplic. MW-13	Pumped VOA MW-13	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-21	MW-22	Ford Canal Upstream	Ford Canal Downstream	Storm Sewer Gate Vault
Nonpriority Pollutants (continued)														
carbon disulfide														
4-methyl-2-pentanone											10			
o-xylene														
Dioxins														
2,3,7,8-tetrachlorodibenzo -p-dioxin			NA											

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-6}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table 4 (page 7 of 9)
SUMMARY OF PRIORITY POLLUTANT ORGANIC ANALYSIS OF GROUNDWATER AND SURFACE WATER
AT CHEM-DYNE PHASE I - HYDROGEOLOGIC STUDY
CASE NO. 1608
APRIL 6-13, 1983
M65310.CO

Compound[a,b]	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Acid Compounds, ug/l		
2,4-dimethylphenol		
2-nitrophenol	NCA	
2,4-dinitrophenol	70	
phenol	3,500	
Base/Neutral Compounds, ug/l		
bis(2-chloroethyl)ether		0.30
1,2-dichlorobenzene	400	
1-3-dichlorobenzene	400	
1,4-dichlorobenzene	400	
isophorone	5,200	
naphthalene	NCA	0.028
bis(2-ethylhexyl)phthalate	15,000	
benzyl butyl phthalate	NCA	
di-n-butyl phthalate	34,000	
di-n-octyl phthalate	NCA	
Volatiles, ug/l		
benzene		6.6
carbon tetrachloride		
chlorobenzene	488	
1,2-dichloroethane		9.4
1,1,1-trichloroethane	18,500	
1,1-dichloroethane	NCA	
1,1,2-trichloroethane		6.0
1,1,2,2-tetrachloroethane		1.7
chloroethane	NCA	
chloroform		1.9

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Compound[a,b]	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)
Volatiles (continued)		
1,1-dichloroethene		0.33
trans-1,2-dichloroethene	NCA	
1,2-dichlorpropane	NCA	
ethylbenzene	1,400	
methylene chloride		1.9
bromodichloromethane		1.9
fluortrichloromethane		1.9
chlorodibromomethane	NCA	
tetrachloroethene		1.9
toluene	14,300	
trichlorethene		27
vinyl chloride		20
Pesticides, ug/l		
dieldrin		0.00071
4,4'-DDT		0.00024
4,4'-DDE	NCA	
4,4'-DDD	NCA	
a-endosulfan	74	
b-endosulfan	74	
endrin	1.0	
a-BHC		0.092
b-BHC		0.163
d-BHC	NCA	
g-BHC (lindane)		0.186
r-BHC		
Nonpriority Pollutants Hazardous Substances, ug/l		
benzoic acid		
2-methylphenol		
4-methylphenol		

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Compound[a,b]	EPA AMBIENT WATER QUALITY CRITERIA[c,d] Toxicity Protection	Carcinogenicity Protection ($R=10^{-5}$)				
Nonpriority Pollutants (continued)						
acetone						
2-butanone						
carbon disulfide			200			
4-methyl-2-pentanone			200	240	340	390
o-xylene				640	990	1,100
Dioxins						
2,3,7,8-tetrachlorodibenzo -p-dioxin					NA	NA

[a] NA denotes that compound was not analyzed for in this sample.
[b] K denotes compound detected below quantitation limit (QL) where QL = 10 x Dectection Limit.
[c] 1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[d] NCA denotes insufficient data available upon which to derive a criterion.

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Table 5
SUMMARY OF INORGANIC ANALYSES OF SOIL AND SEDIMENT AT CHEM-DYNE
PHASE I - HYDROGEOLOGICAL STUDY
CASE NO. 1608
April 4-14, 1983
W65310.CO

Constituent[a]	Offsite Soil Samples				Onsite Soil Samples										Ford Canal
	OS-1	OS-2	OS-3	OS-4	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10	Downst.Sed.
Aluminum	6,500	4,600	2,600	2,150	3,600	6,500	4,900	2,600	3,200	1,500	2,500	7,000	4,500	3,900	4,000
Chromium	14	6.5	15	7.5	7.3	11	9.5	18	60	45	250	170	22	13	12
Barium	140	70	70	85	65	65	65	50	70	55	200	110	190	60	55
Beryllium	0.55	0.25	< 0.25	0.40	0.55	700	0.30	< 0.25	< 0.25	< 0.25	< 0.25	1.1	< 0.25	0.5	< 0.25
Cadmium	1.7	0.18	0.46	0.80	0.55	0.24	0.23	0.06	1.3	9.5	1.0	3.0	3.5	1.0	0.46
Cobalt	5.3	4.1	3.1	3.1	< 2.5	6.5	4.4	3.1	7.0	3.1	4.7	10	3.0	3.2	< 2.5
Copper	31	8.9	37	22	95	360	75	120	36	36	110	65	32	27	14
Iron	1,200	9,500	2,000	5,500	12,000	16,500	15,500	9,500	8,000	16,000	8,000	11,000	8,000	13,000	7,000
Lead	170	3.7	70	75	65	47	42	2.0	100	200	1,200	210	95	75	37
Nickel	12	10	7.5	7	10	16	12	9	32	7.5	31	32	9.5	23	11
Manganese	550	390	170	170	200	400	410	160	200	190	160	330	220	230	210
Zinc	335	32	90	150	120	120	190	175	260	170	190	275	280	210	220
Boron	45	42	90	33	49	18	43	25	40	25	40	40	44	40	25
Vanadium	13	< 10	< 10	< 10	21	16	12	29	12	11	< 10	20	11	< 10	< 10
Arsenic	3.9	0.75	3.0	1.6	3.0	4.1	2.9	0.9	48	50	4.2	14	3.5	100	3.2
Antimony	< 1	< 1	390	< 1	9.8	< 1	< 1	< 1	2.8	30	34	1.5	< 1	< 1	< 1
Selenium	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thallium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Mercury	0.49	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.41	< 0.1	0.27	< 0.1	0.75	1.6	0.41	4.1	0.75
Tin	3.5	1.5	12,000	1.2	2.7	2.8	4.0	6,500	5,500	10,000	6,000	7,500	4.1	5.4	1.1
Silver	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	12	< 0.5	1.9	< 0.5	< 0.5	< 0.5	4.9

[a] All concentrations are expressed as mg/kg.

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Table 6 (Page 1 of 3)
ORGANIC PRIORITY POLLUTANT ANALYSIS OF ONSITE SOILS SAMPLES
CHEM-DYNE PHASE I HYDROGEOLOGICAL STUDY
CASE NO. 16008
April 4-14, 1983
W65310.CO

Compound	Onsite Soil Sample Location									
	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10
Acid Compounds, ug/g[a]										
Phenol				50K						
Base/Neutral Compounds, ug/g[a]										
1,2,4-trichlorobenzene								76		10K
Hexachlorobenzene		10K		50K			100K	120	24	10K
Hexachloroethane		210					100K	45		67
1,2-dichlorobenzene							240	10K		10K
1,3-dichlorobenzene								11		
1,4-dichlorobenzene								10K		10K
Fluoranthene	10K		2.0K						10K	10K
Hexachlorobutadiene		10K						10K		10K
Hexachlorocyclopentadiene		10K							26	
Isophorone							100K			
Naphthalene	10K		2.0K				160			10K
Bis(2-ethylhexyl)phthalate	10K	11		120	61	100	970	91	10K	10K
Benzyl butyl phthalate						50K	260	10K		10K
Di-n-butyl phthalate							120			
Di-n-octyl phthalate			2.0K				140	10K		
Dimethyl phthalate							100K			
Benzo(a)anthracene			2.0K						10K	10K
Benzo(a)pyrene			2.0K						10K	
Benzo(b)fluoranthene			2.0K						25K	
Benzo(k)fluoranthene			2.0K						10K	
Chrysene	10K		2.0K						10K	10K
Phenanthrene	25K		2.0K						25K	25K
Pyrene	25K		5.0K						25K	25K

Table 6 (Page 2 of 3)
ORGANIC PRIORITY POLLUTANT ANALYSIS OF ONSITE SOILS SAMPLES
CHEM-DYNE PHASE I HYDROGEOLOGICAL STUDY
CASE NO. 1608
April 4-14, 1983
W65310.CO

Compound	Onsite Soil Sample Location									
	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10
Volaties, ug/g[a]										
Benzene							4.1	0.01		
Chlorobenzene							29	0.01		0.01K
1,2-dichloroethane						0.46	26			
1,1,1-trichloroethane						0.018	92			
1,1,2-trichloroethane						0.019	24	0.80	0.01K	1.3
1,1,2,2-tetrachloroethane		0.23		0.015	0.029	0.29	28	3.4	0.054	1.2
Chloroform						0.01K	17			
1,1-dichloroethene							3.4	0.01K		0.031
1,2-dichloropropane						0.66				
Ethylbenzene							26			
Methylene chloride							3.5			
Bromodichloromethane							0.53			
Tetrachloroethene		3.2	0.13	0.12	0.029	3.0	14	1.8	0.054	1.6
Toluene					0.01K	0.01K	35			0.01K
Trichloroethene		0.029		0.015		0.019	30	0.30		0.45
Pesticides, ug/g[a,b]										
Aldrin	0.1K**								1.7**	0.48**
Dieldrin						0.48**	10K**	10K**	4.9**	0.01K**
Chlordane							580	570	203	
4,4'-DDE			0.017**		1.6**	10K**				
b-endosulfan			0.01**							
Endosulfan sulfate						0.43**				
Endrin					2.9**	2.9**	26	61	28**	0.26**
Heptachlor								30**	6.4**	0.34**
b-BHC			0.01K**					21**	6.8**	
PCB-1260					31**		93**	58**		

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Table 6 (Page 3 of 3)
ORGANIC PRIORITY POLLUTANT ANALYSIS OF ONSITE SOILS SAMPLES
CHEM-DYNE PHASE I HYDROGEOLOGICAL STUDY
CASE NO. 1608
April 4-14, 1983
W65310.CO

Compound	Onsite Soil Sample Location									
	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10
Dioxins, ug/g[c]										
2,3,7,8-tetrachorodibenzo-p-dioxin	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U
Nonpriority Pollutants Hazardous Substances, ug/g[a]										
2-methylnaphthalene	10K		2.0K		50K		100K			10K
Acetone	0.73		0.48	1.1	0.67	0.61				
Carbon disulfide				0.030						
O-xylene							21			

a K denotes that mass spectral data indicated the presence of the compound but the quantitative result is less than the specified detection limit (value is specified) but greater than zero.

b ** applies to pesticide parameters where identification has been performed using two column confirmation (as specified in Method 608) but the level is too low for verification of the compound by mass spectrometry.

c U denotes that the compound has been analyzed for but not detected. The number is the minimum detection limit.

GLT414/50

Table 7
ORGANIC PRIORITY POLLUTANT ANALYSIS OF OFFSITE SURFACE SOIL SAMPLES CHEM-DYNE PHASE I - HYDROGEOLOGICAL STUDY
CASE NO. 1608
April 4-14, 1983
W65310.CO

Compound	Offsite Soil Sample Location			
	OS-1	OS-2	OS-3	OS-4
Acid Compounds, ug/g[a]				
Phenol			10K	
Base/Neutral Compounds, ug/g[a]				
Hexachlorobenzene			10K	
Fluoranthene			10K	
Napthalene			10K	
N-nitrosodiphenylamine			10K	
Bis(2-ethylhexyl)pthalate			27	
Di-n-butyl phthalate			10K	
Chrysene			10K	
Phenanthrene			25K	
Pyrene			25K	
Volatiles, ug/g[a]				
Methylene chloride		0.084		
Pesticides, ug/g[a]				
Dieldrin	0.01K**		0.1K**	0.01K**
Chlorodane	1.0**			
4,4'-DDT	0.10K**	0.10K**		
4,4'-DDE		0.08		
Endrin			0.23**	
PCB-1260			38	0.93
Dioxins, ug/g[a]				
2,3,7,8-tetrachorodibenzo-p-dioxan	0.1U	0.1U	0.1U	0.1U
Nonpriority Pollutants Hazardous Substances, ug/g[a]				
2-methylnaphthalene			10K	
Acetone	0.90			0.92

[a] K denotes that mass spectral data indicated the presence of the compound but the quantitative result is less than the specified detection limit (value specified) but greater than zero.

GLT414/49

Table 8
ORGANIC PRIORITY POLLUTANT ANALYSIS OF FORD CANAL SAMPLES
CHEM-DYNE PHASE I - HYDROGEOLOGIC STUDY
CASE NO. 1608
April 4-14, 1983
W65310.CO

Compound	Ford Canal Downstream Sediment (ug/g)[a]	Ford Canal Upstream Water (ug/l)[a]	Ford Canal Downstream Water (ug/l)[a]
Acid Compounds			
Phenol	0.58	No acid compounds detected.	
Base/Neutral Compounds			
Fluoranthene	2.5	No base/neutral compounds detected.	
Naphthalene	0.20		
Bis(2-ethylhexyl)pthalate	0.73		
Benzo(a)anthracene	1.1		
Benzo(a)pyrene	1.2		
Benzo(b)fluoranthene	0.93		
Benzo(k)fluoranthene	0.93		
Chrysene	1.3		
Acenapaphthylene	0.40		
Anthracene	0.49		
Benzo(ghi)perylene	1.2		
Phenanthrene	2.2		
Indeno(1,2,3-cd)pyrene	1.5		
Pyrene	1.8		
Volatiles			
Tetrachloroethene	0.055	No volatiles detected.	
Toluene	1.5		
Pesticides[b]			
Aldrin	0.3K**	No pesticides detected.	
Dieldrin	0.18**		
Chlorodane	3.8**		
Endrin	0.97**		
Dioxins[c]			
2,3,7,8-tetrachorodibenzo-p-dioxan	0.03U	0.03U	0.03U
Nonpriority Pollutants Hazardous Substances			
4-methyl phenol	3.3		
Acetone	1.4	19	

[a] K denotes that mass spectral data indicated the presence of the compound but the quantitative result is less than the specified detection limit (value specified) but greater than zero.

[b] ** applies to pesticide parameters where the identification has been performed using two column confirmation (as specified in Method 608) but the level is too low for verification of the compound by mass spectrometry.

[c] U denotes that the compound was analyzed for but not detected. The number is the minimum detection limit.

APPENDIX A

Photo Log
Chem-Dyne Site
Monitoring Well and Soil Sampling
April 6-12, 1983
W65310.C0

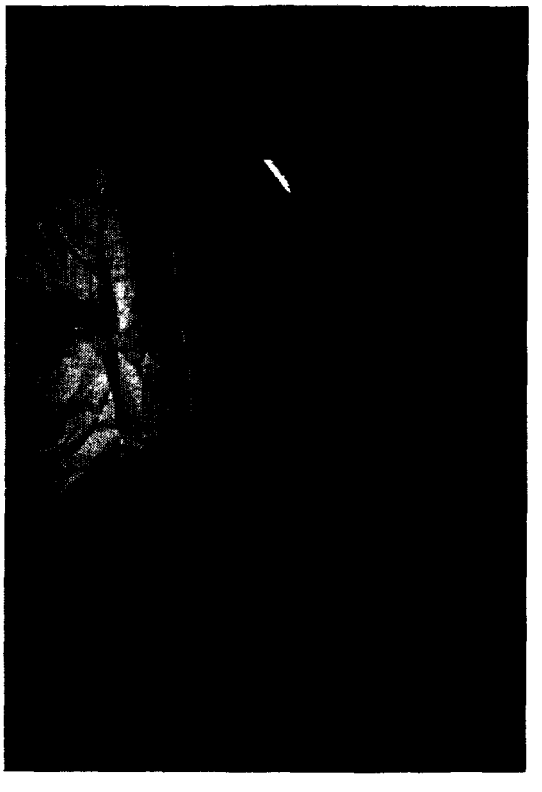
The following photo log has descriptions of each of the 70 exposures taken during the site work. All photographs, except where noted, were taken by Fleissner. The film is Kodak Ektachrome 200 (daylight) exposed at ASA 200. Two cameras were used: a Ricoh AF-2 and a Nikon FE which was fitted with a 24-mm Nikkor and a Nikon data back.

The photo log also includes two figures showing the approximate location and direction of each photograph. The following photographs were taken with a Nikon FE fitted with a 24-mm Nikkor and data back.

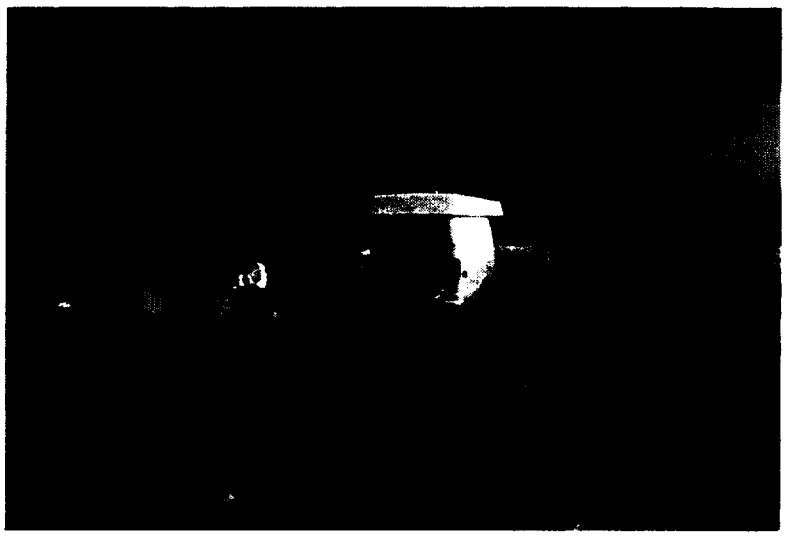
GLT442/4
Photos:GLT442/2

Sampling well water in the Vaughn Building Co. warehouse (photo by Holm). [4/6/83]

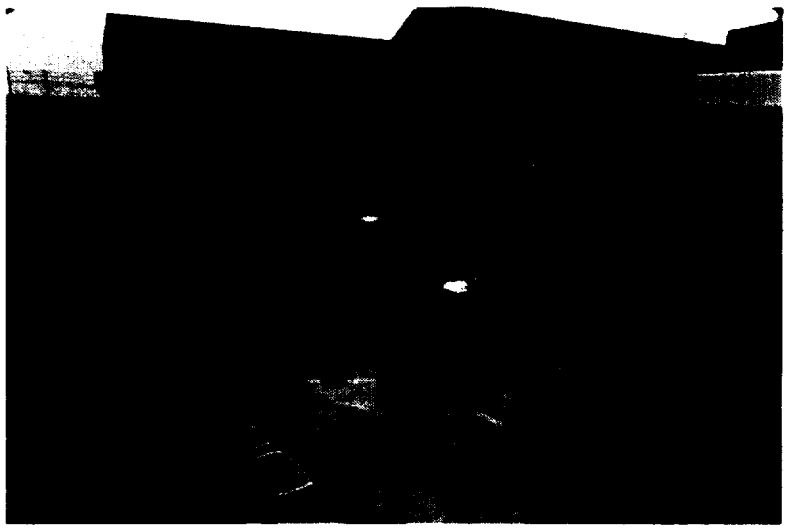
HNU operation during above sampling (photo by Holm). [4/6/83]



Sampling operation as in top photo (photo by Holm). [4/6/83]



Well purging at MW-1, viewing east (photo by Holm). [4/6/83]



Initial HNU check at MW-20, viewing east. [4/7/83]

Sounding MW-20, viewing northeast. [4/7/83]

Measuring the MW-20 sounding using rag tape, viewing east-southeast. [4/7/83]

M-scope check for W. S. at MW-20, viewing east. [4/7/83]

Withdrawing M-scope reaching on rag tape at MW-20, viewing northeast. [4/7/83]

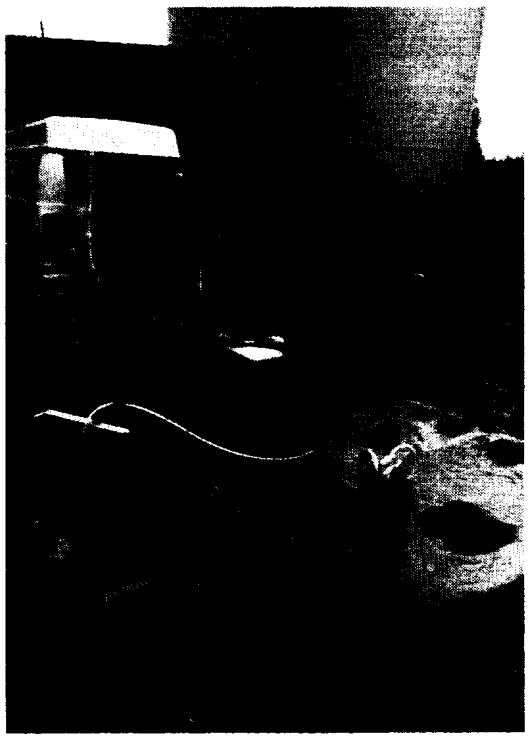
Measuring M-scope reaching on rag tape at MW-20, viewing northeast. [4/7/83]

Inserting Johnson-Keck pump into MW-20, viewing northeast. [4/7/83]

Placing pump clamp on submersible pump cable at MW-20, viewing east. [4/7/83]

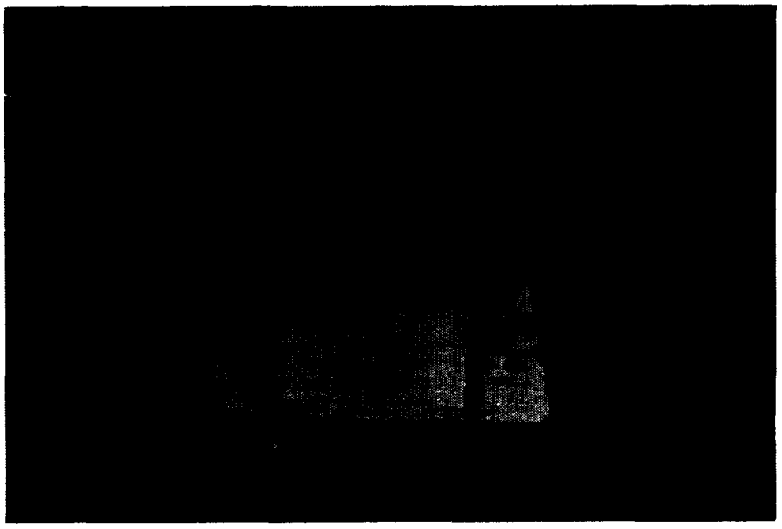
HNU monitoring in purge water storage barrel at MW-20, viewing southwest. [4/7/83]

Investigating dark soil southwest of MW-20, viewing southwest. [4/7/83]

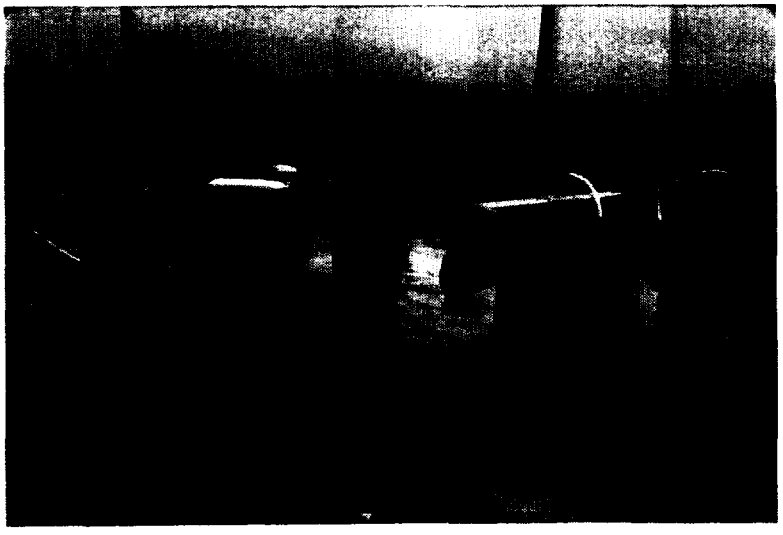


HNU monitoring in purge water storage barrel at MW-20, viewing southwest. [4/7/83]

Closeup view of Johnson-Keck pump control and extra batteries. [4/7/83]

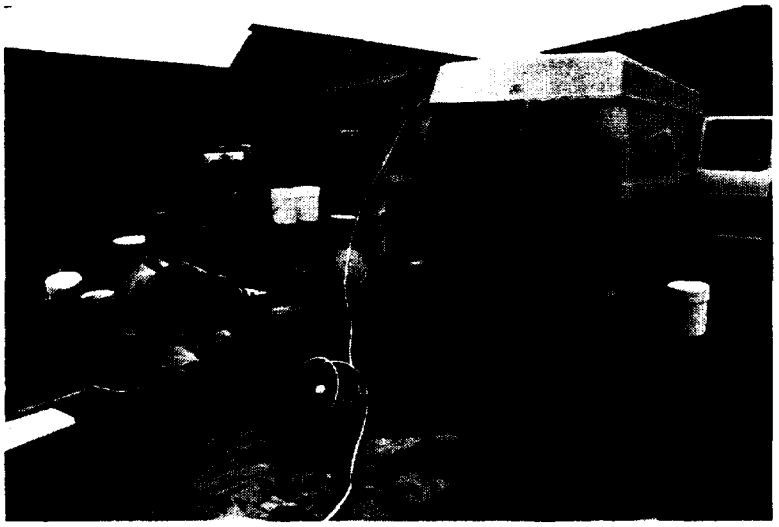


Closeup of Johnson-Keck pump control box. [4/7/83]



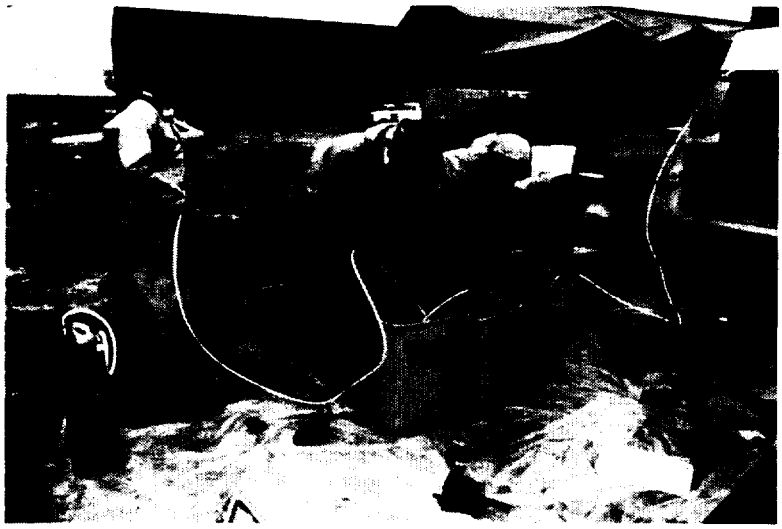
Closeup of MW-20 and decon setup, viewing west. [4/7/83]

Collecting sample for metals at MW-20, viewing southeast. [4/7/83]



Collecting sample for CN at MW-20, viewing southeast. [4/7/83]

Decontamination operation for outside of sample pump tubing at MW-20, viewing east-northeast. [4/7/83]

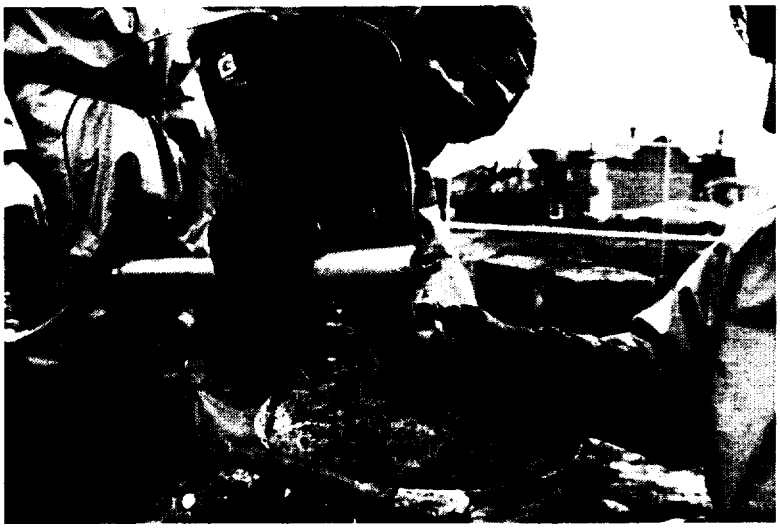


Same as previous photo viewing east. [4/7/83]

Decontamination of pump and inside of tubing, pumping TSP solution at MW-20, viewing southeast. [4/7/83]

Collecting VoA sample by bailing at MW-20, viewing northwest. [4/7/83]

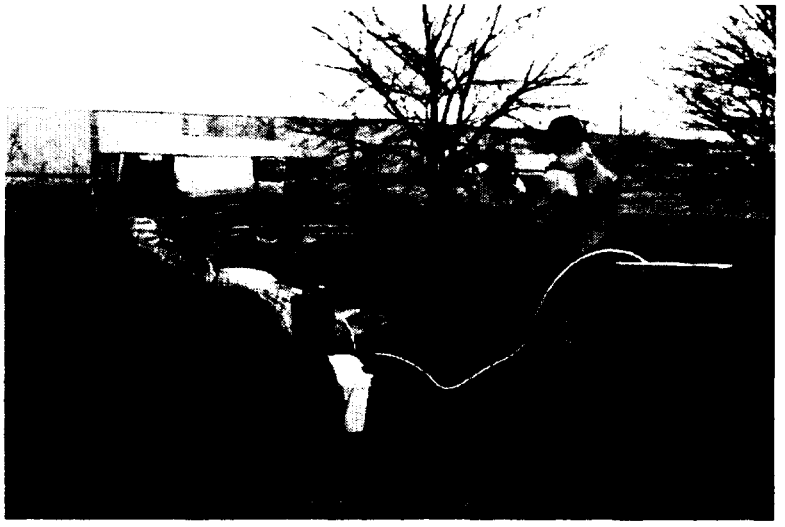
Pouring VoA sample from SST bailer at MW-20, viewing north. [4/7/83]



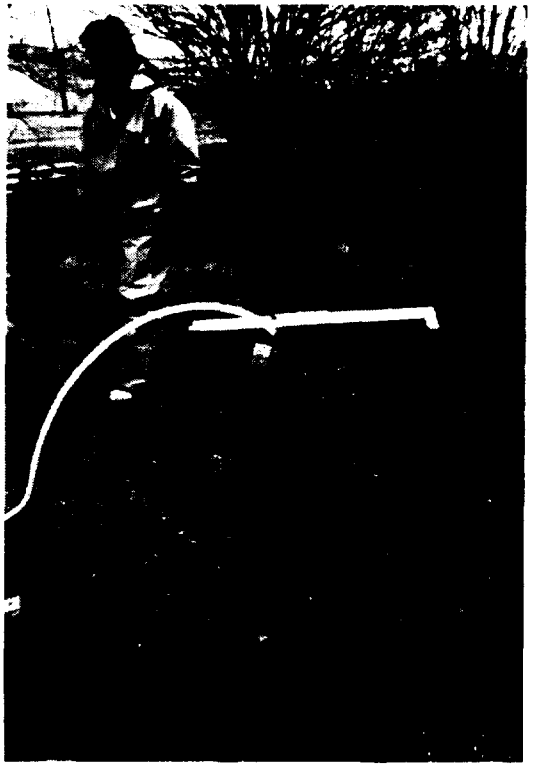
Pouring VoA sample from SST bailer at MW-20, viewing north. [4/7/83]

Filtering metals sample at van at MW-20, viewing west. [4/7/83]

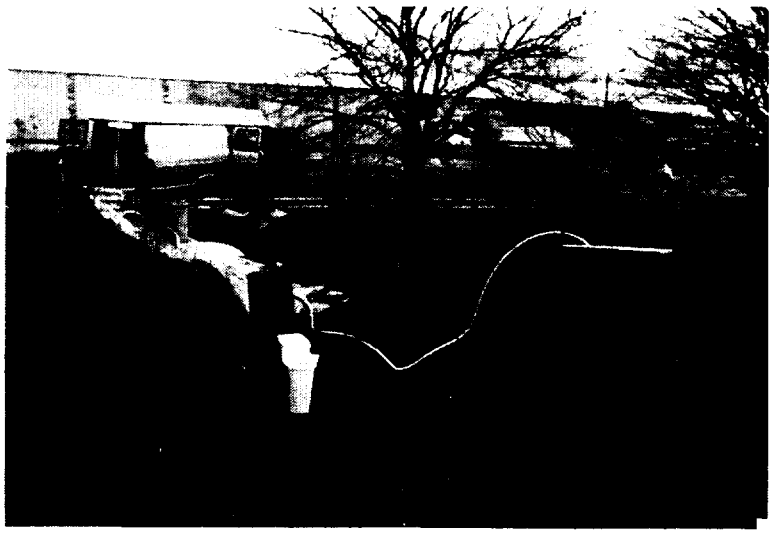
Setup at MW-4, viewing south-east (data back off). [4/11/83]



Setup of sampling line and decon equipment at MW-4, viewing north with Nimrod building in background (data back off). [4/11/83]

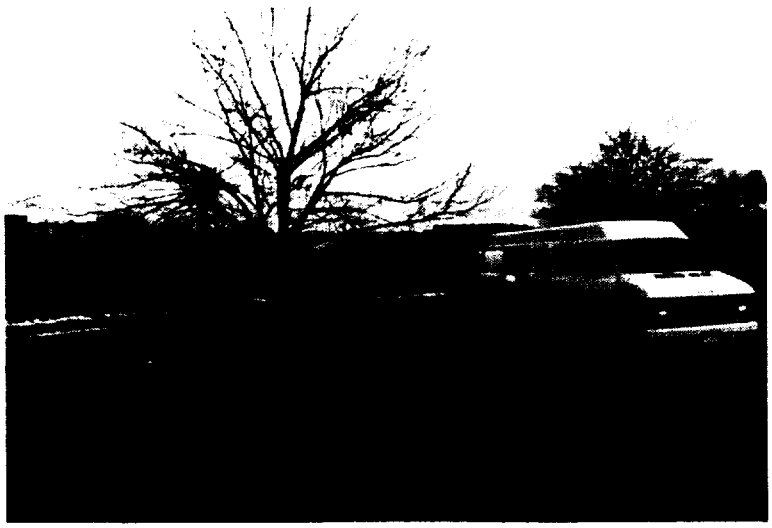


Closeup of pump cable clamp in place at MW-4, viewing northwest (data back off). [4/11/83]



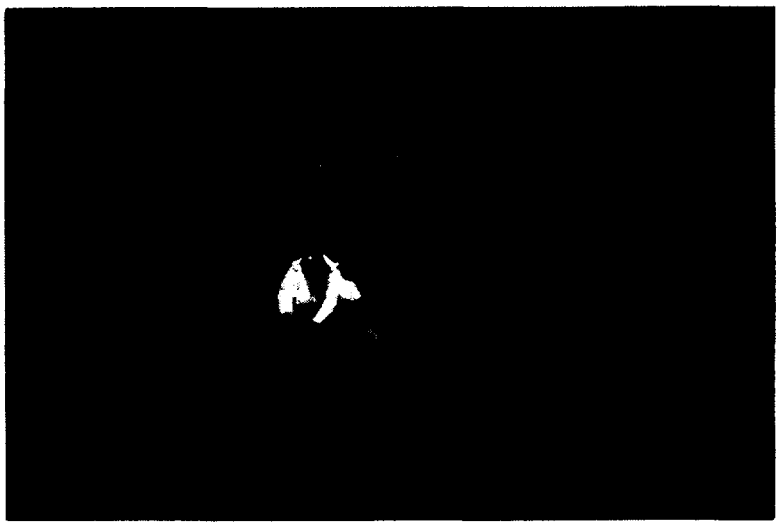
Same as previous photo with data back switched on. [4/11/83]

View of sampling setup at MW-4, viewing east. [4/11/84]



View of sampling setup at MW-4, viewing southwest. [4/11/83]

Taking offsite soil sample OS-1 at 547 N. Fifth St. backyard garden, viewing west. [4/12/83]

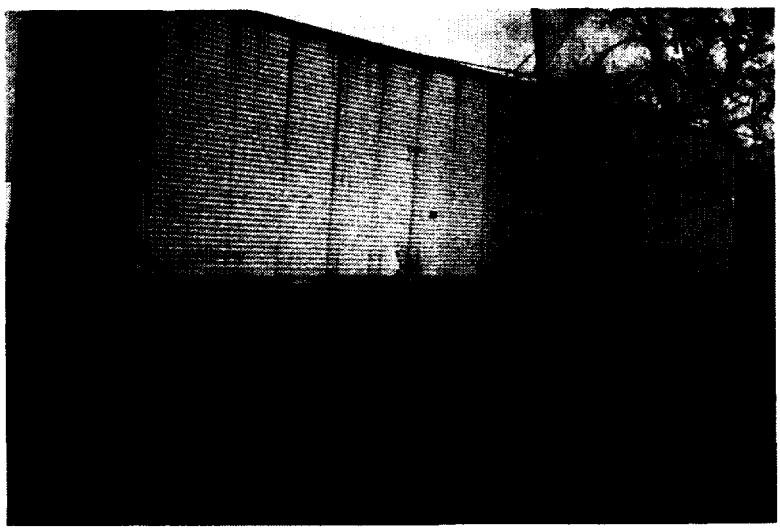


Taking offsite soil sample, OS-2 at vicinity of second base, viewing west. [4/12/82]

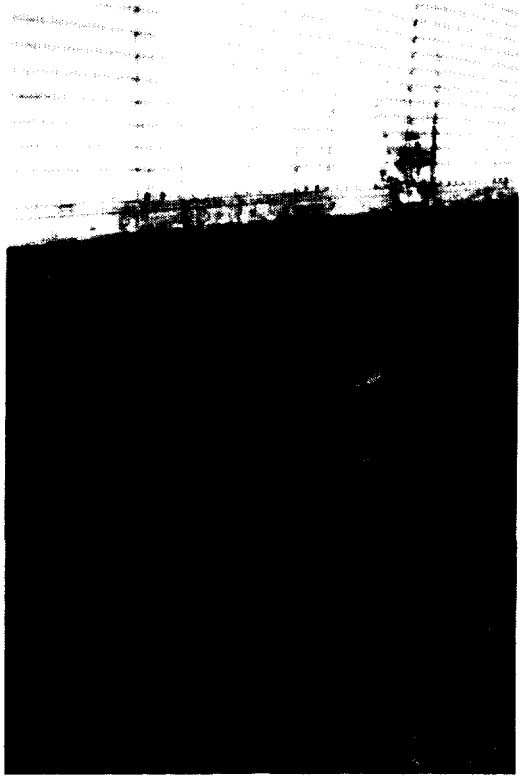
Taking offsite soil sample OS-3 near Nimrod warehouse, viewing west with Chem-Dyne facility in background. [4/12/83]

Onsite soil sample SS-1, viewing west. [4/12/83]

Same as photo above, viewing north. [4/12/83]



Abandoned truck trailer onsite, viewing southeast. [4/12/83]



Closeup of drum and concrete block supporting trailer shown in previous photo, viewing southeast. [4/12/83]

Onsite soil sample SS-3, viewing east. [4/12/83]

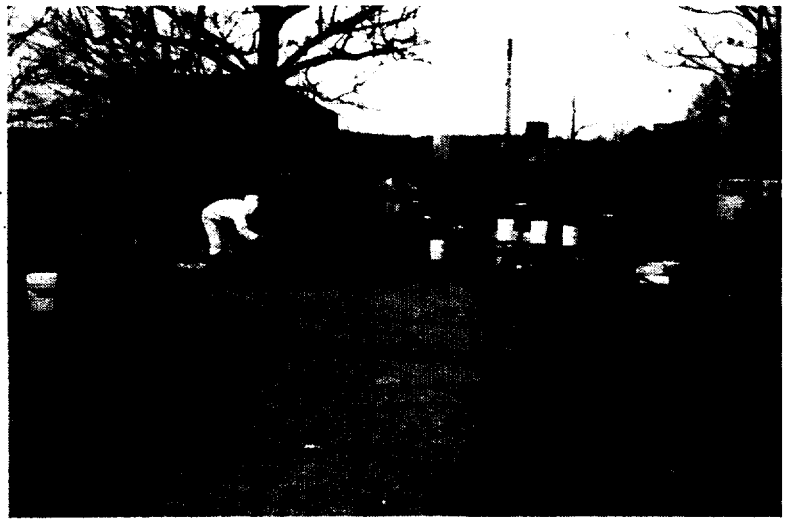
Onsite soil sample SS-3, viewing west. [4/12/83]

Onsite soil sample SS-4, viewing southeast. [4/12/83]

Onsite soil sample SS-4, viewing northeast. [4/12/83]

Onsite soil sample SS-2, viewing east. [4/12/83]

Onsite soil sample SS-2, viewing west. [4/12/83]



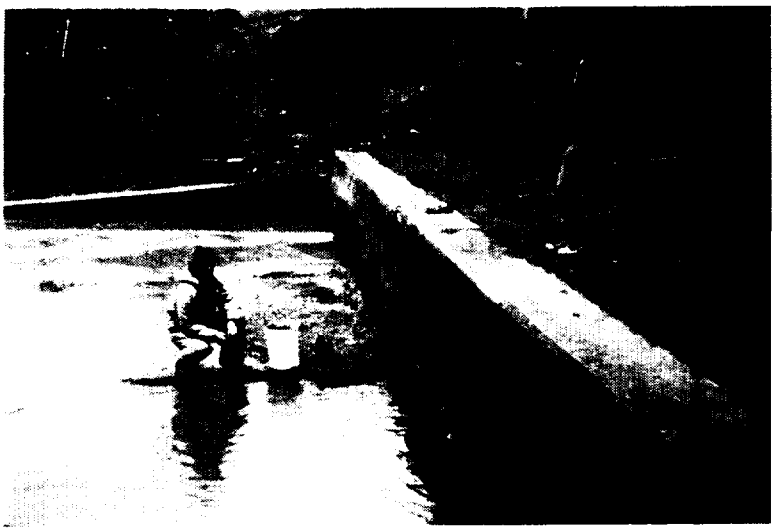
Command post hotline, viewing north. [4/12/83]

Command post hotline, viewing north-northwest. [4/12/83]

Command post, viewing northeast. [4/12/83]

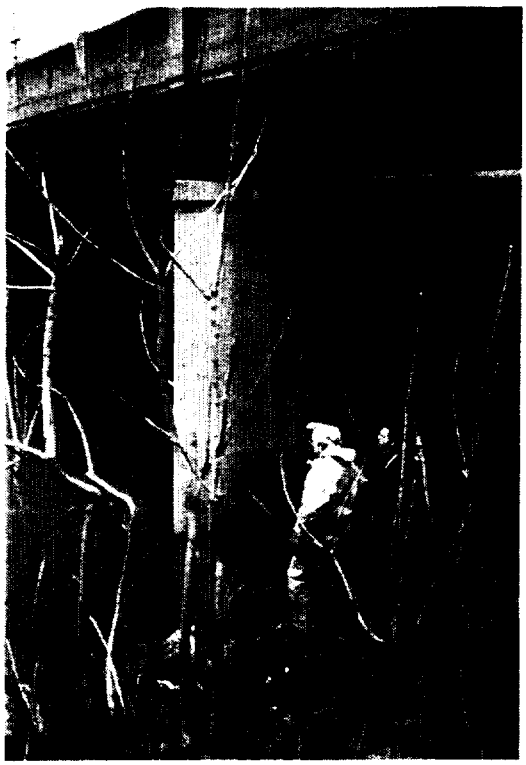
Ford Hydraulic Canal upstream water sampling location, viewing west. [4/13/83]

Closeup of water sampling shown in photo above, viewing west. [4/13/83]



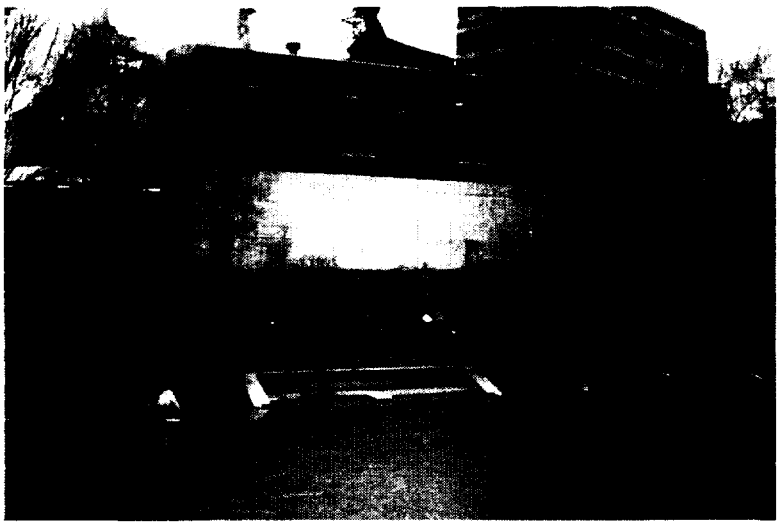
Ford Hydraulic Canal downstream water sampling location immediately downstream of RR bridge, viewing north. [4/13/83]

Ford Hydraulic Canal viewing east, toward the location where submerged site drain discharges into canal. [4/13/83]



Third Street Bridge crossing Ford Hydraulic Canal, viewing south. [4/13/83]

Ford Hydraulic Canal downstream sediment sampling location, viewing northwest. [4/13/83]



Same as photo above, viewing south. [4/13/83]

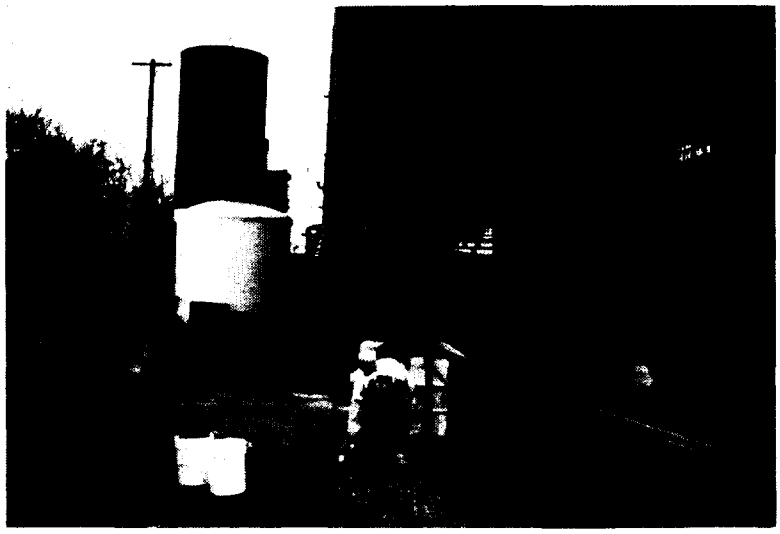
Attempted sampling in storm sewer vault, viewing west with Chem-Dyne bulk tank at left. [4/13/83]

Same as previous photo, viewing northwest. [4/13/83]

Onsite soil sample SS-5, viewing north. [4/14/83]

Buried "mixing tanks" immediately east of SS-5 location, viewing east. [4/14/83]

Onsite soil sample SS-6, viewing north. [4/14/83]



Onsite soil sample SS-8, viewing north. [4/14/84]

Onsite soil sample SS-8, viewing south. [4/14/83]

Bulk tank no. 6 in northwest corner of the site, viewing east. Note leakage from corrosion penetration. [4/14/84]

Same as previous photo, viewing southeast. [4/14/83]

Onsite soil sample SS-9, viewing north. [4/14/84]

Onsite soil sample SS-9, viewing south. [4/14/84]

Onsite (acutally outside site fence but considered as an "onsite" sample) soil sample SS-10, viewing north. [4/14/84]

Same as previous photo viewing south. [4/14/83]

Closeup viewing south, same as previous photo.
[4/14/83]

APPENDIX B

TENTATIVELY IDENTIFIED COMPOUNDS

Table 9
TENTATIVELY IDENTIFIED COMPOUNDS IN PHASE I
SOIL SAMPLES COLLECTED AT CHEM-DYNE

Sample Number	CAS Number	Compound Name	INCOS Purity	Estimated Concentration (ug/g)
OS-02		none found		
OS-03	126-73-8	phosphoric acid tributylester	94.8	9
OS-03	6738-04-1	1,1'-biphenyl,2-phenoxy-	83.4	48
OS-03	3933-94-6	1,1--biphenyl,4-phenoxy-	84.6	28
OS-03	563-12-2	phosphorodithioic acid,S,S'-	71.5	200
OS-03	791-28-6	phosphine oxide, triphenyl	87.8	110
OS-04	3387-41-5	bicyclo/3.1.0/hexane,4-methylene-1-(methylethyl)-	83.2	
SS-01	90-12-0	naphthalene,1-methyl-	89.1	2
SS-01	719-22-2	2,5-cyclohexadiene-1,4-dione,2	74.7	18
SS-01	791-28-6	phosphine oxide, triphenyl	86.3	6
SS-02	719-22-2	2,5-cytohexadiene-1,4-dione,2,6-bis(1,1-dimethylethyl)-	75.2	11
SS-02	88-19-7	benzene sulfonamide, 2-methyl-	88.1	12
SS-02	70-55-3	benzene sulfonamide, 4-methyl-	89.7	10
SS-02	791-28-6	phosphine oxide, triphenyl	87.9	10
SS-02		possible pentachlorobutadiene	manual interp.	14
SS-02	42769-38-0	1,3-butadiene,1,1,3,4-tetrachloro	89.2	0.400
SS-02	67-72-1	ethane, hexachloro-	91.8	5.5
SS-03	91-57-6	naphthalene,2-methyl	88.3	1.1

SHELL/GLT461/46
FILE/GLT461/360

Sample Number	CAS Number	Compound Name	INCOS Purity	Estimated Concentration (ug/g)
SS-03		alkane	manual interpretation	
SS-03	791-28-6	phosphine oxide, triphenyl	86.4	3
SS-04	719-22-2	2,5-cyclohexadiene-1,4-dione,2	74.4	65
SS-04	96-76-4	phenol,2,4-bis(1,1-dimethylethyl)	88.4	520
SS-04	732-26-3	phenol,2,4,6-tris(1,1-dimethyl)	84.8	67
SS-05	54932-78-4	phenol 4-(2,2,3,3-tetramethyl or isomer)	91.1	22
SS-05	39761-61-0	2 hexene 5,5-dimethyl(Z)	94.4	0.900
SS-05	107-40-4	2 pentene,2,4,4-trimethyl	93.4	0.180
SS-06	791-28-6	phosphine oxide, triphenyl-	86.7	250
SS-07	101-84-8	benzene,1,1'-oxybis-	85.3	820
SS-07	126-73-8	phosphoric acid tributylester	94.1	380
SS-07	6738-04-1	1,1'-biphenyl,2-phenoxy-	78.4	600
SS-07	6738-04-1	1,1'-biphenyl,2-phenoxy-	77.8	1,100
SS-07	131-17-9	1,2-benzene dicarboxylic acid, di-	88.6	360
SS-07	3933-94-6	1,1'-biphenyl,4-phenoxy-	58.4	700
SS-07	1806-54-8	phosphoric acid, trioctylester	80.7	650
SS-07	630-20-6	ethane 1,1,1,2-tetrachloro	91.7	12
SS-08	3389-71-7	bicyclo[2.2.1]hepta-2,5-diene	80.9	110
SS-08	76-44-8	4,7-methano-1H-indene,1,4,5,6	69.3	32
SS-08	72-20-8	2,7:3,6-dimethanonaphth[2,3-8]	61.7	50

SHELL/GLT461/46
FILE/GLT461/360

Sample Number	CAS Number	Compound Name	INCOS Purity	Estimated Concentration (ug/g)
SS-08	6298-65-3	1,3-cyclopentadiene,1,2,3,4-TE	73.8	47
SS-08	465-73-6	1,4:5,8-dimethanonaphthalene,1	61.0	100
SS-08	791-28-6	phosphine oxide, triphenyl	76.6	40
SS-08	96-12-8	propane 1,2 dibromo-3-chloro	60.0	1.9
SS-08	67-72-1	ethane, hexachloro-	92.0	0.700
SS-08	76-01-7	ethane, pentachloro-	88.0	1.2
SS-08	630-20-6	ethane, 1,1,1,2 tetrachloro-	90.6	0.300
SS-08	55887-82-6	cyclobutane, 1,3,dichloro-	820	0.070
SS-09	72-20-8	2,7:3,6-dimethanonaphth[2,3-8]	62.5	13
SS-09	6298-65-3	1,3-cyclopentadiene,1,2,3,4-Te	77.8	5.5
SS-09		alkane	manual interpretation	
SS-09		alkane	manual interpretation	
SS-09		alkane	manual interpretation	
SS-09		alkane	manual interpretation	
SS-09	465-73-6	1,4:5,8-dimethanonaphthalene,1-	61.2	18
SS-09	706-78-5	octachlorocyclopentene	57.0	50
OS-01		none found		

SHELL/GLT461/46
FILE/GLT461/360

Table 10

SUMMARY OF TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDATER AT THE CHEM-DYNE SITE
PHASE I - HYDROGEOLOGY STUDY (CASE NO. 1608)

Sample Number	CAS Number	Compound Name	INCOS Purity	Estimated Concentration (ug/l)
MW-01		none found		
MW-02		none found		
MW-03		none found		
MW-04	1421-49-4	Benzoic acid, 3,5-Bis(1,1-dimethylethyl)4-	762	12
MW-04	20195-08-8	Phosphoric acid, diethylpentylester	677	17
MW-04	75-43-4	Methane, dichlorofluoro	932	5
MW-05	2567-14-8	1-Propene, 1,1,3-trichloro-	755	10
MW-05	873-94-9	Cyclohexanone, 3,3,5-trimethyl-	862	12
MW-05	719-22-2	2,5-cyclohexadiene-1,4-dione,2	738	13
MW-05	2233-00-3	1-propene,3,3,3-trichloro	804	20
MW-06	123-42-2	2-pentanone, 4-hydroxy-4-methyl-	927	24
MW-06	111-96-6	ethane, 1,1'-oxybis/2-methoxy-	984	24
MW-07	623-37-0	3-hexanol	918	60
MW-07	595-41-5	3-pentanol, 2,3-dimethyl-	820	70
MW-07	123-42-2	2-pentanone, 4-hydroxy-4-methyl-	937	45
MW-07	544-12-7	3-hexen-1-ol	823	75
MW-07	6137-11-7	3-heptanone, 4-methyl-	873	47
MW-07	25639-42-3	cyclohexanol, methyl-	863	94

SHELL/GLT461/44
FILE/GLT461/200

Sample Number	CAS Number	Compound Name	INCOS Purity	Estimated Concentration (ug/l)
MW-07	502-42-1	cycloheptanone	869	38
MW-07	111-96-6	ethane, 1,1'-oxybis/2-methoxy-	969	190
MW-07		none found		
MW-08	10544-50-0	Sulfur, mol. (S8)	961	10
MW-09	306-83-2	Ethane,2,2-dichloro-1,1,1-trifluoro	613	10
MW-09	76-13-1	Ethane,1,1,2-trichloro-1,2,2-trifluoro	787	20
MW-10	2567-14-8	1-propene,1,1,3-trichloro-	763	120
MW-10	719-22-2	2,5-cyclohexadiene-1,4-dione,2,6-bis(1,1-dimethylethyl)-	743	92
MW-10	95-51-2	benzenamine, 2-chloro-(or isomer)	885	62
MW-10	75-18-3	Methane,thiobis	917	600
MW-10	2567-14-8	1-propene,1,1,3-trichloro-	759	150
MW-10	719-22-2	2,5-cyclohexadiene-1,4-dione,2,6-dione, 2,6-bis(1,1-dimethylethyl)-	750	120
MW-11		none found		
MW-12	60-29-7	ethane 1,1-oxybis	976	30
MW-12	111-96-6	Ethane,1-1'-oxybis/2-methoxy-	972	9
MW-12	60-29-7	ethane 1,1'-oxybis	961	15
MW-13	630-20-6	ethane 1,1,1,2-tetrachloro	930	100
MW-13	76-13-1	ethane 1,1,2-trichloro 1,2,2-trifluoro	974	20
MW-13	630-20-6	ethane,1,1,1,2-tetrachloro	932	20
MW-13	21400-25-9	1-Propene 1,1,2-trichloro	824	10

SHELL/GLT461/44
FILE/GLT461/200

Sample Number	CAS Number	Compound Name	INCOS Purity	Estimated Concentration (ug/l)
MW-13	630-20-6	ethane 1,1,1,2-tetrachloro	936	25
MW-13	76-13-1	ethane 1,1,2-trichloro 1,2,2-trifluoro	976	40
MW-15	55887-82-6	Cyclobutane, 1,3-dichloro-	868	70
MW-15	13676-58-9	1-Butene, 1,4-dichloro- (or isomer)	835	55
MW-15	2567-14-8	1-Propene,1,1,3-trichloro-	763	70
MW-15	111-44-4	ethane,1,1'-oxybis/2-chloro-	899	38
MW-15	13676-58-9	1-butene-1,4-dichloro-	826	80
MW-15	13676-58-9	1-butene,1,4-dichloro	849	2,100
MW-16		none found		
MW-17		none found		
MW-18	111-96-6	ethane, 1,1'-oxybis/2-methoxy-	982	9
MW-18	354-23-4	ethane, 1,2 dichloro-1,1,2 trifluoro	967	280
MW-18	60-29-7	ethane 1,1' oxybis	971	140
MW-19		none found		
MW-20		none found		
MW-21		none found		
MW-22		none found		

MEMORANDUM

TO: File

FROM: Brad J. Berggren

DATE: January 11, 1984

JOB NO: W65310.C0

SUBJECT: Chem-Dyne Site Remedial Investigation
Phase II - Hydrogeologic Investigation; Split Spoon Sampling and Groundwater Monitoring Well Installation.
Subtask 3-2.1, Subtask 3-2.2, and Subtask 3-2.3

INTRODUCTION

This memorandum summarizes the Phase II Hydrogeologic Investigation activities conducted to perform split spoon sampling and installation of seven onsite groundwater monitoring wells at the Chem-Dyne site in Hamilton, Ohio. Split spoon sampling and monitoring well installation were performed from May 26 through July 13, 1983, by Brooks Geoprobe, Inc. Soil sampling and well installation inspection services were provided by personnel from CH2M HILL and Ecology and Environment, Inc. (E&E). Health and safety support equipment, support personnel, breathing air and decontamination facilities were provided by O.H. Materials. All drilling, soil sampling, and support services were conducted under subcontract to CH2M HILL. This work was performed in partial satisfaction of Contract No. 68-01-6692, Work Assignment No. 21-5M10.0.

PURPOSE

The purpose of the split spoon sampling effort of the Phase II Hydrogeologic Investigation was twofold: first, to more completely define the nature and extent, both vertical and horizontal, of soil contamination onsite; second, to more accurately define the character and distribution of surficial geologic deposits at the site. The primary purpose of the onsite well installation effort was to allow greater definition of the nature, extent, and movement of groundwater contamination onsite. In addition, the new onsite well installations would provide valuable observation locations during subsequent hydraulic testing of the aquifer.

The general scope and timing of this effort were determined by U.S. EPA personnel with recommendations by CH2M HILL. Joseph Keely, U.S. EPA groundwater specialist, was closely involved in all planning related to this phase of drilling, including specification of drilling, sampling, and well installation methods and selection of well locations and depths. Specific well locations and depths were also reviewed with other U.S. EPA and OEPA personnel prior to initialing the field work.

SCOPE

The scope of the split spoon sampling and well installation portion of the Phase II Hydrogeologic Investigation included the following:

- Procurement of well drilling contractor able to perform under levels "B" and "C" personal protection.
- Performance of split spoon sampling at the seven onsite well locations.
- Analysis of 26 soil samples, including two duplicate soil samples and two laboratory blank samples.
- Installation of seven onsite groundwater monitoring wells, five wells 35 feet deep and two wells 65 feet deep.

Twenty-six soil samples, selected from the 84 soil samples taken, were analyzed for the inorganic and organic constituents included in the routine analytical packages of the U.S. EPA Contract Laboratories Program (CLP).

Samples collected during this investigation were analyzed by the following laboratories:

<u>Routine Organic Analysis</u>

- Mead Compu/Chem, in Research Triangle Park, North Carolina 27709

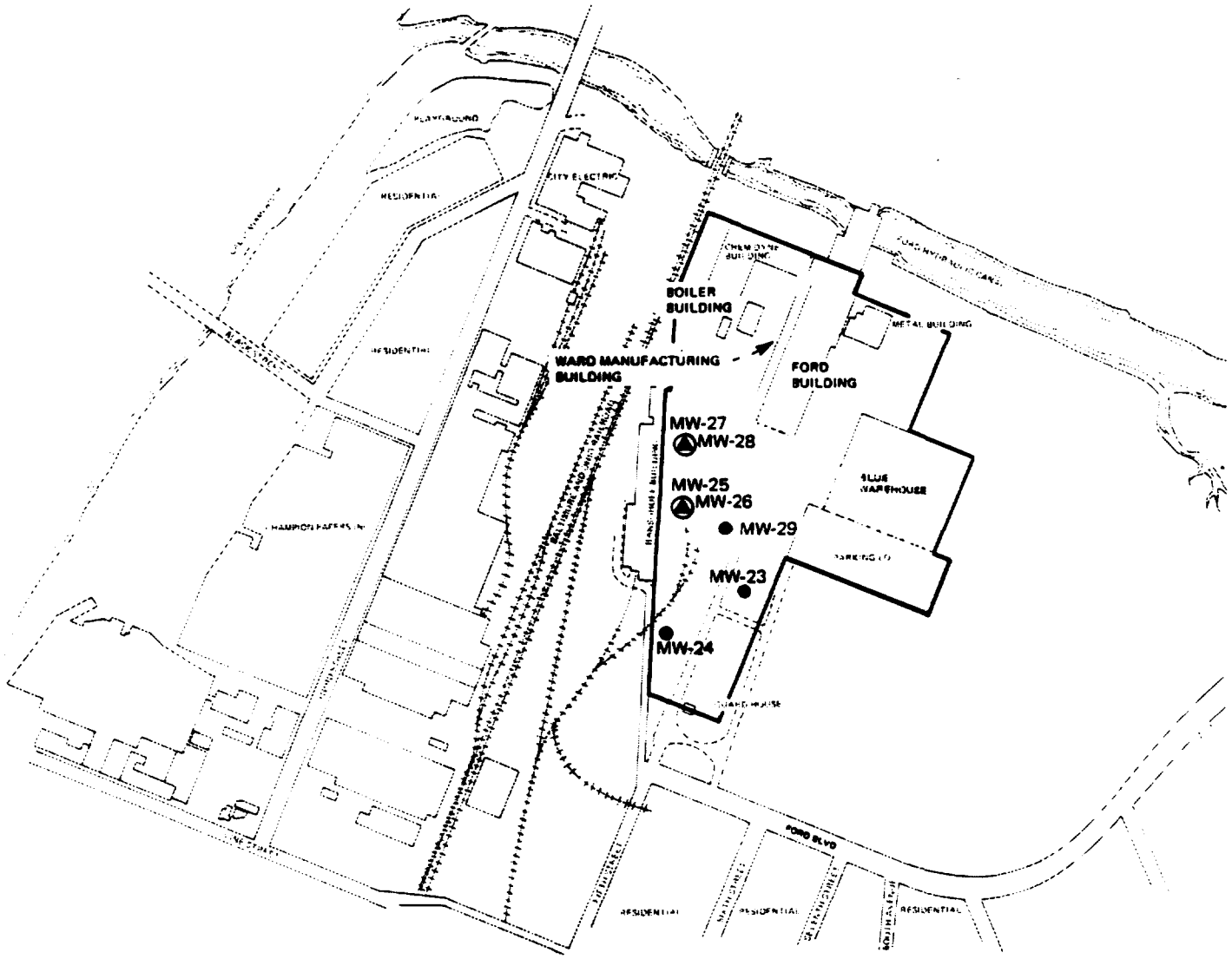
<u>Routine Inorganic Analysis</u>

- Chemtech Consulting Group, Ltd., in New York, New York 10014

PERSONNEL

<u>CH2M HILL</u>

Larry A. Holm, Project Manager/GLO
Dale Rowlison, Project Engineer/DEN



LEGEND

- HAZARDOUS WASTE SITE BOUNDARIES
- ● SOIL BORING WITH SHALLOW (35 FEET) MONITORING WELL INSTALLATION
- ▲ SOIL BORING WITH SHALLOW (35 FEET) AND DEEP (65 FEET) MONITORING WELL INSTALLATIONS

N

0 500 1000

SCALE IN FEET

FIGURE 1
PHASE II HYDROGEOLOGICAL INVESTIGATION SOIL BORING AND INSTALLED GROUNDWATER MONITOING WELL LOCATIONS
CHEM - DYNE

Brad J. Berggren, Project Engineer/GLO
William Faught, Inspector/CVO

E&E, Inc.

Peter Gorton
Scott McCone (June 14 and 15 only)
Jerry Kelly (June 16, 17, and 18 only)

Brooks Geoprobe, Inc.

Joseph Pappert, Drilling Foreman
B.C. Manos, Driller's Helper
Tim Augustine, Driller's Helper
Mike Bish, Driller
Harvey Neal, Driller's Helper

O.H. Materials

Bob Hesse

SPLIT SPOON SAMPLING

BORING LOCATIONS AND EQUIPMENT

Split spoon samples were taken from seven onsite borings located throughout the site and coinciding with the projected Phase II well installations. Positions of the seven onsite soil borings and the associated monitoring well installations are shown in Figure 1.

Soil borings were performed using a Mobile B-80 drilling rig equipped with 6-inch outside diameter hollow stem augers. Representative soil samples were collected using steel split spoon samplers fitted with plastic basket-type retainers. The samplers were 24 inches in length with inside diameters of 1.5 inches.

SOIL SAMPLING

Soil borings, in which the split spoon sampling was performed, ranged in depth from 34 to 58 feet. Split spoon samples were taken on 2-1/2-foot centers to a depth of approximately 25 feet, the zone of greatest soil variability, and thereafter at 5-foot intervals.

Sampling involved driving the split spoon sampler 18 inches beyond the end of the auger flight. Driving of the sampler was accomplished by repeatedly dropping a 140-pound hammer a distance of approximately 30 inches. Following retrieval and opening of the split spoon sampler, the soil sample was vertically bisected. Then from each half, a composite sample was collected using a clean stainless steel teaspoon.

Soil boring logs, presenting sample locations and descriptions, are included in Appendix A.

DECONTAMINATION

Decontamination procedures included steps to avoid contamination of the soil sample and to minimize carryover of contamination from one boring to another. The primary steps used were as follows:

- Steam cleaning of the drilling rig and all split spoon sampling equipment prior to initiation of field work.
- Decontamination of the drilling rig and equipment between each boring using a high-pressure water wash provided by O.H. Materials.
- Decontamination of split spoon sampler between collection of each soil sample.
- Decontamination of stainless steel teaspoons used for composite sample collection.

Four solutions were used in sequence to decontaminate split spoon samplers. These solutions were a city tap water rinse, trisodium phosphate (TSP) dissolved in city tap water, acetone mixed with city tap water (approximately 20-percent acetone), and a city tap water rinse. The stainless steel teaspoons were decontaminated using a solution of acetone and distilled water followed by a distilled water rinse.

Spent decontamination solutions were disposed of by O.H. Materials at the Chem-Dyne site.

SAMPLE SELECTION FOR ANALYSIS

The requirements of the work plan necessitated selection of approximately three samples from each soil boring for analysis of the inorganic and organic constituents included in the routine analytical packages by the U.S. EPA CLP. Sample selections were based on observations noted in the soil boring logs and results of a rough "headspace" analysis of the samples in the field. The "headspace" analysis involved opening the sample container designated for inorganic analysis and obtaining an organic vapor measurement in the air space above the soil sample. Simultaneous measurements were taken using a HNu Model 101 portable analyzer equipped with a 10.2 eV probe and a Century Systems (Foxboro) Model OVA-128 organic vapor analyzer.

Results from the "headspace" analysis performed on split spoon soil samples collected onsite at Chem-Dyne are presented in the Appendix.

"HEADSPACE" ANALYSIS OBSERVATIONS

Observations concerning the results of the rough "headspace" analysis performed on the split spoon samples obtained from soil borings onsite at Chem-Dyne included the following:

- HNu measurements ranged up to 180 ppm.
- Several Foxboro OVA measurements had values of greater than 1000 ppm.
- The presence of volatile organic compounds with ionization potentials greater than 10.2 eV was suggested by the consistently greater Foxboro OVA readings.
- Commonly two primary zones of apparent volatile organic contamination were suggested from comparisons of "headspace" analysis results with sample collection depth; near surface soil, generally within 10 feet of the ground surface, and soil influenced by the groundwater table.

Samples selected for routine inorganic and organic analysis are shown in Table 1.

RESULTS OF ANALYSIS BY CLP

Results of routine inorganic and organic analysis performed on selected split spoon soil samples are presented in Tables 2 and 3. Tentatively identified compounds from the organic analyses are presented in Appendix C. Detailed discussion of these results will be included in the Final Remedial Investigation Report.

GROUNDWATER MONITORING WELLS

WELL LOCATIONS

Seven groundwater monitoring wells were positioned onsite to complement the previously existing network of monitoring wells and allow greater definition of the vertical and horizontal extent and movement of groundwater contamination from the site. The majority of the new wells installed were positioned along the western site boundary. These wells were situated in the downgradient direction of groundwater movement from the site as reported by previous investigations. The location of the seven onsite groundwater monitoring wells installed during the Phase II effort are shown in Figure 1. The number, general location, material of contruction, and depth of the monitoring wells

Table 1
SOIL SAMPLES FROM SPLIT SPOON SAMPLING SELECTED FOR ANALYSIS - CHEM-DYNE SITE (W65310.C0)

Sample[a]	Depth (ft)	Traffic Report No. Inorganic	Traffic Report No. Organic	Lab Shipment Date
MW-23/SS4	10-11.5	ME 0759	E 3370	6/10/83
MW-23/SS8	20-21.5	ME 0760	E 3371	6/10/83
MW-23/SS10	25-26.5	ME 0761	E 3372	6/10/83
MW-24/SS4	10-11.5	ME 0643	E 2888	6/2/83
MW-24/SS6	15-16.5	ME 0644	E 2889	6/2/83
MW-24/SS11	35-36.5	ME 0645	E 2890	6/2/83
MW-25/SS3	12.5-14	ME 0638	E 2801	5/31/83
duplicate	12.5-14	ME 0639	E 2802	5/31/83
MW-25/SS6	20-21.5	ME 0640	E 2803	5/31/83
MW-25/SS10	32.5-34	ME 0642	E 2885	5/31/83
Blank[b]	--	--	E 2886[c] E 2887[d]	5/31/83
MW-26/SS4	10.5-12	ME 0635	E 2798	5/31/83
MW-26/SS7	18-19.5	ME 0636	E 2799	5/31/83
MW-26/SS11	30.5-32	ME 0637	E 2800	5/31/83
MW-27/SS5	12.5-14	ME 0756	E 3366	6/10/83
MW-27/SS6	15-16.5	ME 0757	E 3367	6/10/83
MW-27/SS12	30-31.5	ME 0758	E 3368	6/10/83
Blank	--	--	E 3369 E 3369	6/10/83
Blank	--	--	E 2891 E 2892	6/2/83
MW-28/SS2	7.5-9	ME 0646	E 2893	6/2/83
MW-28/SS6	17.5-19.5	ME 0647	E 2894	6/2/83
duplicate	17.5-19.5	ME 0648	E 2895	6/2/83
MW-28/SS11	30-31.5	ME 0649	E 2896	6/2/83
MW-29/SS7	15-16.5	ME 0762	E 3373	6/10/83
MW-29/SS10	25-26.5	ME 0763	E 3374	6/10/83
MW-29/SS13	35-36.5	ME 0764	E 3375	6/10/83

[a] Sample designation example, MW-23/SS4: refers to soil boring MW-23, split spoon sample 4.
[b] Laboratory blank run as soil sample using water analysis protocol.
[c] Traffic Report Number for blank analyzed for water (extractable).
[d] Traffic Report Number for blank analyzed for water (VOA).

GLT460/2

Table 2 (Page 1 of 2)
SUMMARY OF INORGANIC ANALYSES OF SPLIT-SPOON SOIL SAMPLES
AT THE CHEM-DYNE SITE - CASE NO. 1746 JUNE 1983

Constituent[a]	MW-23 SS-4B	MW-23 SS-8B	MW-23 SS-10B	MW-24 SS-4	MW-24 SS-6	MW-24 SS-11	MW-25 SS-3	MW-25 SS-3	MW-25 SS-6	MW-25 SS-10
Aluminum	4,120	1,935	2,785	4,585	1,210	2,280	10,450	4,620	1,290	1,420
Chromium	4.9	4.7	<0.50	2.3	<0.5	<0.5	7.3	1.7	<0.5	<0.5
Barium	40.0	18.2	17.5	46	14.2	9.8	65.5	37.3	7.8	9.6
Beryllium	0.55	0.25	<0.25	<0.25	<0.25	<0.25	0.4	<0.25	<0.25	<0.25
Cadmium	0.08	<0.05	<0.05	<0.05	0.21	0.16	<0.05	<0.05	<0.05	<0.05
Cobalt	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.9	<2.5	<2.5
Copper	19.8	5.0	12.8	9.7	5.6	6.6	15.1	8.9	5.2	3.7
Iron	8,500	3,925	8,500	8,350	4,840	6,300	15,050	7,900	3,760	6,900
Lead	3.43	1.48	2.30	4.1	3.2	1.5	13.4	3.7	2.5	3.6
Nickel	4.4	3.7	3.3	4.6	<2	4.1	10.1	3.6	<2	<2
Manganese	276	99	379	254	191	309	353	231	166	351
Zinc	28.2	6.9	18.1	20.1	c9.6	c10.6	35	14.1	2.2	4.6
Boron	<5	<5	<5	5.5	<5	<5	5.5	<5	6.6	5.2
Vanadium	<10	<10	<10	<10	<10	<10	16.2	<10	<10	<10
Arsenic	2.20	3.20	8.10	3.6	1.9	1.3	6.4	2.4	1.2	3.6
Antimony	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium	<0.10	<0.10	<0.10	<0.1	<0.1	0.25	0.25	<0.1	<0.1	<0.1
Thallium	0.65	<0.50	<0.50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Mercury	0.10	<0.10	<0.10	<0.1	<0.1	<0.1	0.2	0.15	<0.1	<0.1
Tin	<1.0	<1.0	<1.0	<1	1.3	<1	<1	<1	<1	<1
Silver	<0.50	<0.50	<0.50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cyanide	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25

[a]All concentrations reported as mg/kg.

GLT432/91-1

Table 2 (Page 2 of 2)
SUMMARY OF INORGANIC ANALYSES OF SPLIT-SPOON SOIL SAMPLES
AT THE CHEM-DYNE SITE - CASE NO. 1746 JUNE 1983

Constituent[a]	MW-26 SS-4	MW-26 SS-7	MW-26 SS-11	MW-27 SS-5B	MW-27 SS-6B	MW-27 SS-12	MW-28 SS-2	MW-28 SS-6B	MW-28 SS-6D	MW-28 SS-11	MW-29 SS-7B	MW-29 SS-10D	MW-29 SS-13D
Aluminum	4,405	2,110	7,000	9,700	14,500	4,870	2,460	10,350	6,600	2,400	2,045	3,400	2,190
Chromium	1.5	<0.5	8.5	8.0	13.3	2.8	<0.5	9.7	5.6	--	<0.50	1.2	<0.50
Barium	46	23.5	41	76.0	98.5	24.0	21.3	69.5	41.5	17.5	17.7	16.6	14.1
Beryllium	<0.25	<0.25	0.3	0.65	1.00	0.40	<0.25	0.8	0.5	<0.25	<0.25	0.25	<0.25
Cadmium	<0.05	<0.05	<0.05	0.20	0.26	<0.05	0.20	0.31	0.14	0.10	<0.05	<0.05	<0.05
Cobalt	<2.5	<2.5	3.3	3.5	5.5	<2.5	<2.5	4.5	<2.5	<2.5	<2.5	<2.5	<2.5
Copper	8.2	10.6	14.1	20.5	19.9	9.5	11.8	15.4	10.7	8.7	3.8	12.2	<7.7
Iron	7,900	4.915	11,850	14,400	21,350	10,000	8,700	16,550	11,500	7,050	5,000	9,600	7,600
Lead	4.4	4.0	4.2	27.0	20.8	2.50	13.2	15.5	7.5	7.4	1.18	3.20	2.38
Nickel	6.4	<2	10.2	10.5	15.8	6.7	2.0	12.3	9.4	2.3	<2.5	5.1	3.5
Manganese	293	127.5	252	610	361	320	332	545	331	388	157	211	575
Zinc	15.6	7.3	18.1	43.6	55	19.1	c15.0	c44.4	c27.1	c16.2	8.0	22.5	22.3
Boron	<5	5	10.8	11.4	<5	5.5	7	<5	<5	6.6	<5	5.25	<5.0
Vanadium	<10	<10	<10	15.1	21.8	<10	<10	15.4	<10	<10	<10	<10	<10
Arsenic	3.0	2.9	2.9	8.00	9.15	4.00	1.8	3.7	3.0	1.0	3.00	8.00	4.60
Antimony	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.1	0.3	<0.1	<0.1	<0.10	<0.10	<0.10
Thallium	<0.5	<0.5	<0.5	<0.50	0.50	<0.50	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
Mercury	<0.1	<0.1	<0.1	0.10	0.35	0.10	<0.1	<0.1	<0.1	<0.1	0.10	0.10	<0.10
Tin	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.6	<1.0	<1.0	<1.0	<1.0	<1.0
Silver	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
Cyanide	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25

[a]All concentrations reported as mg/kg.

GLT432/91-2

Table 3 (Page 1 of 2)
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS OF SPLIT SPOON SOIL SAMPLES AT CHEM-DYNE
CASE NO. 1964 AUGUST 1983

Compound[a]	MW-23 SS-4A[d]	MW-23 SS-8A[d]	MW-23 SS-10A[d]	MW-24 SS-4A	MW-24 SS-6A	MW-24 SS-11A[d]	MW-25 SS-3A[d]	MW-25 SS-3d[d]	MW-25 SS-6A	MW-25 SS-10A	MW-26 SS-4A	MW-26 SS-7A[d]	MW-26 SS-11A[d]
Acid Coumpounds, ug/kg													
P-chloro-m-cresol													
2-Chlorophenol													
4-Nitrophenol													
Pentachlorophenol													
Phenol													
Base/Neutral Compounds, ug/kg													
Acenaphthene							4,600	LT					
Hexachloroethane													
Fluoranthene							6,800	480				LT	
Isophorone	LT	LT	1,300										
Naphthalene							20,000	600					LT
Bis(2-ethylhexyl)phthalate	14,000	2,400	800										
Benzyl butyl phthalate													
Di-n-butyl phthalate													
Di-n-octyl phthalate													
Diethyl phthalate													
Benzo(a)anthracene							2,000						
Benzo(a)pyrene							1,000						
Benzo(b)fluoranthene							1,200						
Benzo(k)fluoranthene							LT						
Chrysene							1,700						
Acenaphtylene							1,900						
Anthracene							3,600	LT					
Benzo(ghi)perylene							LT						
Fluorene							6,200	LT					
Phenanthrene							18,000	1,100				480	LT
Indeno(1,2,3-cd)pyrene							LT						
Pyrene							4,400	LT				LT	
Volatiles, ug/g													
Carbon tetrachloride			10			8.8							
1,2-Dichloroethane													
1,1,1-Trichloroethane							LT						
1,1,2-Trichloroethane			4.7			LT		6.9					
1,1,2,2-Tetrachloroethane													
Chloroform			7.3			5.7							
trans-1,2-Dichloroethene			53										
Ethylbenzene													LT
Methylene chloride			LT	5.5	3.6	4.5	LT	5.6	LT			LT	LT
Fluortrichloromethane	LT							7.6					
Tetrachloroethene	16		240				LT	86	LT			LT	
Toluene			4.9										
Trichloroethene			18			16		11					
Pesticides, ug/kg													
4,4'-DDT							47						
4,4'-DDE							5.2[b]						
4,4'-DDD													
PCB-1,260	PN 132[c]	PN 56.9[c]											
Nonpriority Pollutants Hazardous Substances, ug/kg													
Dibenzofuran							4,400	LT					
2-Methylnaphthalene							5,800						
Nonpriority Pollutants, ug/g													
Acetone			120										
4-Methyl-2-pentanone			300										
O-xylene													LT
Dioxins, ug/kg													
2,3,7,8-Tetrachlorodibenzo -p-dioxin													

[a]NA denotes that the compound was not analyzed for in this sample. Only compounds identified in samples are listed on this table. Compounds not identified in any sample are not listed.
[b]Presence indicated by >200 percent difference by packed w. capillary column quantitation.
[c]PN means pesticide or PCB cannot be confirmed by GC/MS.
[d]LT denotes compound found at less than the specified detection limit but greater than one-half of the detection limit.

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Table 3 (Page 2 of 2)
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS OF SPLIT SPOON SOIL SAMPLES AT CHEM-DYNE
CASE NO. 1964 AUGUST 1983

Compound[a]	MW-27 SS-5B	MW-27 SS-6A	MW-27 SS-12A[d]	MW-28 SS-2[d]	MW-28 SS-6	MW-28 SS-6d	MW-28 SS-11[d]	MW-29 SS-7A	MW-29 SS-10C	MW-29 SS-13C[d]
Acid Compounds, ug/kg										
P-chloro-m-cresol										920
2-Chlorophenol										960
4-Nitrophenol										4,400
Pentachlorophenol										LT
Phenol										1,000
Base/Neutral Compounds, ug/kg										
Acenaphthen										
Hexachloroethane			LT							
Fluoranthene										LT
Isophorone										
Naphthalene										
Bis(2-ethylhexyl)phthalate			440	LT				1,000		LT
Benzyl butyl phthalate				21,0000						
Di-n-butyl phthalate				LT						
Di-n-octyl phthalate				2,600						
Diethyl phthalate							LT			
Benzo(a)anthracene										
Benzo(a)pyrene										
Benzo(b)fluoranthene										
Benzo(k)fluoranthene										
Chrysene										
Acenaphtylene										
Anthracene										
Benzo(ghi)perylene										
Fluorene ,										
Phenanthrene										LT
Indeno(1,2,3-cd)pyrene										
Pyrene										LT
Volatiles, ug/g										
Carbon tetrachloride										
1,2-Dichloroethane	LT									
1,1,1-Trichloroethane										
1,1,2-Trichloroethane										
1,1,2,2-Tetrachloroethane		3.4	12							
Chloroform										
trans-1,2-Dichloroethene	14									
Ethylbenzene		LT								
Methylene chloride	7.3	2.8	7.4		2.5	LT	LT	LT	2.6	4.5
Fluortrichloromethane										
Tetrachloroethene	7.4	LT	25							
Toluene	LT		LT							
Trichloroethene										LT
Pesticides, ug/kg										
4,4'-DDT										
4,4'-DDE										
4,4'-DDD										
PCB-1,260			P.N. 115			P.N. 41				
Nonpriority Pollutants Hazardous Substances, ug/kg										
Dibenzofuran										
2-Methylnaphthalene										
Nonpriority Pollutants, ug/g										
Acetone										
4-Methyl-2-pentanone										
O-xylene										
Dioxins, ug/kg										
2,3,7,8-Tetrachlorodibenzo -p-dioxin										

[a]NA denotes that the compound was not analyzed for in this sample. Only compounds identified in samples are listed in this table. Compounds not identified in any sample are not listed.
[b]Presence indicated by >200 percent difference by packed w. capillary column quantitation.
[c]P.N. menas pesticide or PCB cannot be confirmed by GC/MS.
[d]LT denotes compound found at less than the specified detection limit but greater than one half of the detection limit.

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installed were determined by U.S. EPA personnel with recommendations from CH2M HILL.

EQUIPMENT AND MATERIALS

Air rotary drilling, temporary casing installations, and well casing and screen installation were performed using a Davey M-7 drill rig. Temporary steel casing was driven using a 3,000-pound pneumatic hammer.

Monitoring wells were constructed using threaded 4-inch diameter stainless steel well casing and stainless steel wire wound, No. 10 slot size well screen.

WELL INSTALLATION PROCEDURE

The drill rig was positioned over each of the newly performed soil borings and a pilot hole approximately 8 inches in diameter and 20 feet in depth was drilled. Temporary casing, 6 inches in diameter, was installed in the pilot hole and advanced to the well placement depth. The temporary casing was advanced by driving in 5- or 10-foot intervals followed by cleaning out of the casing using air rotary techniques. Well screen and casing were positioned within the 6-inch temporary casing. After positioning the screen and casing, temporary casing was withdrawn to expose the screened well section and sand pack was installed. Following placement of a bentonite seal and addition of a cement grout seal, all temporary casing was withdrawn.

To complete the well installation, the drill rig was moved off the location. A locking protective enclosure and concrete pad with steel guard posts were placed around each well. Figure 2 presents a summary of the onsite monitoring well construction.

Development of the new onsite groundwater monitoring wells was accomplished by air lift techniques. The air lift techniques involved forcing air through a venturi type device attached to PVC tubing. The reduced pressure near the venturi portion of the device allowed groundwater and sediment to enter the air stream in the tubing. This water was then carried along with the air stream to the ground surface. This development technique was effective and avoided direct introduction of air or water into the monitoring well and surrounding aquifer. Development water was contained in drums and treated using the onsite treatment system provided by O.H. Materials.

DECONTAMINATION

Decontamination procedures used during well installation included steps to avoid contaminating the monitoring zone of

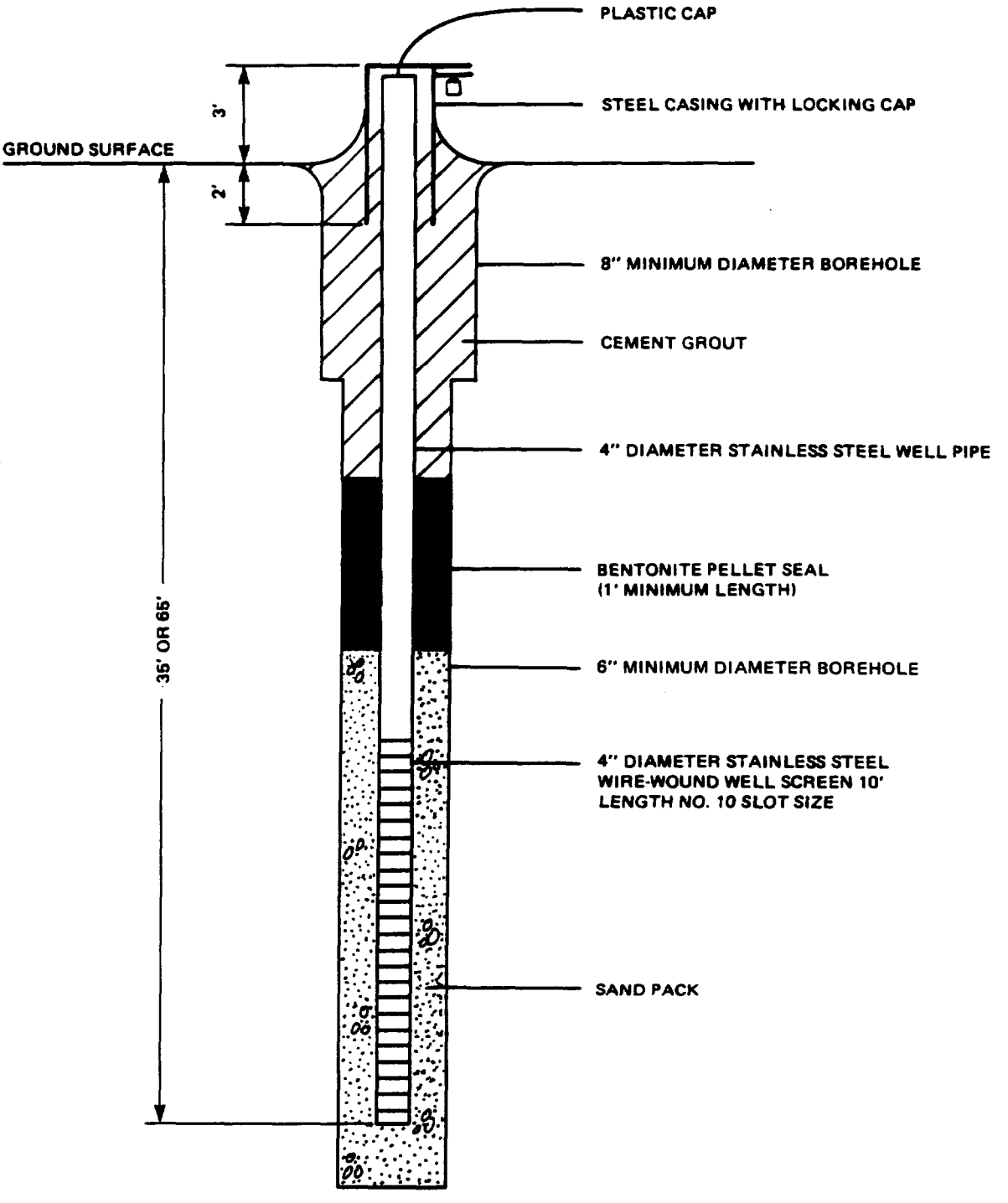

FIGURE 2
PHASE II HYDROGEOLOGICAL SHALLOW AND DEEP MONITORING WELL CONSTRUCTION
CHEM - DYNE SITE

the aquifer system and eliminate carryover of contamination from one monitoring well location to another. The primary steps used were as follows:

- Steam cleaning the drilling rig and equipment prior to initiation of field work.

- Decontamination of the drill rig, drilling equipment, and temporary casing between each well installation using a high-pressure water wash provided by O.H. Materials.

- Drilling and well installation procedures (e.g., use of casing and contingency for sealing and telescoping casing) to avoid contamination of lower monitoring zones by material from overlying zones.

- Decontamination of the well casing and screen. The procedure for decontamination of the well casing and screen consisted of an acetone wash followed by a high-pressure water rinse. Following decontamination, well casing and screen were wrapped in plastic sheeting until installed.

CHRONOLOGY

The following chronology summarizes the major activities and events of each week of the Phase II split spoon sampling and well installation effort onsite at Chem-Dyne from May 23 through July 13.

<u>May 23-29</u>

- Health and safety training of drilling crew for onsite split spoon sampling.

- Brooks Geoprobe mobilization of soil boring rig.

- Soil boring MW-26 completed.

<u>May 30 - June 5</u>

- Soil boring MW-25 completed.
- Soil boring MW-24 completed.
- Health and safety training of drilling crew for onsite well installation.
- Brook Geoprobe mobilization of well installation rig.
- Groundwater monitoring well MW-25 initiated.
- Soil samples collected from soil borings MW-24, MW-25, MW-26 and MW-28 shipped to laboratories for analysis.

June 6-12

- Soil boring MW-28 completed.
- Soil boring MW-27 completed.
- Soil boring MW-23 completed.
- Soil boring MW-29 completed.
- Groundwater monitoring well MW-24 installed.
- Soil samples collected from soil borings MW-23, MW-27, and MW-29 shipped to laboratories for analysis.

June 13-19

- Well installation crew begins working at 3:00 a.m. with lighting to avoid severe heat stress problems.
- Groundwater monitoring well MW-23 installed.
- Groundwater monitoring well MW-27 installed.
- Groundwater monitoring well MW-29 installed.

June 20-26

- Groundwater monitoring well MW-26 installed.

June 27 - July 3

- Groundwater monitoring well MW-26 completed.
- Groundwater monitoring well MW-28 initiated.
- Brook Geoprobe demobilized soil boring rig.

July 4-12

- Groundwater monitoring well MW-28 still in progress.

July 11-13

- Groundwater monitoring well MW-28 installed.
- Guard posts placed around each monitoring well.
- Brooks Geoprobe demobilized will installation rig.

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APPENDIX A

CHEM-DYNE SITE
SOIL BORING LOGS

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-23	SHEET 1 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION _____ DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE _____ START 6/8/83 FINISH 6/9/83 LOGGER ROWLISON

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		X	SS-1	18"	8-15-10 (25)	**Silty Sand**, fine, brown to black, dense (SP)		33 (10)	Pink and red flakes chemical stain
	5	X	SS-2	14"	26-20-11 (46)	**Sandy Silt**, black, stiff (ML)		43 (92)	Green, pink flakes, black chemical stain
		X	SS-3	11"	9-3-4 (12)	**Sandy Silt**, brown, soft, damp (ML)		900 (110)	
	10	X	SS-4	16"	3-2-4 (6)	**Silty Sand**, fine, brown, loose damp (SP)		160 (84)	Change at 10.5'
		X	SS-5	14"	4-4-5 (9)	**Silty sand**, fine, brown, loose, damp (SP)		63 (108)	
	15	X	SS-6	16"	4-5-7 (12)	**Silty Sand**, fine, brown, loose damp (SP)		150 (86)	
		X	SS-7	16"	13-5-7 (12)	**Silty Sand**, fine, brown, medium dense, damp (SP)		115 (56)	Cleaner
	20	X	SS-8	16"	17-26-33	**Sand**, fine to medium, brown, dense, damp		240 (80)	
		X	SS-9	3"	70/4"	**Cobble**		100 (106)	Hard driving and augering
	25	X	SS-10	10"	38-28-38	**Gravelly Sand**, medium, brown, very dense, wet		500 (138)	Water table at 25'
		X	SS-11	10"	17-20-32	**Gravelly Sand**, medium, brown, very dense, wet		100 (20)	Clean sand-may be slough
	30								

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-23	SHEET 2 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION 590 FT DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE _____ START 6/8/83 FINISH 6/9/83 LOGGER ROWLISON

ELEVATION	DEPTH BELOW SURFACE	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30	X	SS-12	14"	28-28-31	**Gravelly Sand**, medium, brown, very dense, wet (SP)		100 (34)	
	35	X	SS-13	12"	50-38-74	**Gravelly Sand**, medium, brown, very dense, wet (SP)		5.4 (5)	
						BOTTOM OF BORING AT 38-1/2"			
	40								Installed 25' of 4" stainless steel well pipe and 10' of stainless steel well screen

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-24	SHEET 1 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION 591 FT DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE _____ START 5/31/83 FINISH 5/31/83 LOGGER BERGGREN

ELEVATION / DEPTH BELOW SURFACE	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	X	SS-1	0"	75/6"	**No Recovery**		No recovery. Split spoon appears obstructed
5	X	SS-2	12"	19-12-7	**Sandy Gravel,** silty, black		20 (4)
	X	SS-3	10"	4-6-6	**Silty Clay,** dark brown to black 1/4" thick piece of wood near top of spoon sample		6 (<1)
10	X	SS-4	12"	6-4-5	**Clayey Silt,** with some lenses of fine sand, medium brown		3 (1)
	X	SS-5	13"	3-4-7	**Sand,** medium to coarse, light brown, top 2" of sample--fine to medium sand		1.6 (<1)
15	X	SS-6	14"	13-15-25	**Sandy Gravel—Gravelly Sand,** light brown, gravel gnerally < 1/2" in diameter		3.8 (1.8)
	X	SS-7	12"	36-46-53	**Sandy Gravel—Gravelly Sand,** light brown, gravel generally < 1/2" in diameter, except more large diameter gravel		4 (3)
20	X	SS-8	12"	42-100/6"	**Sandy Gravel—Gravelly Sand,** light brown, gravel generally < 1/2" in diameter, except more large diameter gravel		4.8 (1.4) Approximately 22" hard augering
25	X	SS-9	12"	20-44-36	**Sandy Gravel,** light brown to gray, gravel 1/2" to > 1" in diameter, wet		4.2 (2.0) Water table at about 25'
30							

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-24	SHEET 2 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION 591 FT DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE _____ START 5/31/83 FINISH 5/31/83 LOGGER BERGGREN

ELEVATION	DEPTH BELOW SURFACE	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30	X	SS-10	12"	44-103/6"	**Clayey, Sandy, Gravel,** light gray, wet		2 (<1)	Approx. 12" of disturbed material in auger above 30'. Split spoon given and discarded, then redriven and sample collected
	35	X	SS-11	16"	25-84-97	**Sandy Gravel—Gravelly Sand,** light brown to gray, less clay than sample above, gravel from 1/4" to > 1" diameter		30 (4.5)	End of boring and sampling at 36-1/2"
									Installed 25' of 4" stainless steel well casing and 10' of stainless steel well screen

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-25	SHEET 1 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION 589 FT DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE _____ START 8:30 5/30/83 FINISH 2:00 p.m. LOGGER HOLM/FAUGHT

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
						Fill, black, rubble, obstruction, at 3' (±)			
	5	X	SS-1	14"	30-55-41	**Coarse Sand,** small fines, chunks of rubble, wood at 6'		>1000 (240)	
									Broken head on auger
		X	SS-2	4"	2-2-5	**Fill, black,** some wood type material, soil formed balls typical of clay		220 (100)	
	10								
		X	SS-3	18"	10-11-9	**Sand,** some clay and organic material		900 (200) 140 (100)	
	15	X	SS-4	12"	11-12-8	**Sand,** yellow brown, changes to darker color with more clay matrix at center of spoon		720 (240)	
		X	SS-5	9"	2-3-4	**Fine Silty Sand**		280 (100)	
									Break at 10:00 a.m.
	20	X	SS-6	11"	49-61-51	**Sand,** with some clay and gravel		>1000 (120)	
		X	SS-7	11"	29-65-65	**Sandy Gravel,** light brown, slightly wet, gravel to 3" diameter		400 (100)	Water table at about 23-1/2'
	25	X	SS-8	13"	11-17-33	**Clay Silt till with Coarse Sand,** gray, wet 3 ft up from bottom rod		3 (1)	
		X	SS-9	9"	12-63-50	**Coarse Gravel and Sand,** slightly wet		600 (6)	
	30								

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-25	SHEET 2 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION 589 FT DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE _____ START 5/30/83 FINISH 5/30/83 LOGGER HOLM/FAUGHT

ELEVATION	DEPTH BELOW SURFACE	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30								
		X	SS-10	12"	19-28-79	Gravel, fine, some sand, wet		900 (100)	Out of hole here at 2:00 p.m.
	35								Installed 25' of 4" stainless steel well pipe and 10' of stainless steel well screen

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-26	SHEET 1 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION 589 FT DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE START 5/27/83 FINISH 5/28/83 LOGGER HOLM

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
						0-3' Coarse Gravelly Fill with Rubble, black, obstruction at 3'			
		X	SS-1	5"	31-17-8	**Large Gravel** in spoon		10	
	5								
		X	SS-2	4"	15-21/5"	**Wood in shoe**		68	At 6' 9-10 ppm on HNu background 2 ppm
		X	SS-3		3-4-5	**Clayey Silt**, fine, with coarse sand to fine gravel		320 (60)	Hole stopped at 10' for day (3:30 p.m.)
	10								
		X	SS-4	14"	2-3-4	**Silty Sand**, fine, brown, moist		240 (50)	OVA scan detected vapors
		X	SS-5	14"	5-5-6	**Silty Sand**, fine, brown, moist		120 (90)	
	15								
		X	SS-6	6"	4-6-6	**Silty Sand**, fine, brown, moist, with some medium to coarse sand		120 (50)	
		X	SS-7	8"	5-4-11	**Silty Sand**, fine, brown, moist, with some medium to coarse sand, some coarse sand seams, some siltier seams		420 (90)	Hard augering at 19.5'
	20								
		X	SS-8	5"	10-40-65	**Gravel**, coarse with some sand		240 (64)	
		X	SS-9	12"	13-32-38	**Clayey Silt**, with sand and gravel gray-brown (till)		100 (8)	
	25								
		X	SS-10	10"	15-31-55	**Clayey Silt**, with sand and gravel gray-brown (till), some fine sand lenses, moist		340 (8)	Water on spoon at about 21 feet
	30								

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-26	SHEET 2 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION 589 FT DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE _____ START 5/27/83 FINISH 5/28/83 LOGGER HOLM

ELEVATION / DEPTH BELOW SURFACE	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	X	SS-11	9"	35-40-66	**Gravel**, coarse, some sand, light gray, dense		>1000 (72)	Cobbles at 34'
35	X	SS-12	8"	70-46-50	**Sandy Gravel**, wet, large cobbles at 36'		>1000 (110)	Stopped for lunch
40								Did not sample at 40.5' due to 1-1/2' of sand in auger
	X	SS-13	0"	40-75/5"	**Sand and Gravel**, coarse		>1000 (20)	Still about 1' of sand in auger. Cleaned and sampled.
45					**ATTEMPTED TO SAMPLE AT 47.5', BUT 2' OF SAND IN AUGER. DID NOT SAMPLE**			
50					**AUGERED TO 52.5' AND HOLE WAS STOPPED THERE**			
								Installed 55' of 4" stainless steel well pipe and 10' of stainless steel well screen

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-27	SHEET 1 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION 590 FT DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE _____ START 6/7/83 FINISH 6/8/83 LOGGER BERGGREN

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		X	SS-1	13"	45-18-18	**Fill, sandy gravel, dark brown to black**		300 (160)	
	5	X	SS-2	3"	21-11-8	**Fill, sandy gravel, dark brown to black**		250 (118)	
		X	SS-3	2"	58-21-23	**Fill, silty sandy gravel, dark brown.**		110 (58)	Low recovery - no catcher in spoon
	10	X	SS-4		40-19-13	**Fill, silty sandy gravel, dark brown slightly more clay. No sample.**			**No sample,** sample was lost when spoon was opened
		X	SS-5	11"	4-3-2	**Clayey Silt, dark brown to black, some horizontal dark streaks of organic matter or charcoal**		>1000 (42)	
	15	X	SS-6	18"	8-9-20	**Clayey Silt, dark gray, about 8" over sandy gravelly clay, brown with rust colored mottles.**		820 (40)	
		X	SS-7	8"	7-14-17	**Sand, coarse, light brown, with some fine gravel, very little clay**		30 (18)	
	20	X	SS-8	5"	18-65/3"	**Sand, coarse, light brown, with some fine gravel, very little clay, with more gravel; tip of spoon blocked with cobble**		56 (24)	SS-8 spoon appear to be bouncing on cobble
		X	SS-9	0"	115-40/0"	**No sample, end of spoon blocked with cobble**			Very hard augering at and below 21'. Stopped and pull augers. Bit was clogged with clay and gravel
	25	X	SS-10	10"	16-47-122	**Clayey Sandy Gravel, grayish brown larger gravel and more clay than above**		160 (8)	
		X	SS-11	0"	14-21-45	**No Sample, all of recovery was material from above in auger**			
	30								

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-27	SHEET 2 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION 590 FT DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE _____ START 6/7/83 FINISH 6/8/83 LOGGER HOLM

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30	X	SS-12	15"	32-48-75	**Gravel**, coarse with sand		>1000 (36)	
						Sand up into auger 1'			
	35	X	SS-13	12"	37-37-85	**Gravel**, coarse, gray		>1000 (165)	
	40								Installed 25' of 4" stainless steel well pipe and 10' of stainless steel well screen

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-28	SHEET 1 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION 590 FT DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE _____ START 6/3/83 FINISH 6/6/83 LOGGER BERGGREN

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	5	X	SS-1	8"	16-15-3	**Fill,** poorly graded gravel generally < 1" diameter dark brown		>1000	
		X	SS-2	11"	6-13-12	**Fill,** poorly graded gravel generally < 1" diameter dark brown, except lighter in color		360	
	10	X	SS-3	0"	27-27-20	**No Recovery,** auger cuttings indicate coarse gravel 1 to 1-1/2" diameter			Tip of spoon plugged with gravel
		X	SS-4	0"	18-4-5	**No Recovery,** residue in spoon suggests coarse sand—sandy gravel			
	15	X	SS-5	18"	2-6-21	**Top 2" Clayey Gravel,** light brown **6" Silty Sandy Clay,** dark brown, firm **10" Sand,** coarse-medium, brown		40	At 15' drove 2' spoon. First 6" were waste. Blow counts are for last 18".
		X	SS-6	24"	9-12-12-17	**Silty Clay,** dark brown, firm 1 foot, remainder sand, coarse with some gravel, light brown		38	
	20	X	SS-7	4"	15-50/2	**Sand,** coarse with some gravel, fine, light brown		24	At 21' spoon bouncing on cobble. Hard augering. 1/2 hour and <1" auger progress. Pulled augers and moved*
		X	SS-8	6"	9-23-53	**Sand,** coarse with some gravel, fine, light brown, with some clay matrix		240	
	25	X	SS-9	9"	14-20-87/5"	**Sand,** coarse with some gravel, fine, light brown, with some clay matrix, wet		540	Water table about 25'
	30	X	SS-10	16"	38-113-120/5"	**Gravelly Sand,** much like above, but more gravel; gravel > 1" diameter and subangular to subrounded		>1000	*5' to the west. Drilled to 22-1/2' and resumed sampling

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-28	SHEET 2 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION 590 FT DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE _____ START 6/3/83 FINISH 6/6/83 LOGGER BERGGREN

ELEVATION / DEPTH BELOW SURFACE	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
30	X	SS-11	14"	28-88-100/3"	**Gravelly Sand,** much like above, but more gravel; gravel > 1" diameter and subangular to subrounded		> 1000	
35	X	SS-12	11"	26-75-125	**Clayey Gravel,** gray to dark brown; angular to subangular; gravel different texture than overlying material		> 1000	Drilling postponed for weekend. Break stopped at 35' 6/3/83
40	X	SS-13	10"	34-68-83	**Clayey Gravel,** gray to dark brown; angular to subangular gravel different texture than overlying material; dense, firm, well graded			Resumed drilling 6/6/83 auger cuttering look like clayey silt or sand
45	X	SS-14	4"	15-29-44	**Clayey Gravel,** gray to dark brown; angular to subangular gravel different texture than overlying material; dense, firm, well graded			Augering more difficult at 45' to 50' than 10' above
50	X	SS-15	13"	22-27-38	**No Sample** collected, recovery was material in auger casing			
55	X	SS-16		25-24-38	**No Sample Collected.** Recovery was material in auger casing.			SS-16 drove spoon about 1' through material in auger before starting blow counts
	X	SS-17		44/6"	**No Sample Collected.** Recovery was material in auger casing.			SS-17 drove spoon about 1' through material in auger material before starting blow counts
60					**BORING ENDED AT 58-1/2 FEET**			

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-29	SHEET 1 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION 590 FT DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE _____ START 6/9/83 FINISH 6/10/83 LOGGER ROWLISON

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		X	SS-1 A&B	18"	50-9-15 (24)	**Sandy Fill**, black, stained, dry		700 (162)	
	5	X	SS-2 A&B	14"	8-4-7 (11)	**Sandy Fill**, black, stained, dry		240 (44)	
		X	SS-3 A&B	14"	3-4-3 (7)	**Sandy Silt**, brown, soft, damp (ML)		8.6 (12)	
	10	X	SS-4 A&B	16"	3-3-2 (5)	**Sandy Silt**, brown, soft, damp (ML)		2.0 (4.0)	Note: took extra sample after SS-4
		X	SS-5 A&B	14"	2-2-4 (6)	**Silty Sand**, fine, brown, loose, damp (SP)		4.0 (6.0)	
		X	SS-6 A&B	12"	6-5-6 (11)	**Silty Sand**, fine, brown, loose, damp (SP)		2.0 (6.0)	Note: spoon samples over lapped SS-5 to SS-6 to get back on even ft
	15	X	SS-7 A&B	12"	6-12-31 (43)	**Gravelly Sand**, medium to coarse, brown, dense, damp		3.0 (2.8)	Two diff. samp. labeled SS-7 changed to C&D designation to differentiate
		X	SS-7 C&D		11-27-52 (79)	**Gravelly Sand**, medium to coarse, brown, dense, damp (SP)		3.8 (3.0)	
	20	X	SS-8 C&D	12"	18-30-42 (72)	**Gravelly Sand**, medium to coarse, brown, dense, damp (SP)		8.4 (14.8)	
		X	SS-9 C&D	9"	184-92	**Gravelly Sand**, medium to coarse, brown, dense, damp (SP)		3.4 (6.0)	Hard augering at 22' cobble in spoon in SS-9
	25	X	SS-10 C&D	12"	75-35-56 (91)	**Silty Sand**, fine, brown, very dense, wet		20 (18)	GWT at 25'N
		X	SS-11 C&D	13"	68-40-39 (79)	**Silty Sand**, fine, brown, very dense, wet		16 (16)	
	30								

CH2M HILL

PROJECT NUMBER	BORING NUMBER	
W65310.C0	MW-29	SHEET 2 OF 2

SOIL BORING LOG

PROJECT CHEM-DYNE RI/FS LOCATION HAMILTON, OHIO

ELEVATION 590 FT DRILLING CONTRACTOR BROOK'S GEOPROBE

DRILLING METHOD AND EQUIPMENT HOLLOW STEM AUGER (6" OD) MOBILE B-80

WATER LEVEL AND DATE _____ START 6/9/83 FINISH 6/10/83 LOGGER ROWLISON

ELEVATION	DEPTH BELOW SURFACE	SAMPLE INTERVAL	SAMPLE TYPE AND NUMBER	SAMPLE RECOVERY	STANDARD PENETRATION TEST RESULTS 6" -6" -6" (N)	SOIL DESCRIPTION: NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	HEAD SPACE OVA (HNu)	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	30	X	SS-12 C&D	12"	63-34-41 (75)	**Silty Sand**, fine, brown, very dense, wet (SP)		14 (8)	
	35	X	SS-13 C&D	11"	60-25-32 (57)	**Silty Sand**, fine, brown, very dense, wet (SP) 36.5		600 (11.8)	
						BOTTOM OF HOLE			Installed 25' of 4" stainless steel well pipe and 10' of stainless steel well screen

APPENDIX B

PHASE II HYDROGEOLOGICAL INVESTIGATION
SOIL SAMPLING AND WELL INSTALLATION

PHOTOGRAPHIC LOG

PHASE II HYDROGEOLOGICAL INVESTIGATION
Photographic Log
Chem-Dyne Site
W65310.C0

Photo 1: A view of the southern entry to the Chem-Dyne site.

Photo 2: A photo of the health and safety training of the drillers conducted in May, 1983.

Photo 3: A view of the decontamination trailer set up by O.H. Materials at the southern end of the Chem-Dyne site.

Photo 4: Same as Photo 3.

Photo 5: Same as Photo 3.

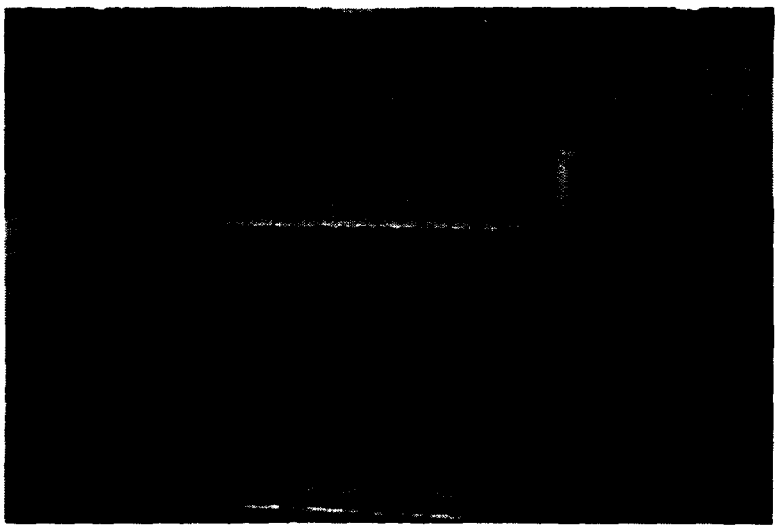

Photo 6: A view of the back entrance to the O.H. Materials decontamination trailer and equipment shed.

Photo 7: A view to the west showing the surroundings of the site and the rain gauge on the O.H. Materials platform offsite.

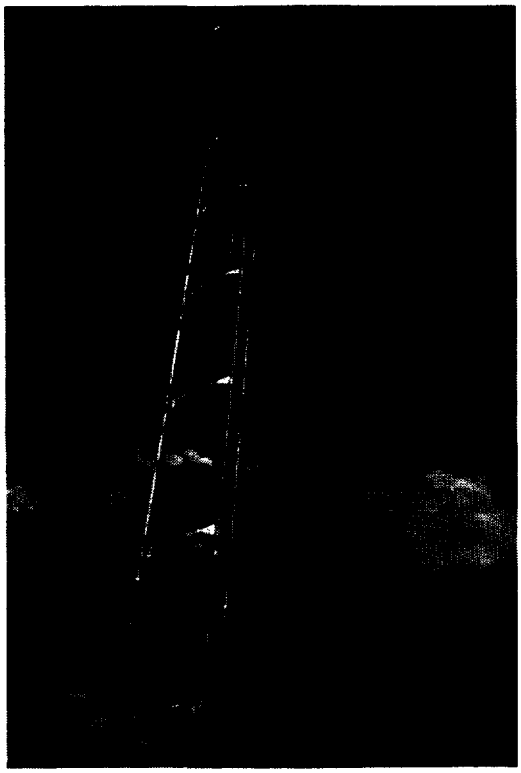

Photo 8: A photo of the weather station erected by O.H. Materials onsite.

Photo 9: A view to the southern entrance gate to the site showing the decontamination trailer, decontamination pad, and water storage unit.

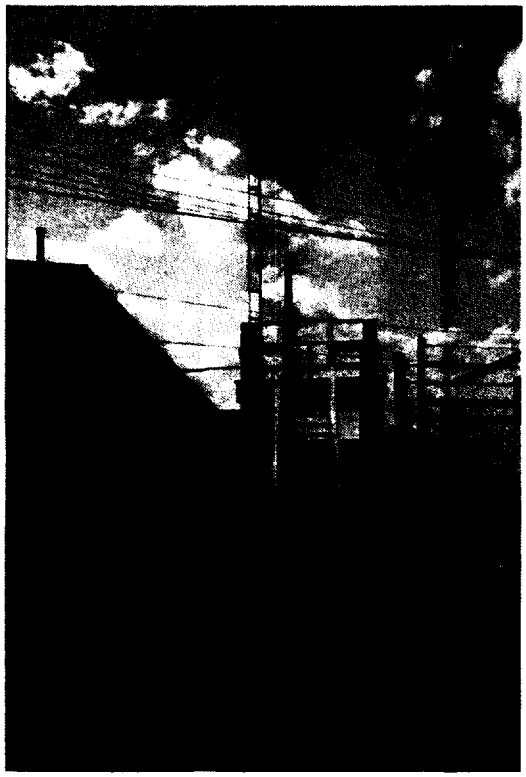

Photo 10: A view to the west showing the observation platform erected by O.H. Materials just offsite.

Photo 11: A view of the dressout area and procedures prior to entrance from the south end of the site.

Photo 12: A photo of split-spoon sampling.

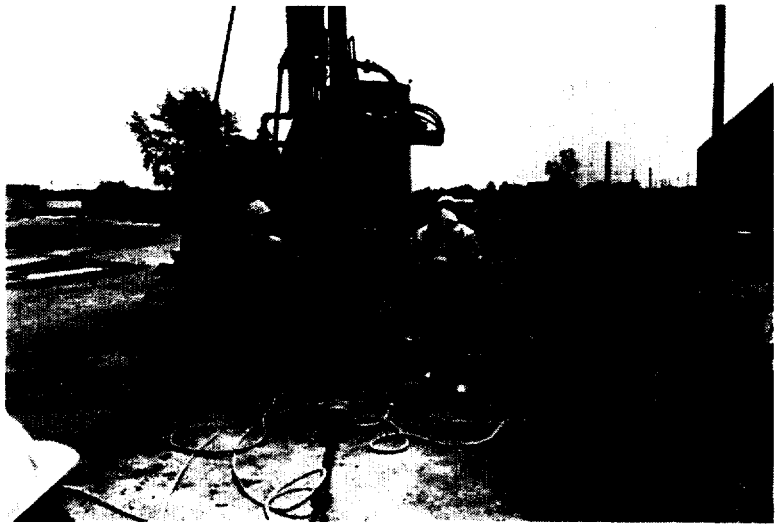

Photo 13: A view of the rear of the soil boring rig and drillers.

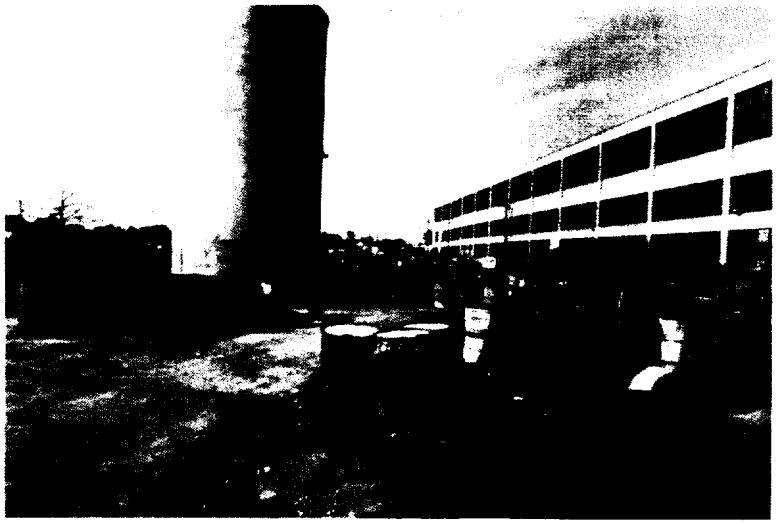

Photo 14: Taken from the northern portion of the site looking south, showing the onsite conditions near Tank 15.

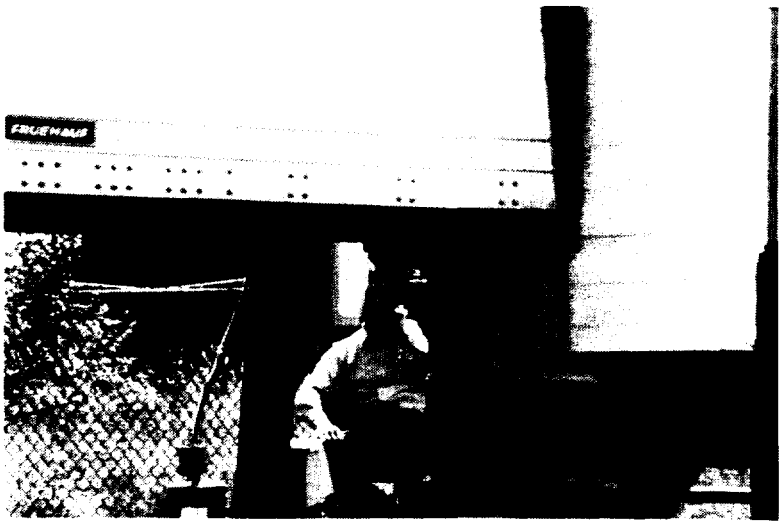

Photo 15: An offsite photo showing the phone installed.

Photo 16: A photo of the onsite operations by O.H. Materials.

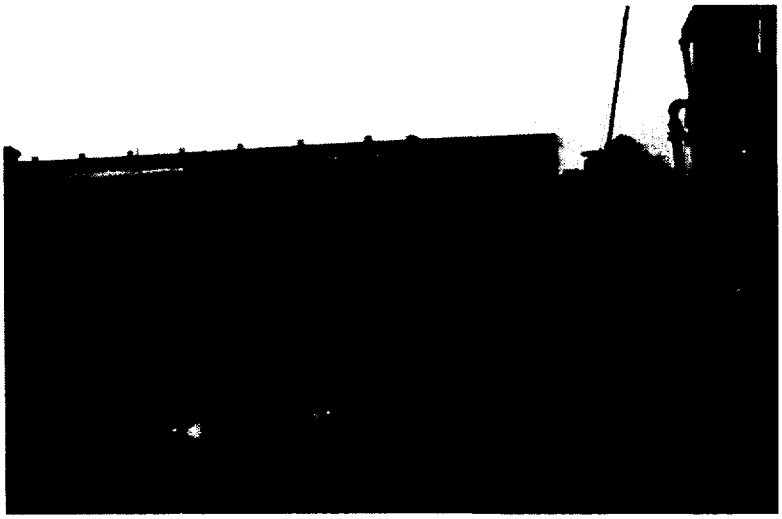

Photo 17: A view of the soil boring operation and logging.

Photo 18: A view of the split spoon samping near MW27.

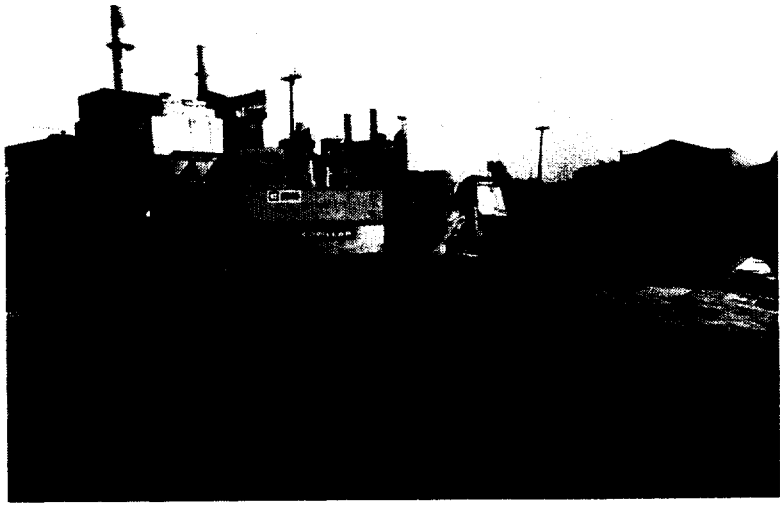

Photo 19: A photo of onsite operations by O.H. Materials on the northern portion of the site.

Photo 20: A view of decontamination procedures for the split spoons used in sampling.

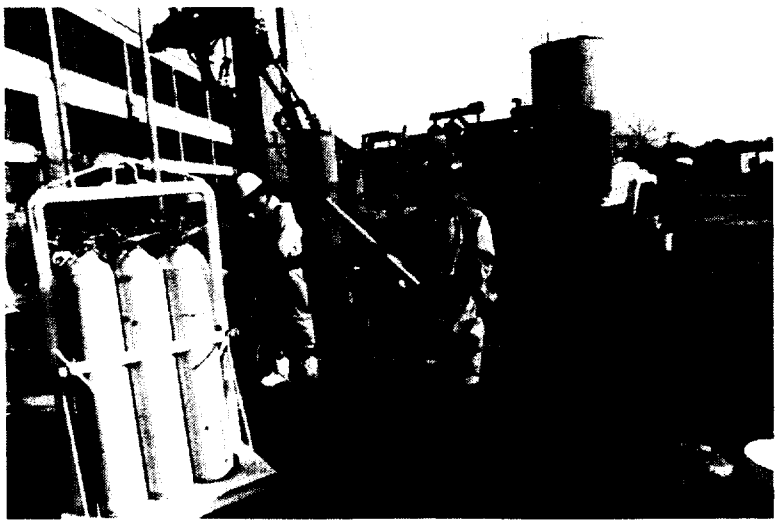

Photo 21: Another view of decontamination of the split spoons.

Photo 22: A view from the northern portion of the site looking west at the Hamilton City Electric Plant.

Photo 23: O.H. Materials operations in the northern portion of the site near MW 27 and 28.

Photo 24: Soil boring operations at MW27 and the supplied air setup.

Photo 25: A photo of the soil boring operation with O.H. Materials activity in the background.

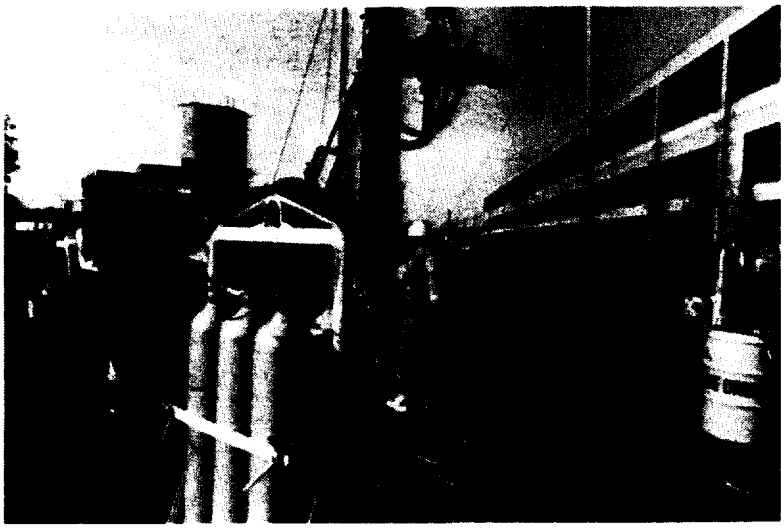

Photo 26: Soil boring operations at the northern portion of the site.

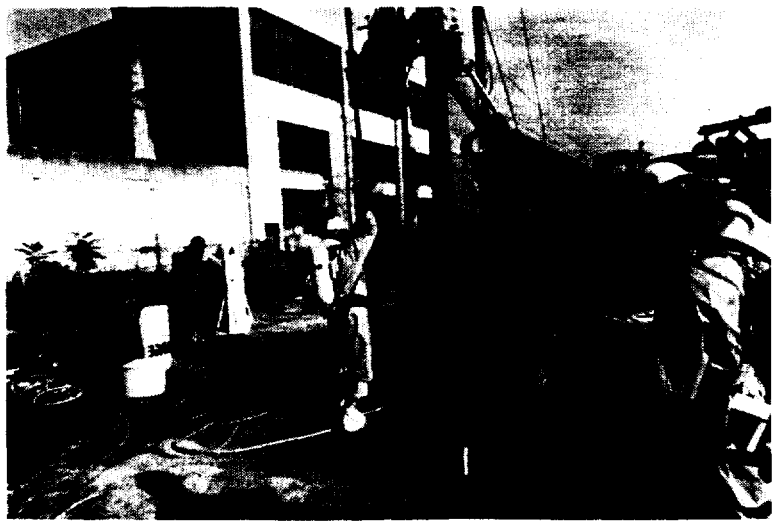

Photo 27: A view of the onsite soil boring operations. Inspector logging the soil boring material and supplied air setup in the background.

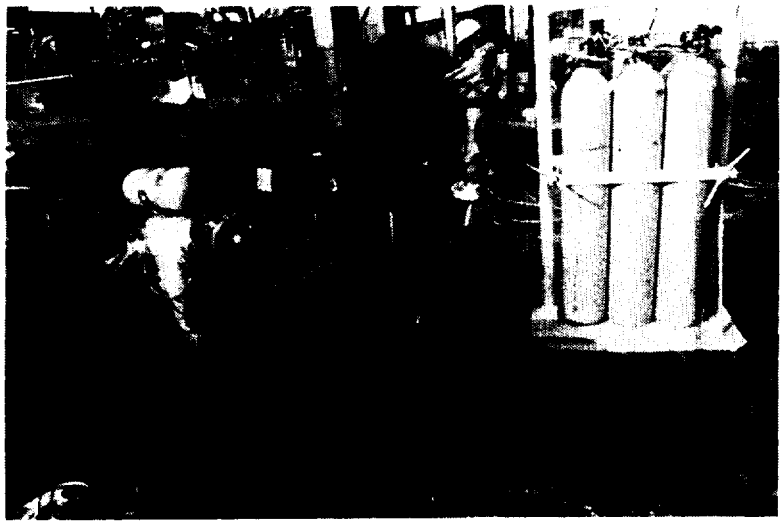

Photo 28: Decontamination setup for the split spoon samples and glove wash.

Photo 29: A photo of the split spoon decontamination procedures onsite.

Photo 30: A shot taken from the observation deck offsite looking toward the north shows the onsite conditions and well installation rig in the foreground.

Photo 31: A view of the onsite operations by O.H. Materials.

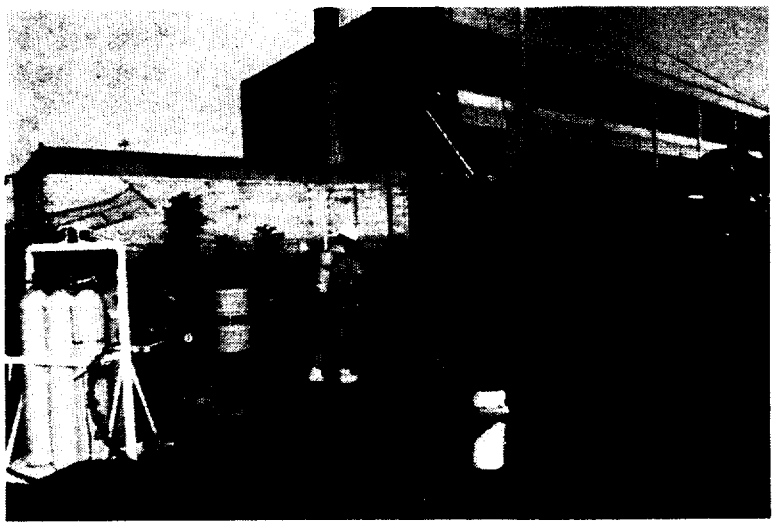

Photo 32: A view of the soil boring rig and drillers.

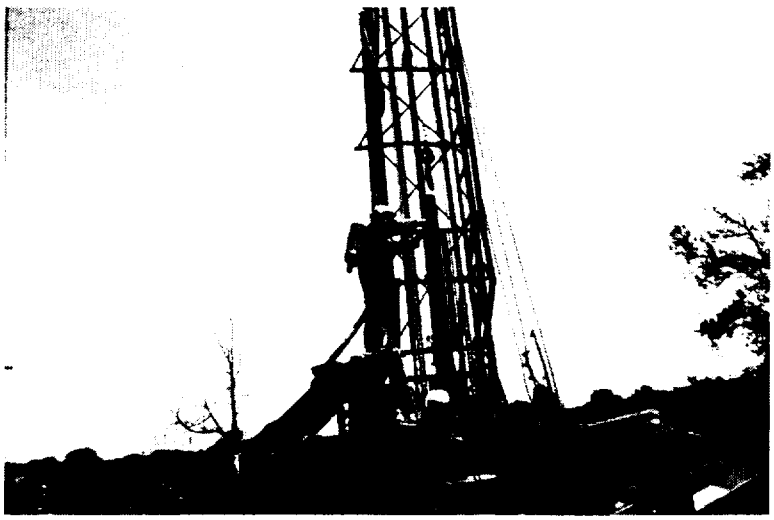

Photo 33: A view of the onsite well installation activity.

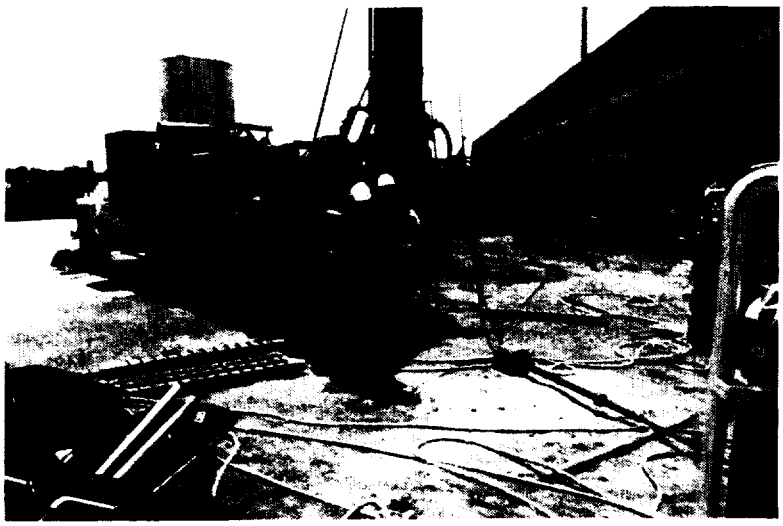

Photo 34: A view of the onsite soil boring rig and drillers with the associated airlines attached.

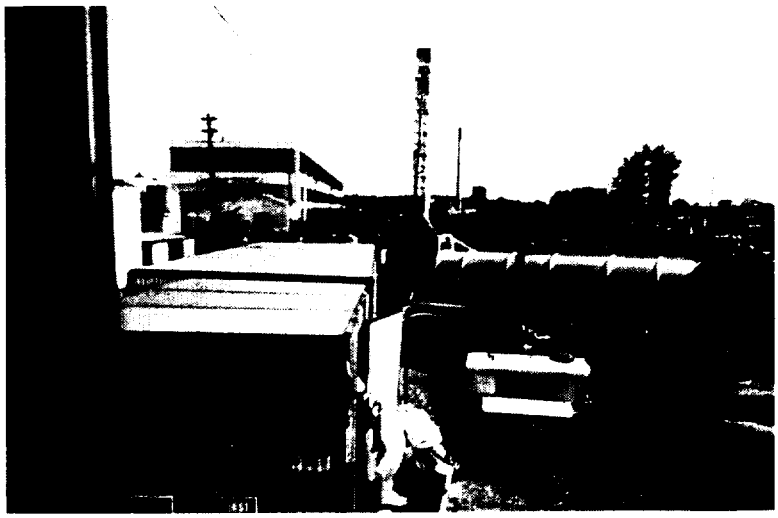

Photo 35: A view of the bottle change shed erected by O.H. Materials for their personnel onsite.

Photo 36: A view of the onsite well installation activity.

Photo 37: A view along the western side of the site, showing well installation activity.

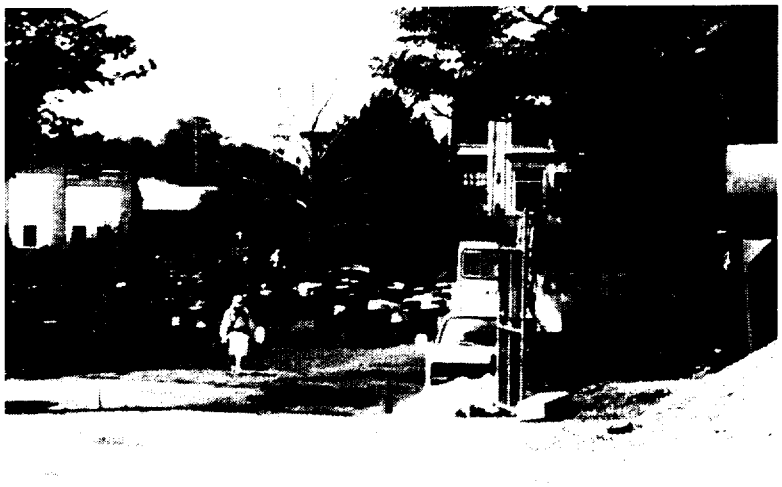

Photo 38: A view to the north through the southern entrance gates to the south.

Photo 39: A view of the decontamination procedures showing the high-pressure water wash installed by O.H. Materials on their decontamination pad.

Photo 40: A view from onsite looking toward the south, showing the well installation rig.

Photo 41: A view of the onsite soil boring operation.

Photo 42: A view from the observation deck erected by O.H. Materials toward the north across the site, showing the soil boring rig located near Tank 15.

Photo 43: A view of the offsite support activity.

Photo 44: A view of the staging area for the construction materials and vehicles located at the southern entrance to the site.

Photo 45: A view from offsite of the onsite well installation activity.

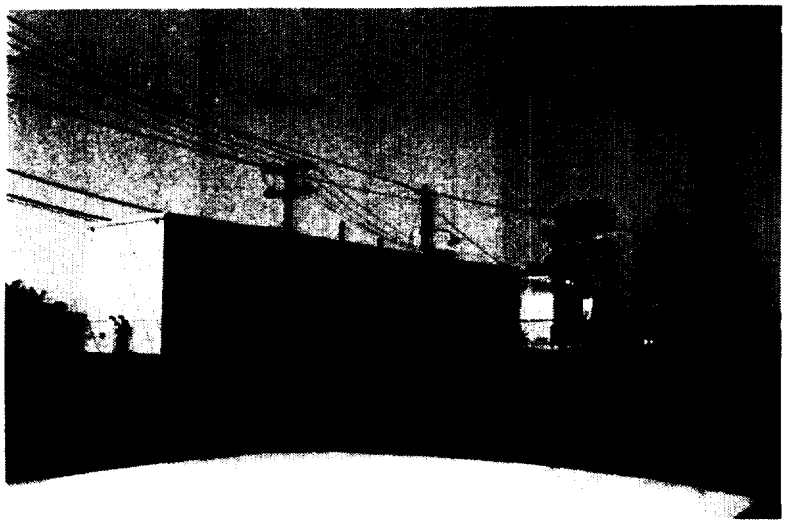

Photo 46: A photo of the NIOSH trailer installed for monitoring of health and safety activity onsite.

Photo 47: A view from the south looking toward the north along the access road onsite.

Photo 48: A view of the split spoon decontamination facility set up onsite near monitoring well 29.

Photo 49: Same as Photo 48.

Photo 50: Same as Photo 48.

Photo 51: Same as Photo 48.

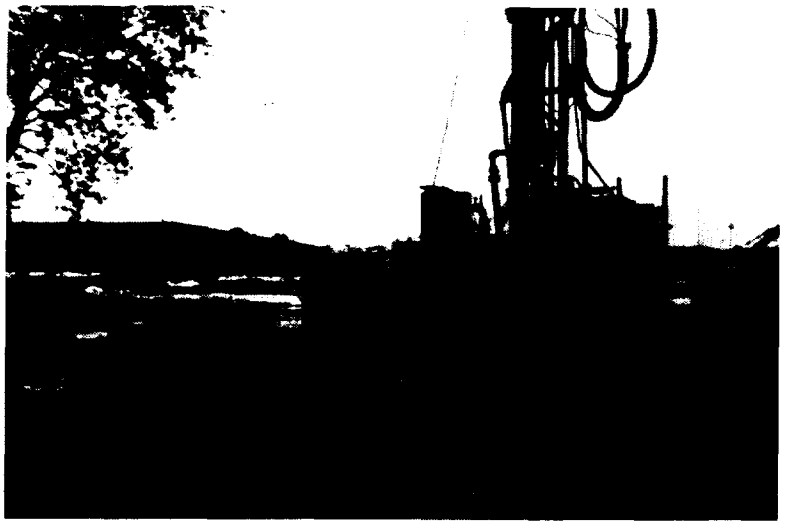

Photo 52: A view of the soil boring rig located at MW 29, also showing the six backup air cylinders used to supply breathing air.

Photo 53: A view from the observation deck at the southern end of the site showing the soil boring rig located at MW 26.

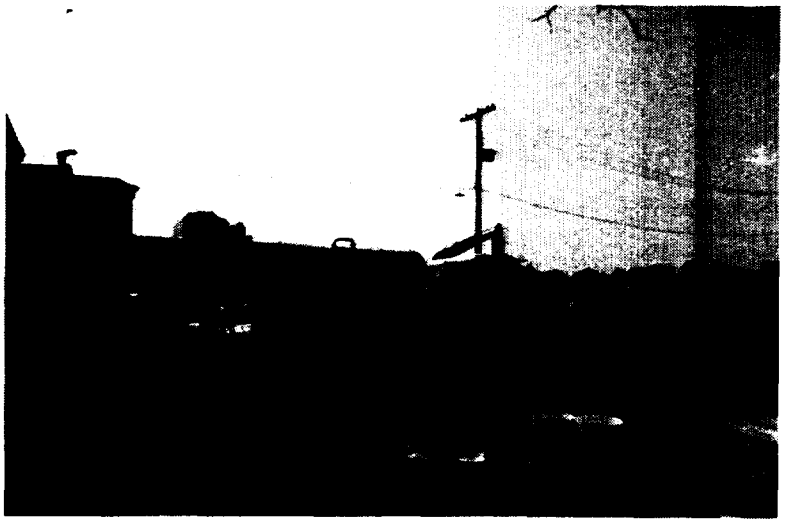

Photo 54: A view of a tank truck moving along the access road onsite near MW 29.

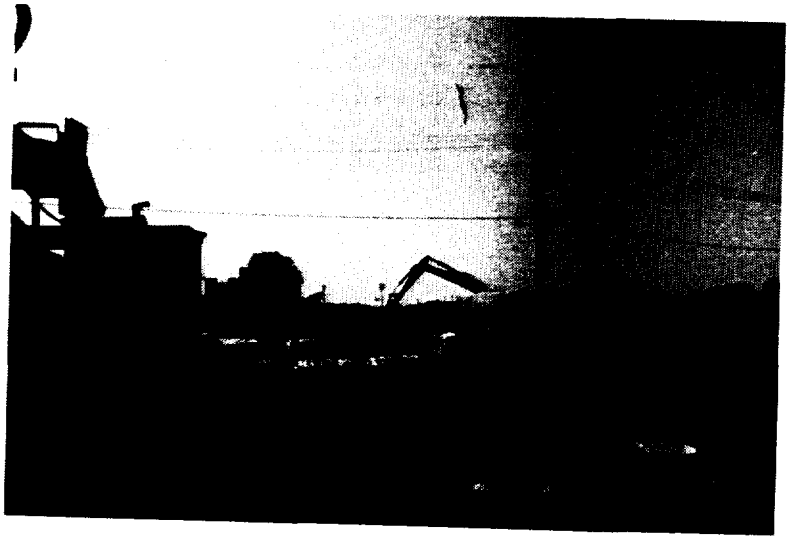

Photo 55: A view from the soil boring rig located at MW 29 showing the onsite bulking of liquids by O.H. Materials.

Photo 56: A view of the drum storage surrounding MW 29 and in the background bulking activities by O.H. Materials' personnel.

Photo 57: A view to the west from the installation location of MW 29.

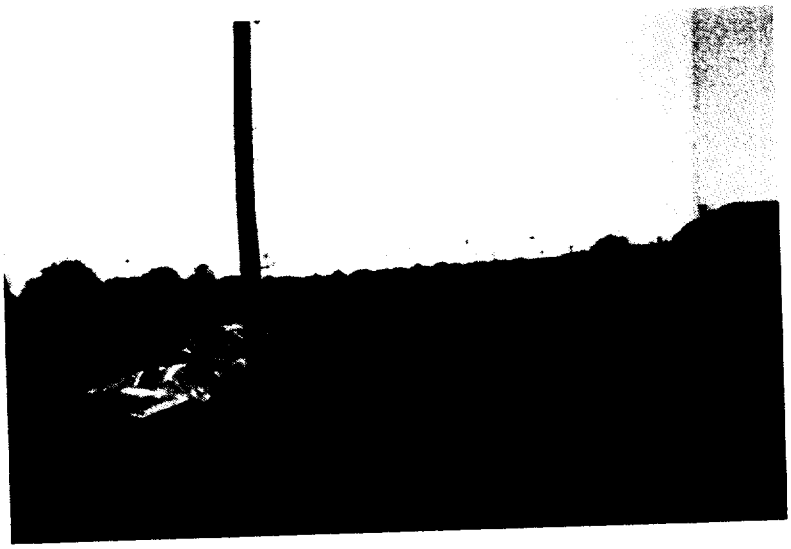

Photo 58: A view from the onsite access road looking toward the east at the location of MW 23.

Photo 59: A view from the access road near the middle of the site looking toward the southwest at the well installation rig setup on MW 24.

Photo 60: A view toward the west looking from the access road at MW 24.

Photo 61: A view from the same location looking toward the northwest showing the drum storage onsite.

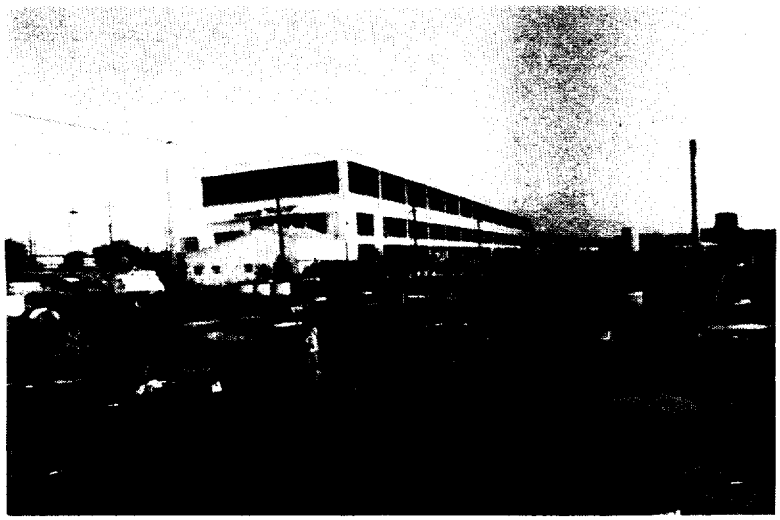

Photo 62: Taken from the same location as Photos 60 and 61, a view toward the north showing the drums stored onsite.

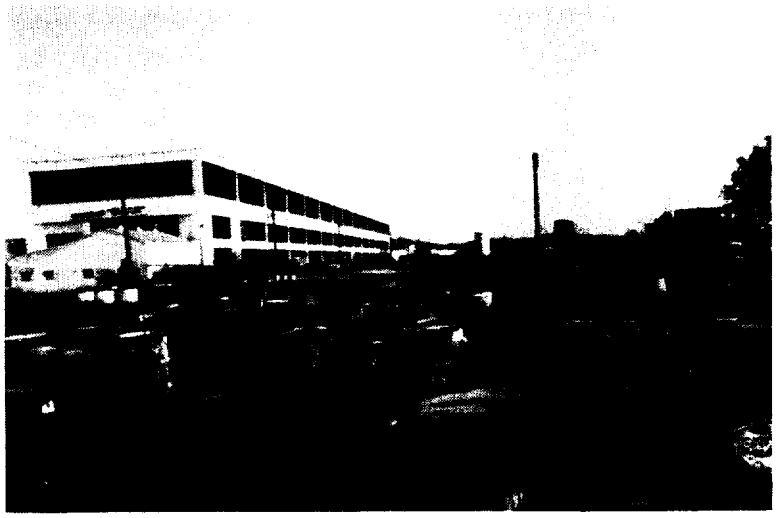

Photo 63: A view towards the north of the drum storage onsite.

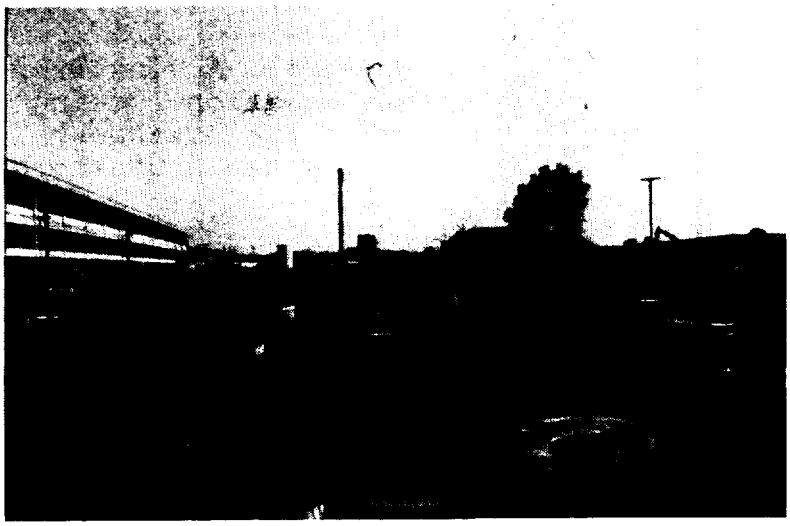

Photo 64: Same as Photo 63.

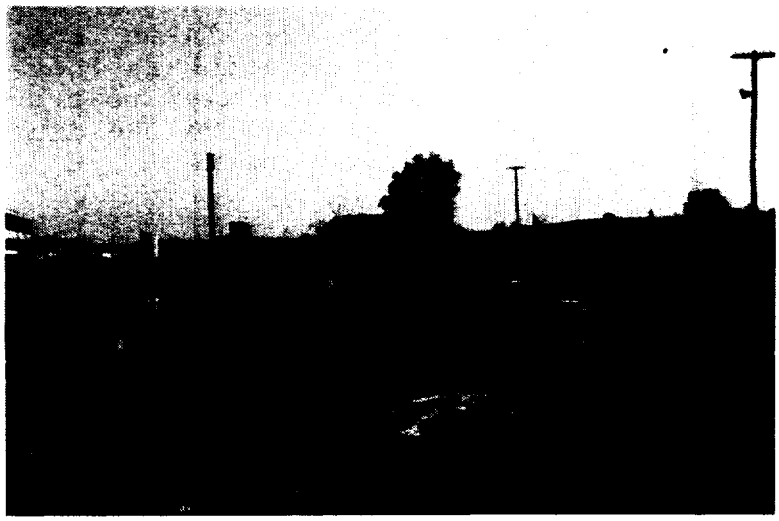

Photo 65: A view towards the northeast showing the drum storage onsite.

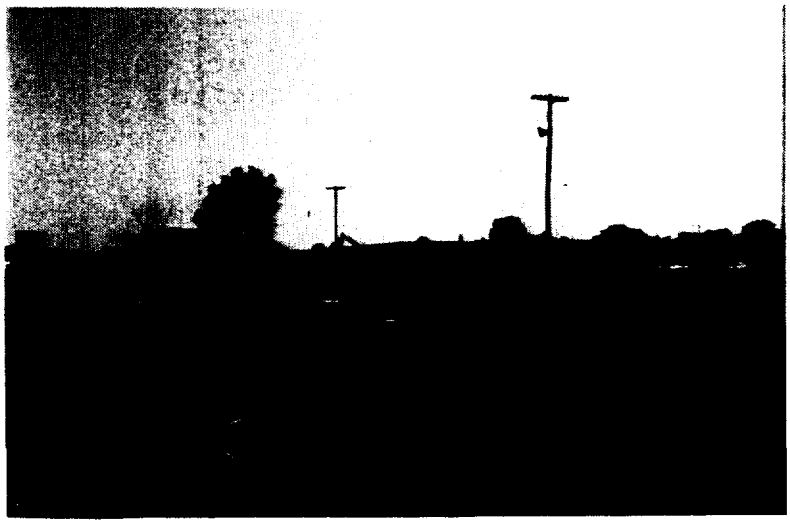

Photo 66: A view towards the northeast slightly more east than Photo 65, again showing the drum storage onsite and access road leading up the eastern portion of the site.

Photo 67: A view of the decontamination of well casing and screen, followed by a plastic wrap.

Photo 68: Same as Photo 67.

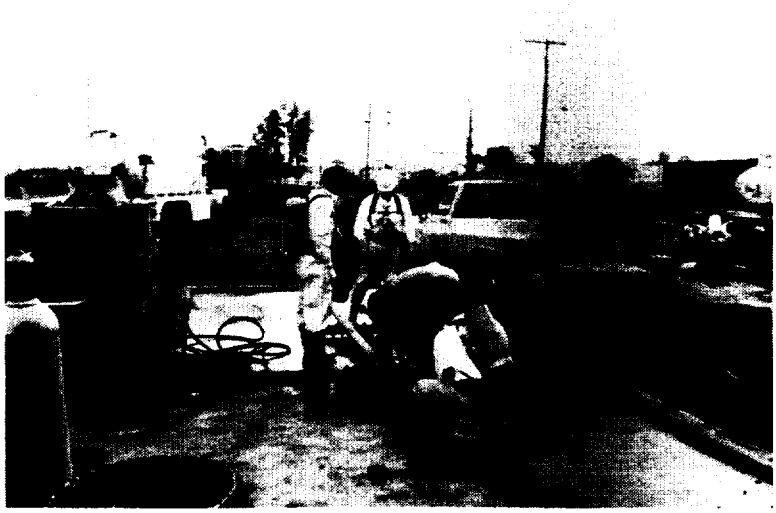

Photo 69: Same as Photo 67.

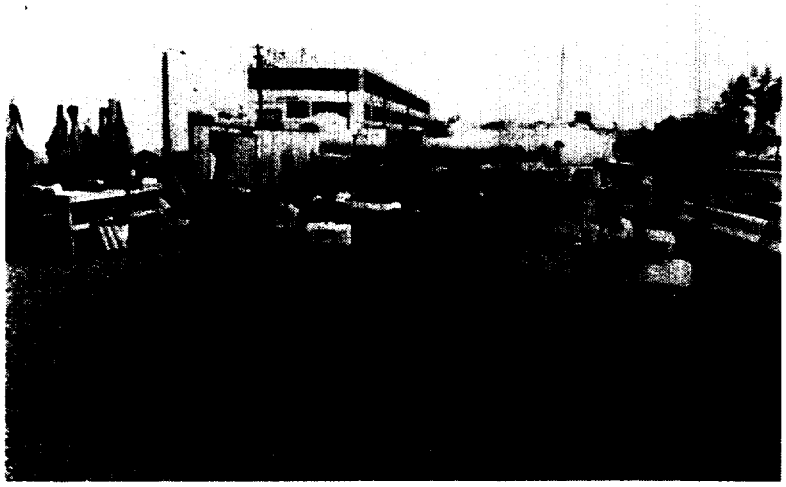

Photo 70: A view of the dressout and equipment area just offsite, and in the background decontamination procedures on the decon pad.

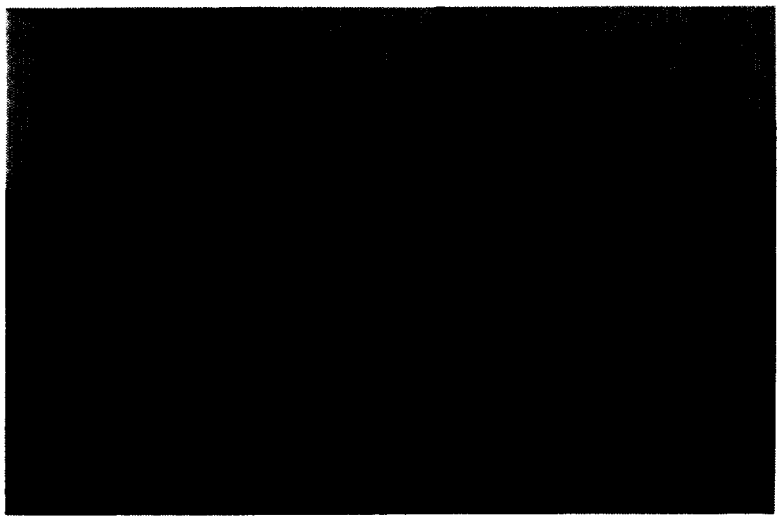

Photo 71: A view of the hotline observed at the Chem-Dyne site in June. To the left of the picture is the dressout area and clean area. In the right portion of the photo is the decontamination pad.

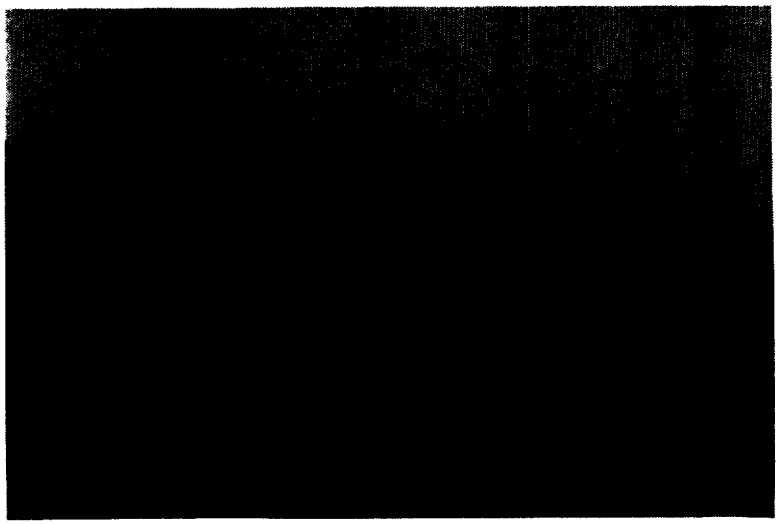

Photo 72: A view of the decontamination pad located at the hotline.

Photo 73: A view from the observation deck at the south end of the site showing the well installation rig at MW 24.

Photo 74: A view toward the north showing the access road running along the eastern portion of the site, also the drum storage onsite.

Photo 75: A view to the north from the observation deck at the sound end of the site, showing the drum storage onsite.

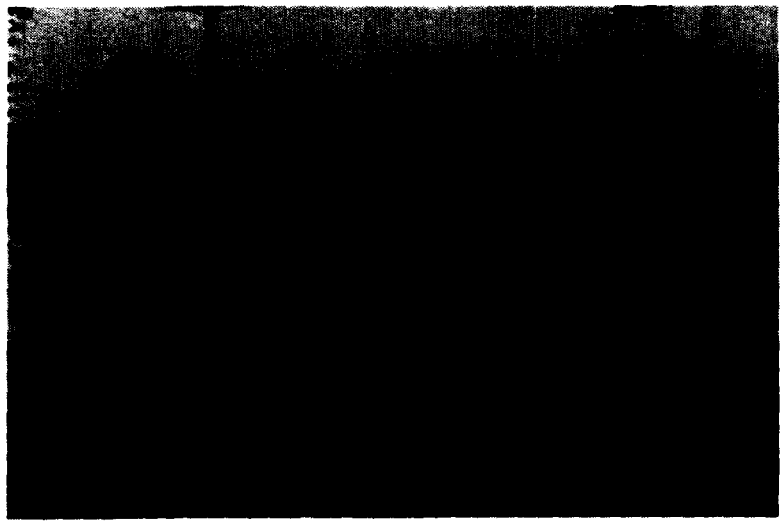

Photo 76: A view of the well installation rig located at MW 23.

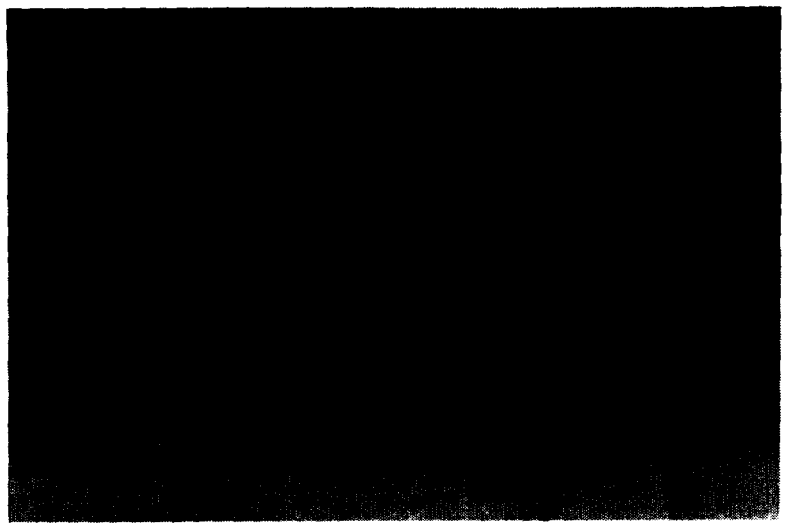

Photo 77: A shot of the abandoned guard house located at the southern entrance to the site.

Photo 78: A view of the abandoned guard house and parking area located at the southern end of the site.

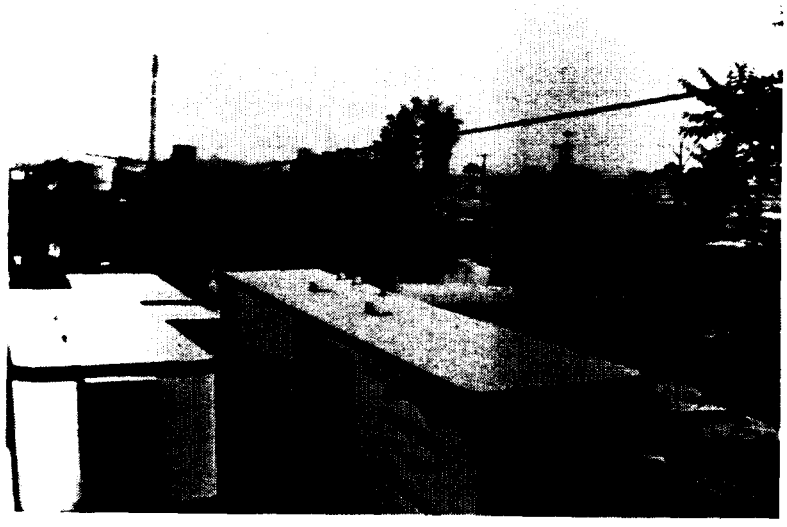

Photo 79: A view from the observation deck at the south end of the site showing the offsite support trailers and onsite drum storage.

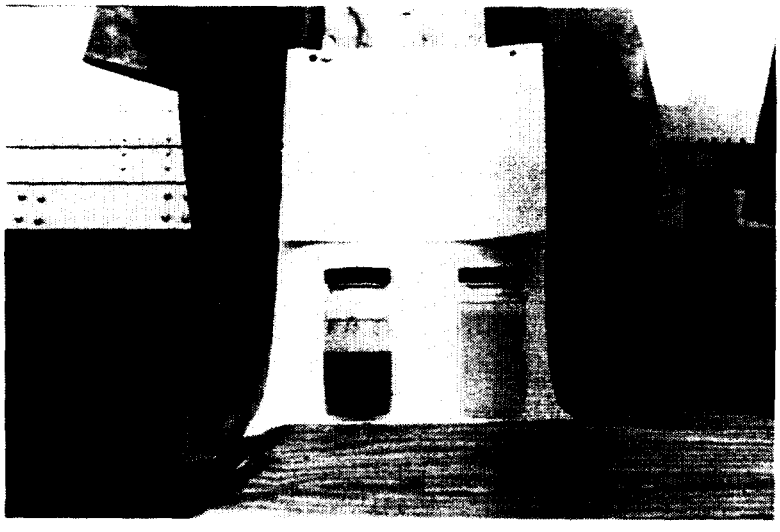

Photo 80: A view of the development water from monitoring well 23.

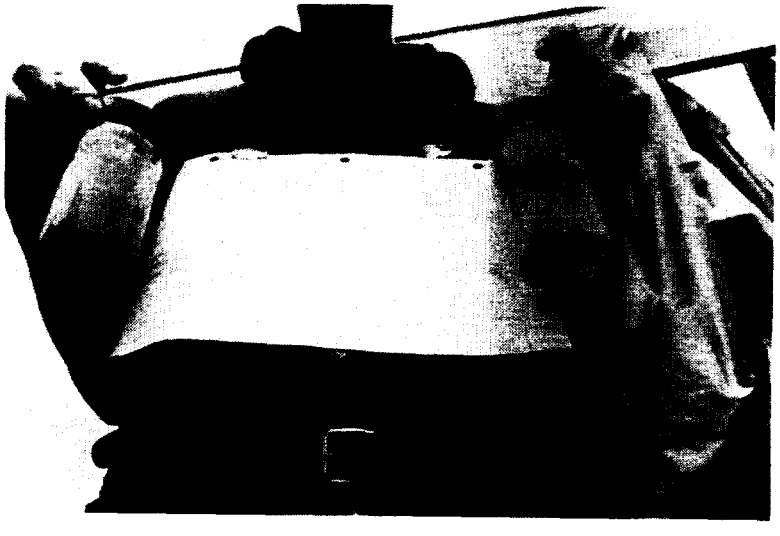

Photo 81: Same as Photo 80.

Photo 82: A view from the south entrance to the site toward the north, showing the access road and drum storage onsite.

Photo 83: A view of the decontamination pad and high-pressure water wash installed by C.H. Materials onsite.

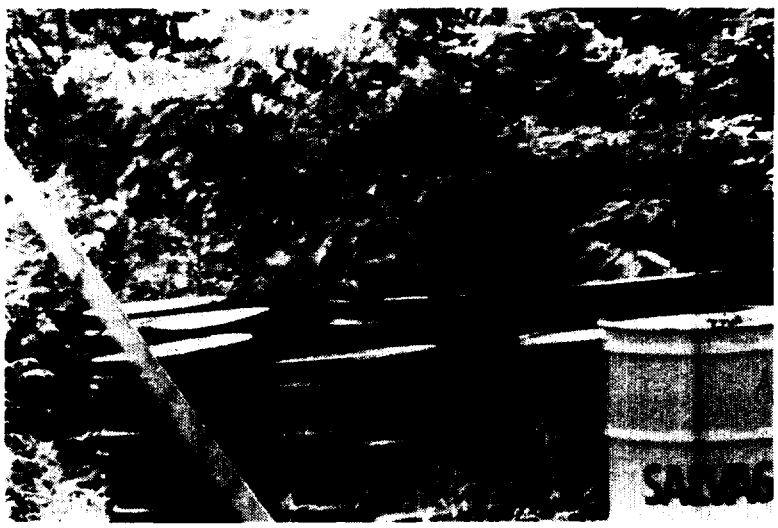

Photo 84: A view of drum storage near the south entrance to the site, also wildlife found onsite.

Photo 85: Same as Photo 84.

Photo 86: Closeup of wildlife found onsite.

Photo 87: A view of the evening or early morning hour well installation activity onsite.

Photo 88: A view from the observation platform at the south end of the site looking toward the north, showing the offsite support trailers and onsite drum storage.

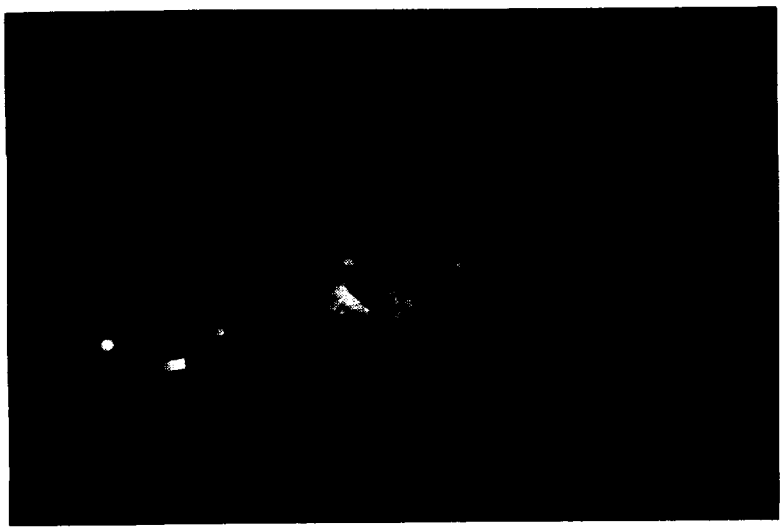

Photo 89: A view of the onsite well installation activity at night to avoid heat stress problems.

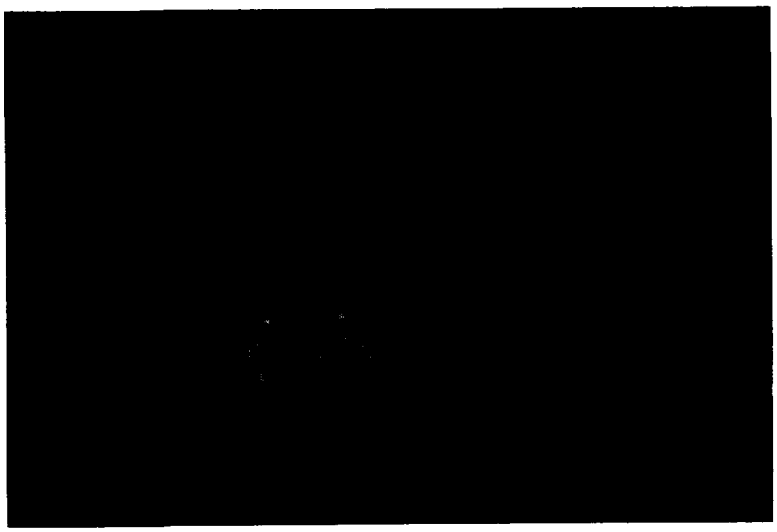

Photo 90: Same as Photo 89.

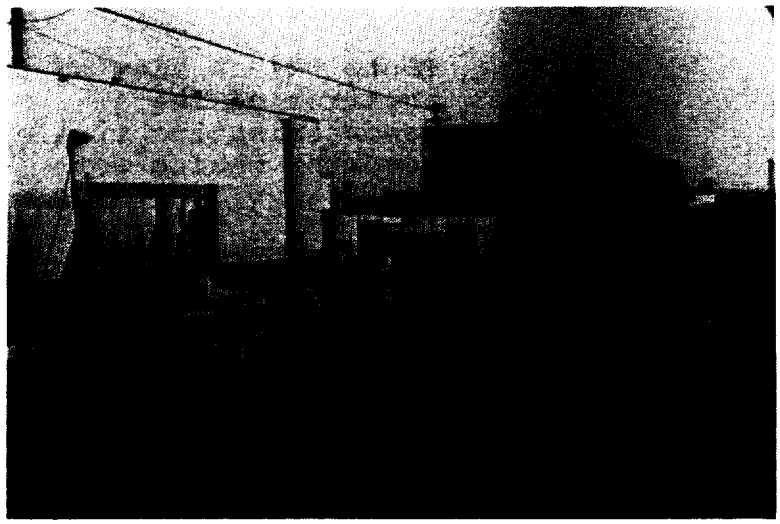

Photo 91: A view of the dressout area on the clean side of the hotline at the Chem-Dyne site.

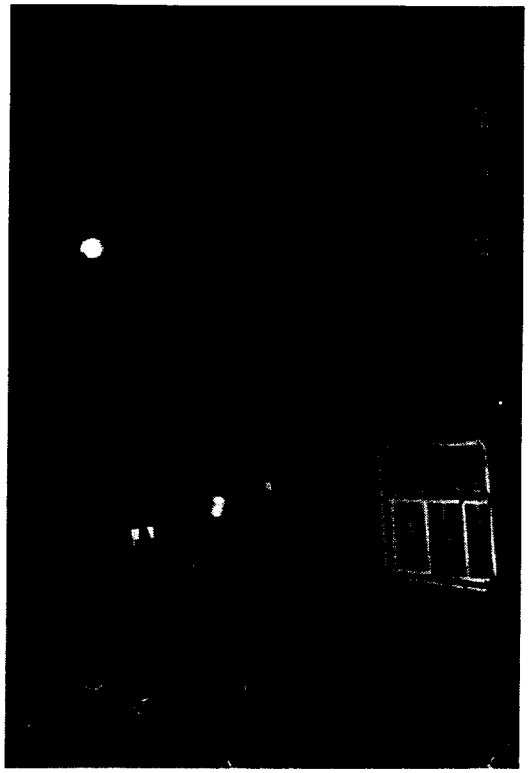

Photo 92: A view of the light plant used for illumination of the onsite well installation work at night.

Photo 93: A view of the onsite well development conducted at night.

Photo 94: A view of the interior of the decontamination trailer used for onsite work.

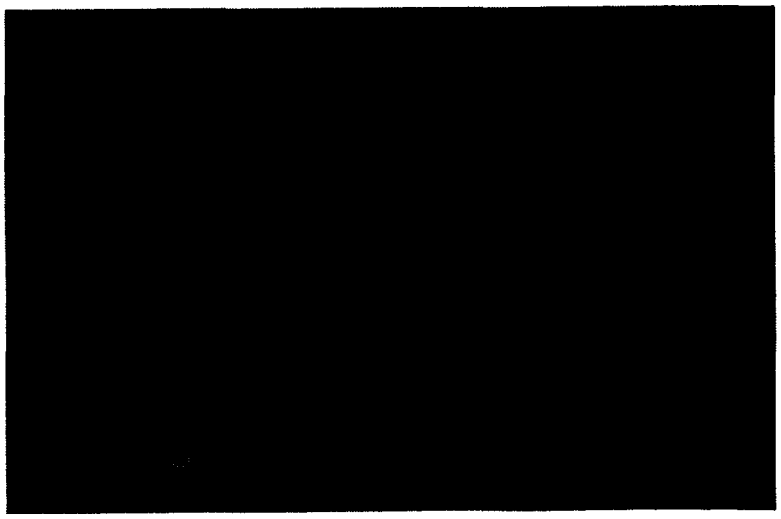

Photo 95: A view of the night well installation work.

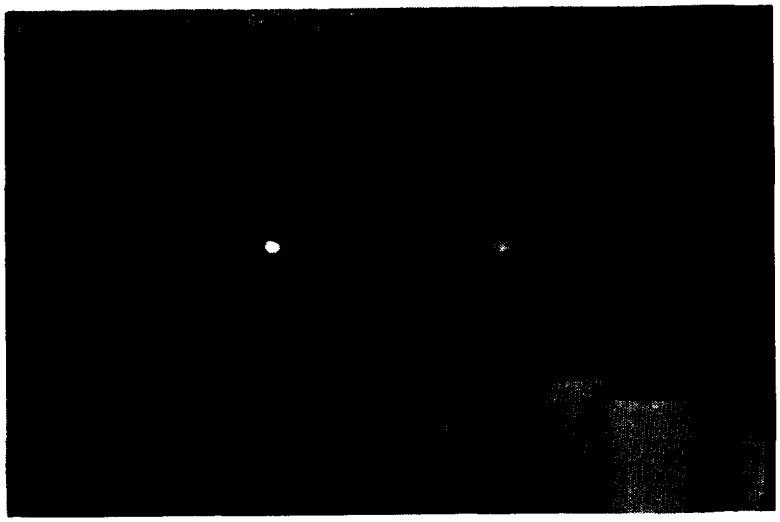

Photo 96: Same as Photo 95.

Photo 97: The view from the observation deck located at the south end of the site looking towards the north at the support trailers offsite and onsite drum storage.

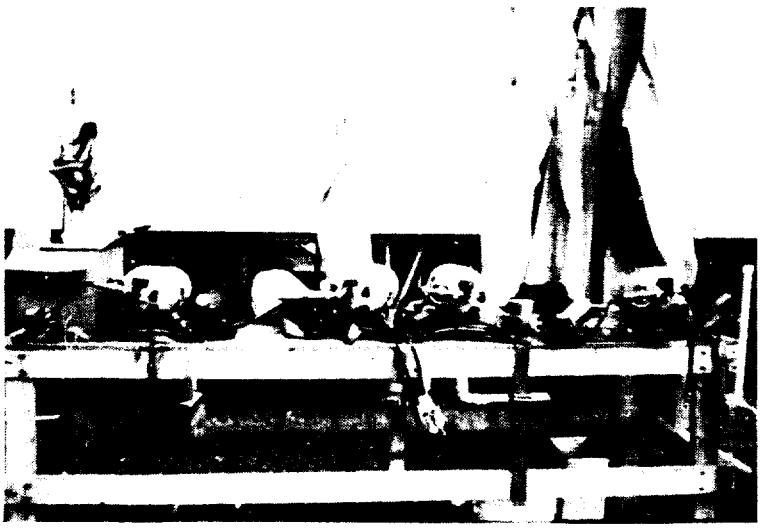

Photo 98: A view of the SCBA's sitting on the dressout table or equipment table located on the clean side of the hotline.

Photo 99: A view of the dressout area and equipment tables used for preparation for onsite work.

Photo 100: Dressout procedure.

Photo 101: A view of the decontamination pad and stripping of contaminated clothing before crossing the hotline.

Photo 102: A view of dressout attire prior to site entry.

Photo 103: Dressout procedure and equipment table in the background.

Photo 104: Dressout procedure.

Photo 105: A view of the decontamination pad and equipment drop on the dirty side of the hotline.

Photo 106: A view of the abandoned guard house located at the southern entrance to the site.

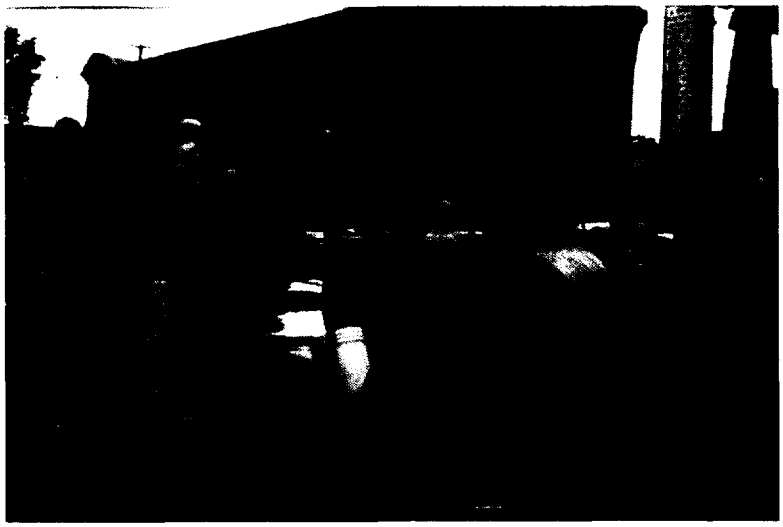

Photo 107: A view of the decontamination of trailers removing contaminated material from the site by O.H. Materials.

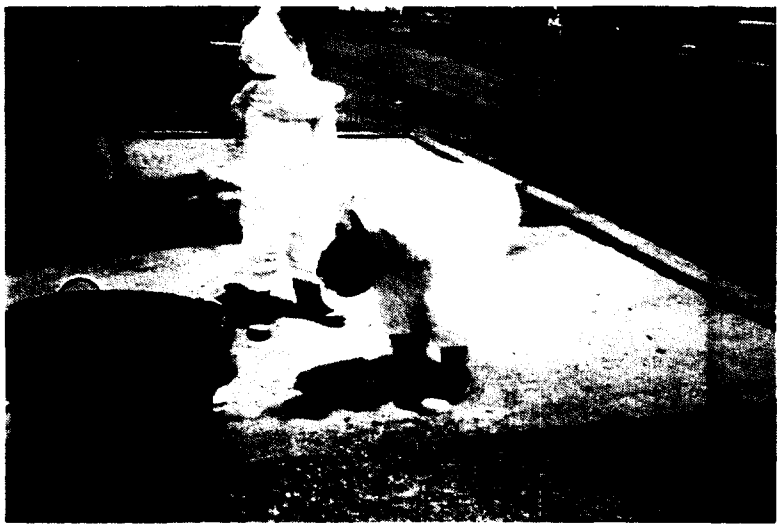

Photo 108: Dressout procedures and disposal of contaminated clothing prior to crossing the hotline.

APPENDIX C

TENTATIVELY IDENTIFIED COMPOUNDS

Table 10
TENTATIVELY IDENTIFIED COMPOUNDS IN SPLIT SPOON
SOIL SAMPLES AT CHEM-DYNE

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/kg)
MW-23 SS-4A	108-10-1	2-pentanone,4-methyl-	88.3	220
MW-23 SS-4A	127-18-4	ethene,tetrachloro-	97.9	2,400
MW-23 SS-4A	108-38-3	benzene,1,3-dimethyl-	92.9	300
MW-23 SS-4A	718-22-2	2,5-cyclohexadiene-1,4-dione,2,6-bis(1,1-dimethylethyl)-	80.1	280
MW-23 SS-4A	1120-21-4	undecane	80.3	170
MW-23 SS-4A	791-28-6	phosphineoxide,triphenyl-	88.6	1,100
MW-23 SS-8A	108-10-1	2-pentanone,4-methyl-	84.6	230
MW-23 SS-8A	127-18-4	ethene,tetrachloro-	95.2	370
MW-23 SS-8A	70-55-3	benzenesulfonamide,4-methyl-	88.1	370
MW-23 SS-8A	791-28-6	phosphineoxide,triphenyl-	85.6	330
MW-23 SS-10A	109-99-9	furan,tetrahydro-	94.4	7.3
MW-23 SS-10A	108-10-1	2-pentanone,4-methyl-	94.1	470

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Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/kg)
MW-23 SS-10A	127-18-4	ethene,tetrachloro-	96.2	2,700
MW-23 SS-10A	29812-79-1	hydroxylamine,o-decyl-	87.1	230
MW-23 SS-10A	544-76-3	hexadecane	84.6	330
MW-23 SS-10A	18344-37-1	heptadecane,2,6,10,14-tetramethyl-	80.9	340
MW-23 SS-10A	18344-37-1	heptadecane,2,6,10,14-tetramethyl-	84.8	220
MW-23 SS-10A	593-45-3	octadecane	83.4	270
MW-23 SS-10A	55162-61-3	tetracontane,3,5,24-trimethyl-	80.3	180
MW-24 SS-4A		none found		
MW-24 SS-6A	544-25-2	1,3,5-cycloheptatriene	93.5	350
MW-24 SS-11A	1120-21-4	undecane	86.7	440
MW-25 SS-3A	1663-35-0	ethene,(2-methoxyethoxy)-	97.3	39
MW-25 SS-3A	91-57-6	naphthalene,2-methyl-	90.8	2,600
MW-25 SS-3A	92-52-4	1,1'-biphenyl	90.1	990

SHELL/GLT461/48
FILE/GLT461/370

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/kg)
MW-25 SS-3A	575-37-1	naphthalene,1,7-dimethyl-	91.0	1,400
MW-25 SS-3A	569-41-5	naphthalene,1,8-dimethyl-	92.1	2,200
MW-25 SS-3A	573-98-8	naphthalene,1,2-dimethyl-	91.5	730
MW-25 SS-3A	3218-36-8	/1,1'-biphenyl/4-carboxaldehyde	87.3	690
MW-25 SS-3A	3218-36-8	/1,1'-biphenyl/4-carboxaldehyde	90.3	940
MW-25 SS-3A	1730-37-6	9H-fluorene,1-methyl-	90.8	940
MW-25 SS-3A	86-74-8	9H-carbazole	86.2	730
MW-25 SS-3A	832-64-4	phenanthrene,4-methyl-	86.9	1,400
MW-25 SS-3A	832-64-4	phenanthrene,4-methyl-	90.5	960
MW-25 SS-3A	2381-21-7	pyrene,1-methyl-	90.1	660
MW-25 SS-3A	1127-76-0	1-ethyl naphthalene	87	520
MW-25 SS-3D	127-18-4	ethene,tetrachloro-	98.9	180
MW-25 SS-3D	1663-35-0	ethene,(2-methoxyethoxy)-	97.4	61

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FILE/GLT461/370

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/kg)
MW-25 SS-6A	1663-35-0	ethene,(2-methoxyethoxy)-	97.3	8.0
MW-26 SS-4A		none found		
MW-26 SS-7A	1663-35-0	ethene,(2-methoxyethoxy)-	97.5	41
MW-26 SS-7A	10544-50-0	sulfur,mol.(S8)	85.7	120
MW-26 SS-11A	1663-35-8	ethene,(2-methoxyethoxy)-	97.3	8.0
MW-26 SS-11A	108-88-3	benzene,methyl-	96.3	190
MW-26 SS-11A	100-41-4	benzene,ethyl-	97.2	150
MW-26 SS-11A	108-38-3	benzene,1,3-dimethyl-	94.6	210
MW-27 SS-5	109-99-9	furan,tetrahydro-	97.1	22
MW-27 SS-5	123-63-7	1,3,5-trioxane,2,4,6-trimethyl-	94.6	15
MW-27 SS-5	111-96-6	ethane,1,1'-oxybis/2-methoxy-	88.3	290
MW-27 SS-5	10544-50-0	sulfur,mol.(S8)	92.8	5,700
MW-27 SS-6	109-99-9	furan,tetrahydro-	97.6	6.3

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/kg)
MW-27 SS-12A	109-99-9	furan,tetrahydro-	97.2	24
MW-27 SS-12A	108-88-3	benzene,methyl-	88.0	48
MW-27 SS-12A	127-18-4	ethene,tetrachloro-	94.2	400
MW-27 SS-12A	10544-50-0	sulfur, mol.(S8)	90.2	430
MW-28 SS-2	544-25-2	1,3,5-cycloheptatriene	92.8	170
MW-28 SS-2	2568-89-0	propane,2,2'-/methylenebis(oxy)bis-	82.8	630
MW-28 SS-2	127-18-4	ethene,tetrachloro-	95.3	340
MW-28 SS-2	107-92-6	butanoic acid	91.3	2,700
MW-28 SS-2	110-43-0	2-heptanone	95.5	510
MW-28 SS-2	142-62-1	hexanoic acid	92.4	790
MW-28 SS-6B	109-99-9	furan,tetrahydro-	98.5	3.4
MW-28 SS-6B	110-54-3	hexane	96.1	3.3
MW-28 SS-6B	110-82-7	cyclohexane	92.7	15,000

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/kg)
MW-28 SS-6B	79-31-2	propanoicacid,2-methyl-	86.6	4,000
MW-28 SS-6B	107-92-6	butanoic acid	90.3	9,600
MW-28 SS-6B	116-53-0	butanoic acid,2-methyl-	92.0	410
MW-28 SS-6B	142-62-1	hexanoic acid	82.5	700
MW-28 SS-6B	111-96-6	ethane,1,1'-oxybis/-2-methoxy-	89.1	880
MW-28 SS-6B	142-62-1	hexanoic acid	91.5	7,100
MW-28 SS-6B	1072-05-5	heptane,2,6-dimethyl-	85.1	180
MW-28 SS-6D	544-25-2	1,3,5-cycloheptatriene	93.8	140
MW-28 SS-6D	123-63-7	1,3,5-trioxane,2,4,6-trimethyl-	96.6	2,400
MW-28 SS-6D	79-31-2	propanoic acid,2-methyl-	89.9	2,200
MW-28 SS-6D	107-92-6	butanoic acid	90.8	6,600
MW-28 SS-6D	116-53-0	butanoic acid,2-methyl-	92.4	280
MW-28 SS-6D	109-52-4	pentanoic acid	93.2	400

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FILE/GLT461/370

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/kg)
MW-28 SS-6D	111-96-6	ethane,1,1'-oxybis/2-methoxy-	94.6	530
MW-28 SS-6D	124-07-2	octanoic acid	88.1	1,600
MW-28 SS-6D	680-31-9	phosphorictriamide,hexamethyl-	92.2	200
MW-28 SS-6D	563-16-6	hexane,3,3-dimethyl-	86.2	160
MW-28 SS-6D	142-62-1	hexanoic acid	81.4	3,600
MW-28 SS-11	921-47-1	hexane,2,3,4-trimethyl-	85.6	440
MW-28 SS-11	17851-53-5	1,2-benzenedicarboxylic acid,butyl 2-methylpropylester	90.6	170
MW-29 SS-7A		none found		
MW-29 SS-10C	109-99-9	furan,tetrahydro-	96.9	10
MW-29 SS-13C	109-99-9	furan,tetrahydro-	97.6	3.9
MW-29 SS-13C	544-25-2	1,3,5-cycloheptatriene	94.3	350
MW-29 SS-13C	100-41-4	benzene,ethyl-	89.1	510
MW-29 SS-13C	100-41-4	benzene,ethyl-	86.8	530

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/kg)
MW-29 SS-13C	100-41-4	benzene,ethyl-	88.8	160
MW-29 SS-13C	54518-04-6	methanol,dibutoxy-	91.8	270
MW-29 SS-13C	85-44-9	1,3-isobenzofurandione	97.7	230

SHELL/GLT461/48
FILE/GLT461/370

MEMORANDUM

TO: File

FROM: John T. Fleissner/GLO

DATE: August 19, 1983

SUBJECT: Chem-Dyne Site Remedial Investigation
Monitoring Well and Production Well Sampling
Phase II - Subtask 3-2.4

JOB NO: W65310.C0

INTRODUCTION

A groundwater sampling effort was performed during three periods: June 2-7, 1983, June 21-23, and July 11-13 at the Chem-Dyne site in Hamilton, Ohio. Sampling was performed both onsite and offsite by personnel from CH2M HILL and Environment and Ecology, Inc. (E&E) as planned by U.S. EPA personnel. This work was performed in partial satisfaction of Contract No. 68-01-6692, Work Assignment No. 21.5M10.0 Task 3-2. To expedite completion of this portion of the Work Assignment, verbal authorization from the Contract Officer was received pursuant to a request by CH2M HILL.

PURPOSE

The purpose of the Phase II groundwater sampling effort was to gather additional data to investigate seasonal variation in groundwater levels and contamination at the site. The general scope and timing of this sampling activity was determined by U.S. EPA.

SCOPE

The scope of the sampling effort at the Chem-Dyne site included the following samples:

- Six industrial cooling and process water production wells
- One municipal power company cooling water well
- Three city water samples from private residences and an office
- Twenty-two existing groundwater monitoring wells offsite and onsite
- Seven "new" groundwater monitoring wells onsite
- Nine groundwater field blanks

- Three laboratory blanks
- Three groundwater duplicate samples
- One city water well (No. 11)

Groundwater samples were taken from both existing and newly-installed groundwater monitoring wells: 11 of the groundwater monitoring wells are onsite and 18 groundwater wells are offsite.

All of the groundwater samples were analyzed for the inorganic and organic constituents included in the routine analytical packages by the U.S. EPA contract laboratories. Samples collected during this effort were analyzed by two laboratories: Mead Compu/Chem in Research Triangle Park, North Carolina 27709 for all organic analysis, and Chemtech Consulting Group, Ltd. in New York, New York 10014 for all inorganic analysis.

PERSONNEL

The sampling team included personnel from CH2M HILL and E&E, Inc. as follows:

CH2M HILL

John T. Fleissner, Project Engineer/GLO
Tom A. Gilgenbach/GLO (June 2-7 and July 12-13)
Jim Emery/DEN (June 2-7 and June 21-23)
Ried Dennis/WDC (June 21-23 only)
Mark J. Lepkowski/GLO (July 12-13)
Linda J. Keppert/GLO (July 12-13)
Diane M. Demshar/GLO (July 12-13)

E&E, Inc.

George Gartseff (June 6 and 7 and June 21-23)
Fred Swed (June 2-7)
Glen Millner (June 2 and 3 only)
Nancy Aungst (June 21-23)

GROUNDWATER SAMPLING PROCEDURE

MONITORING WELL SELECTION

The "existing" monitoring wells sampled during this effort were previously reviewed by Joe Keeley, U.S. EPA prior to the Phase I sampling performed April 4-14, 1983. These monitoring wells included wells installed in 1981 by E&E, Inc. during FIT activities and wells installed by Roy F. Weston in 1982.

Monitoring wells installed by E&E, Inc. were 2-inch diameter wells. Well logs were available for each of these wells.

The monitoring wells installed by Roy F. Weston were 4-inch diameter wells. Well logs were not available for these wells at the time of sampling.

The "new" onsite groundwater monitoring wells sampled during this effort were installed between May 23 and July 11 under the inspection of CH2M HILL according to the plan prepared by the U.S. EPA. These new onsite wells are described in detail in a separate technical memorandum.

MONITORING WELL SAMPLING

General Well Sampling Strategy

The general monitoring well sampling strategy was to obtain representative samples of local groundwater and minimize contamination of both monitoring wells and the samples.

The sequence of monitoring well sampling was approximately the same as the sequence recommended for Phase I by Joe Keeley, who suggested the order of well sampling based upon sampling the least contaminated wells first and moving progressively toward the most contaminated wells. The sequence of monitoring well sampling done during Phase II was as follows:

1.	MW-1	12.	MW-14
2.	MW-2	13.	MW-11
3.	MW-3	14.	MW-4
4.	MW-22	15.	MW-1[a]
5.	MW-21	16.	MW-18[a]
6.	MW-20	17.	MW-15[a]
7.	MW-19	18.	MW-7
8.	MW-15	19.	MW-13[a]
9.	MW-17	20.	MW-12
10.	MW-16	21.	MW-5
11.	MW-8	22.	MW-6
		23.	MW-9
		24.	MW-10

[a]Note: Samples from these monitoring wells split with Mr. Richard Javick, FMC Corp. Wells MW-1 and MW-15 were resampled because Mr. Javick arrived at the site a few days after these wells had been already sampled.

Well Sampling Equipment

Two types of sampling equipment were used to sample the monitoring wells. A stainless steel submersible pump (Johnson-Keck Model SP-81, Serial Number 141) was used to purge and pump out samples (except volatile organics) at most of the monitoring wells.

A 2-inch stainless steel bailer was used for monitoring wells MW-9 and MW-6 because the submersible pump did not fit all the way down the well into the screen section. The bailer was also used at MW-5 based on experience at MW-6. At MW-14, a 1-inch stainless steel bailer was used because previous experience in April showed that the 2-inch bailer did not pass through the well to the screen section.

Well Depth and Water Surface Measurement

Before purging the monitoring wells, the total depth of the well and the location of the groundwater surface were measured. The total depth was sounded with a stainless steel weight and monofilment line. The water surface was measured with an M-scope. A fiberglass or steel tape was used for measurement of the sounding and M-scope wire. All measurements were made from the top of the well casing. Table 1 contains the well measurement data from both this Phase I work and previous work by Roy F. Weston in December 1982.

The well sounding equipment and M-scope were decontaminated after each use by rinsing the equipment through the TSP, acetone solution, and distilled water as described on the next page.

Well Purging

Each groundwater monitoring well was purged prior to taking the groundwater sample. Where the pump was used for purging and sampling, the volume of purge water at each well was based on the total depth of the well, either shallow or deep, and either one 15-minute duty cycle or three consecutive 15-minute duty cycles, respectively, of the sampling pump. This procedure was selected by Keeley.

The seven "new" onsite wells installed by CH2M HILL were each purged by pumping five well volumes before sampling. Thus, for the shallow wells with approximately 12 feet of water column, three duty cycles were required and, for the deep wells with approximately 40 feet of water column, five duty cycles were required.

The routine for pump operation during well purging was based on the constraints of the pump itself. The submersible pump has a normal duty cycle of 15 minutes and an approximate discharge flow rate of 1.0 gpm. After 15 minutes of operation, the pump must be idle for a minimum of 5 minutes for pump and motor cooling. By operating the pump for either one or three duty cycles, depending upon the well volume, each well was adequately purged.

Table 1 (Page 1 of 2)
PHASE II MONITORING WELL DATA SUMMARY CHEM-DYNE SITE
JUNE 2-6 AND 21-23, 1983
HAMILTON, OHIO W65310.CO

WELL NUMBER		PREVIOUS DATA			NEW DATA					
MW-	As-Installed	Elevation Top of Casing (feet)	Estimated Static Water Volume (cubic/feet)	Water Elevation[a] (feet)	Elevation Top of Casing (feet)	Date of Measure-ment	Static Water Elevation (feet)	Elevation bottom of well (feet)	Initial HNU Reading in Casing (ppm)	Comments
MW-1	(Weston)	591.09	2.8	563.59	591.12	6/2/83	568.50	528.20	Less than 1.0	No casing cover in place
MW-2	(Weston)	591.49	0.54	563.67	591.52	6/2/83	568.60	556.27	Less than 1.0	PVC casing cover borken during removal
MW-3	(Weston)	591.15	0.51	563.95	591.14	6/2/83	568.89	555.14	Less than 1.0	-
MW-4	B-9	593.20	0.04	563.44	592.89	6/6/83	567.78	557.89	Less than 1.0	-
MW-5	B-16	591.91	-	563.60	591.62	6/22/83	565.62	555.79	-	Cover in place but no padlock
MW-6	B-14	592.49	0.04	562.79	592.19	6/21/83	565.77	561.11	17	Padlock in place but no cover
MW-7	B-8	593.59	0.10	563.36	593.30	6/7/83	567.84	558.22	Less than 1.0	-
MW-8	(Weston)	598.20	0.35	563.20	597.91	6/3/83	568.04	556.24	-	No HNU measurment in casing because of heavy rain
MW-9	B-15	593.11	-	563.26	592.83	6/21/83	568.41	557.58	-	-
MW-10	B-17	591.84	0.14	563.27	591.58	6/21/83	566.58	554.00	-	-
MW-11	B-12	598.66	0.13	563.05	598.36	6/6/83	567.19	558.86	Less than 1.0	-
MW-12	(Weston)	593.44	2.65	563.11	593.18	6/7/83	567.06	534.18	Less than 1.0	-
MW-13	B-11	593.47	0.08	563.30	593.20	6/7/83	567.12	559.70	Less than 1.0	-
MW-14	B-25	594.66	-	563.62	594.39	6/6/83	567.18	563.81	Less than 1.0	Bare casing; no lock cover
MW-15	(Weston)	595.89	0.16	563.41	595.56	6/3/83	567.56	555.56	15 to 16	-
MW-16	(Weston)	595.09	0.17	562.42	594.82	6/3/83	565.99	554.32	Less than 1.0	-
MW-17	(Weston)	597.55	0.45	560.68	597.32	6/3/83	562.32	553.65	Less than 1.0	-
MW-18	B-3	596.90	0.10	562.42	594.65	6/6/83	566.32	556.65	Less than 1.0	Casing has been modified for drive-way construction by Hamilton Electric
MW-19	(Weston)	591.23	2.75	560.72	591.42	6/3/83	560.71	524.54	Less than 1.0	-
MW-20	(Weston)	591.80	0.88	561.89	592.02	6/3/83	563.27	551.19	Less than 1.0	No casing cover in place
MW-21	(Weston)	597.87	0.92	561.39	598.06	6/2/83	563.69	550.39	1.0	-
MW-22	(Weston)	597.35	3.57	560.31	597.57	6/2/83	561.90	522.74	Less than 1.0	-

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Table 1 (Page 2 of 2)
PHASE II MONITORING WELL DATA SUMMARY CHEM-DYNE SITE
JUNE 2-6 AND 21-23, 1983, HAMILTON, OHIO W65310.CO

WELL NUMBER		NEW DATA					
MW-	As-Installed	Elevation Top of Casing (feet)	Date of Measure-ment	Static Water Elevation (feet)	Elevation bottom of well (feet)	Initial MNU Reading in Casing (ppm)	Comments
MW-23	(CH2M HILL)	590.32	6/22/83	565.24	554.74	50	-
MW-24	(CH2M HILL)	591.32	6/23/83	566.49	557.66	Less than 1.0	-
MW-25	(CH2M HILL)	591.25	6/23/83	565.92	556.42	20 - 30	-
MW-26	(CH2M HILL)	590.52	7/13/83	-	525.77	3 - 4	-
MW-27	(CH2M HILL)	590.71	6/23/83	565.21	554.96	8 - 10	-
MW-28	(CH2M HILL)	591.56	7/12/83	565.64	526.31	12 maximum	-
MW-29	(CH2M HILL)	590.85	6/22/83	561.85	553.93	14 maximum	-

[a] Water elevation before pumping December 6, 7, and 8, 1982.

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During well purging, the pump was periodically moved within the water column from top to bottom to distribute the source of purge suction.

Where the stainless steel bailers were used for purging and sampling, a minimum of three well volumes of water was removed for the purge. The only exception was at MW-14 where one well volume was removed. At MW-14 the well recovered slowly after each bail was removed and one well volume purge was found to remove most of the water column before the well could recover. Therefore, one well volume of purge was considered sufficient to obtain a representative sample.

Well purge water from each well was collected in 55-gallon drums, each of which was disposed of on the Chem-Dyne site by O.H. Materials, the contractor performing concurrent drum and bulk tank removal work.

Well Sampling

Most of the monitoring wells were sampled with the submersible pump. At these wells, the submersible pump was used to take the samples for base/neutral, acid, and pesticide organics, metals, and cyanide. Samples for volatile organic analysis were taken with a stainless steel bailer at all monitoring wells.

Four of the monitoring wells, MW-14, MW-9, MW-6, and MW-5, were purged and sampled completely with a stainless steel bailer. The bailer was used only where the submersible pump could not be used.

Samples were collected by filling the sample bottles directly from the sampling pump discharge line or the bailer. All sample fractions for metals analysis were filtered through a 0.45u filter prior to preservation. Sample fractions for metals were preserved with nitric acid and fractions for cyanide were preserved with sodium hydroxide.

Decontamination

Decontamination procedures included steps to avoid contamination of the sample and monitoring well and to minimize carryover of contaminants from one well to another. In summary, the steps used to minimize contamination were as follows:

- Take samples from the least to most contaminated wells based on previous groundwater data.
- Decontaminate the outside of all equipment used in the wells including depth sounding weight and

line, M-scope, sampling pump (or bailer) and discharge line after each well sampling.

- Decontaminate the inside of the submersible pump by pumping decontamination solutions in sequence through the pump after each well sampling. Decontaminate the inside of the bailers as appropriate.

- Purge each monitoring well prior to sampling. This not only removes stagnant water in the well but also pumps out any contamination carried into the well and pumps decontamination solution out of the pump discharge line.

Three solutions were used in sequence to decontaminate well sampling equipment. These solutions were trisodium phosphate (TSP) and city tap water, acetone and distilled water (approximately 20 percent acetone V/V), and distilled water rinse. To decontaminate the inside of the sampling pump and line, each solution was pumped for 60 seconds through the pump and discharge line. Decontamination solutions were typically used for 1 day or a maximum of six wells and then disposed of.

The decontamination procedure for gloves used to handle equipment was washing in TSP solution followed by tap water rinse.

The spent decontamination solutions were combined with the purge water in 55-gallon drums and disposed of by O.H. Materials at the Chem-Dyne site.

PRODUCTION WELL SAMPLING PROCEDURES

PRODUCTION WELL SELECTION

Production wells were selected by the U.S. EPA with the addition of the municipal wells identified by CH2M HILL at the Hamilton Electric Power Plant. The production wells were all industrial wells used for process and/or cooling water. The municipal wells at the power plant are used exclusively for cooling water.

The production wells sampled during Phase II sampling work included the following:

Well Designation	Primary Water Use
Vaughn Building Company	Air Conditioning
Beckett Paper Parking Lot	Process Water
Beckett Paper Dayton St.	Process Water

Champion Paper No. 1	Process/Cooling Water
Champion Paper No. 4	Process/Cooling Water
Champion Paper No. 10	Process/Cooling Water
Hamilton Power Plant No. 9	Cooling Water

PRODUCTION WELL SAMPLING

All production wells were sampled during normal continuous operation of the well pumps. All sampling was performed by John Fleissner, CH2M HILL, with the cooperation of industry and utility personnel. A general summary of the wells is given in Table 2.

The sampling points at each well were close to the discharge of the well pump with the exception of the Hamilton Electric Power Plant. At the power plant, the sample was taken from a tap on the discharge line near the inactive second well, approximately 150 feet from the active well. This remote sampling point was the most practical location.

The typical sample tap was a small section of pipe with a shut-off valve and a short leg of discharge pipe, except at the power plant. These sample taps were opened and flushed for 1 minute prior to sampling. At the power plant, the sample tap was a small diameter pipe, shut-off valve, and approximately 4 feet of rubber hose. At this location, the line was flushed for 5 minutes prior to sampling.

Samples were collected by filling the sample bottles directly with water from the tap. All samples for metals analysis were filtered through a 0.45u filter prior to preservation at the command post.

MUNICIPAL WATER SAMPLING PROCEDURES

Municipal Water Location Selection

City of Hamilton municipal water was sampled in four locations: city well field at Well No. 11, two private residences (Holland and Fuetterer), and the office of the Hamilton Appalachian Peoples Service Organization (HAPSO). The well water was raw groundwater prior to treatment and the other three samples were finished city water from the distribution system. Location of City of Hamilton municipal water wells and private water taps are shown in Figure 1.

Municipal Well Sampling

The city of Hamilton Well No. 11 was sampled June 22, 1983, by John Fleissner, CH2M HILL, under the direction of Don Bruce, U.S. EPA.

Table 2
SUMMARY OF DATA ON PRODUCTION WELLS IN THE
VICINITY OF CHEM-DYNE SAMPLED ON JULY 12-13, 1983
HAMILTON, OHIO
W65310.CO

Well Location	Well Designation	Primary Water Use	Depth of Screen Section, ft	Approximate Flow, gpm	Sampling Date	Sampling Point Description	Comment
Beckett Paper	Parking Lot	Papermaking	145 to 175	1,000	7/13/83	Sample tap on pump discharge piping	Disconnected yard hose prior to flushing and sampling
Beckett Paper	Dayton Street	Papermaking	93 to 118	750	7/13/83	Sample tap on pump discharge flange	Attached new elbow and pipe nipple to permit sampling
Beckett Paper	Buckeye Street	Papermaking	77 to 102	1,000	-	-	Could not sample because no sample tap available near pump discharge
Champion Paper	Well No. 1	Papermaking & Cooling			7/13/83	Sample tap on pump discharge piping	
Champion Paper	Well No. 4	Papermaking & Cooling			7/13/83	Sample tap on pump discharge piping	
Champion Paper	Well No. 10	Papermaking & Cooling			7/13/83	Sample tap on pump discharge piping	
Hamilton Electric Power	Well No. 9	Bearing Cooling	150 to 180	600	7/12/83	Sample tap approximately 150 feet from pump with 4 feet of rubber hose	

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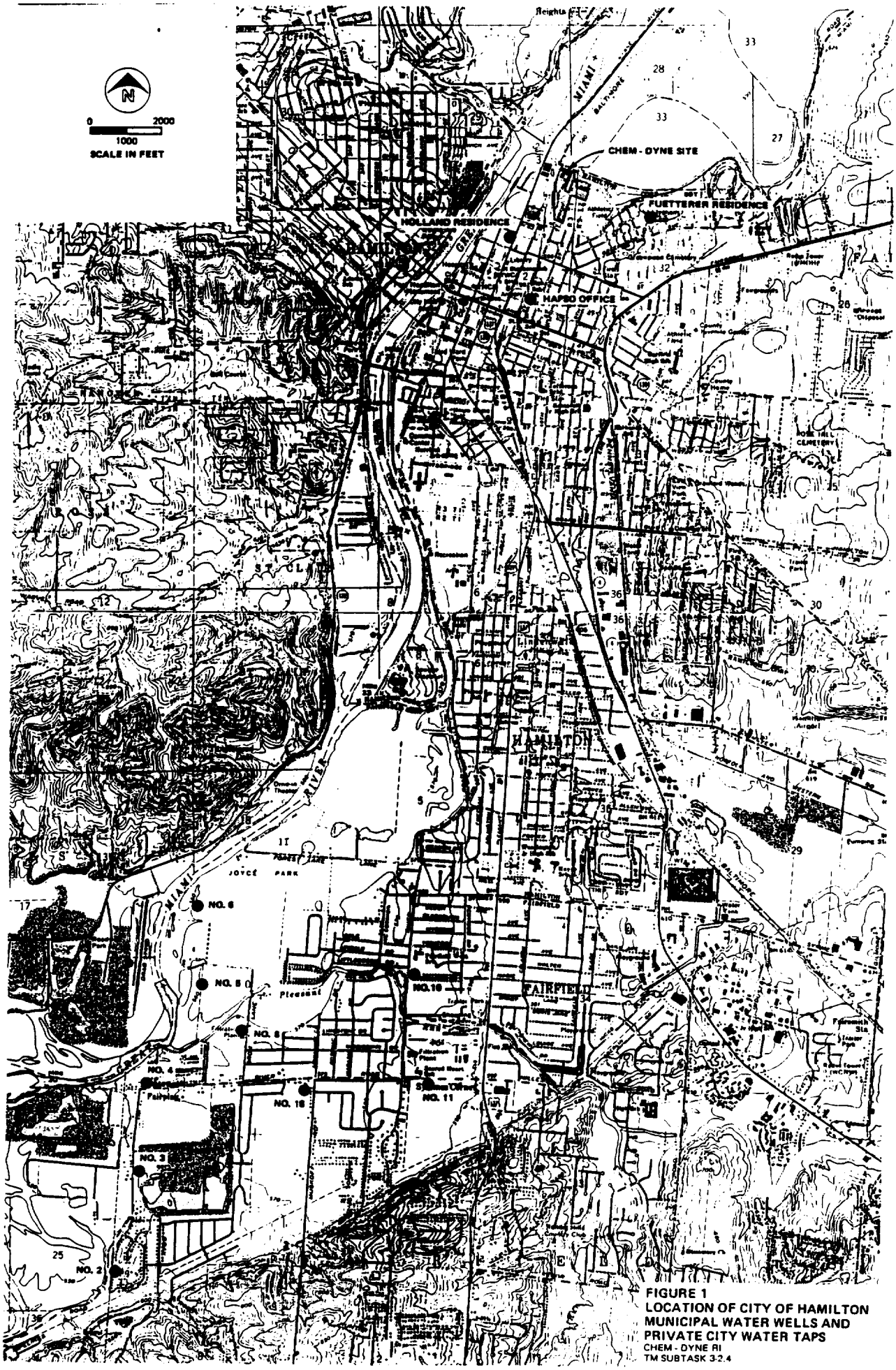

FIGURE 1
LOCATION OF CITY OF HAMILTON MUNICIPAL WATER WELLS AND PRIVATE CITY WATER TAPS
CHEM - DYNE RI
TM SUBTASK 3-2.4

The sample was taken from a small diameter sample tap located near the pump discharge flange. The tap was flushed for approximately 1 minute before sampling. Sample bottles were filled directly from the tap. The sample portion for metals analysis was filtered through a 0.45u filter prior to preservation at the command post.

The private residences and HAPSO office were sampled on June 21, 1983, by Fleissner with Bruce. Sampling locations at each place are described below:

- Holland residence sample taken from the tap in the "laundry room" sink at the rear of the house.
- Fuetterer residence sample taken from the kitchen sink tap.
- HAPSO sample taken at the kitchen sink tap at the rear of the building.

At each location, the tap was flushed for 5 minutes before sampling. Sample bottles were filled directly from the tap. Samples for metals analysis were not filtered prior to preservation because the samples represented "finished" tap water as consumed by persons served.

SAMPLING CHRONOLOGY

The following chronology summarizes the major activities and events for each day of Phase II groundwater sampling work at Chem-Dyne from June 1 through June 7, and June 20 through June 23, and July 11 through June 13, 1983.

June 1, 1983, Wednesday

Team: John T. Fleissner, CH2M HILL
Tom A. Gilgenbach, CH2M HILL
Jim Emery, CH2M HILL
Fred Swed, E&E, Inc.
Glen Millner, E&E, Inc.

Samples obtained: None. Day used for site setup and preparation.

Comments: None.

June 2, 1983, Thursday

Team: Same as Wednesday, June 1.

Samples obtained: MW-1
MW-2
MW-3
MW-22
MW-21
Distilled water blank.
Pumped distilled water blank.
Field blank.

Comments: Samplers forced to break the PVC cap off of casing at MW-2 to sample.

June 3, 1983, Friday

Team: Same as Wednesday, June 1.

Samples obtained: MW-20
MW-19
MW-15
MW-17
Field blank
MW-16
MW-8
Laboratory blank

Comments: MW-14 sampling postponed until Monday to avoid possible vapors released by activity by O.H. Materials onsite.
MW-15 sampled using level-C.

Met Don Bruce, U.S. EPA, and Dave Strayer, OEPA who directed me to split samples with a representative from FMC Corp. Samples to be from MW-1, MW-15, MW-13, and MW-18. FMC representative to arrive Monday, June 6.

Pouring rain with lightning begins at 1500 while sampling MW-8.

Glen Miller of E&E, Inc. returned to Buffalo office after Friday's work. His place on the team was taken by George Gartseff of E&E, Inc.

June 6, 1983, Monday

Team: John T. Fleissner, CH2M HILL
Tom A. Gilgenbach, CH2M HILL
Jim Emery, CH2M HILL
George Gartseff, E&E, Inc.
Fred Swed, E&E, Inc.

Samples obtained: MW-14
MW-11

MW-4
Field blank
MW-1[a]
MW-18[a]
MW-15[a]

[a] Note: Samples from these monitoring wells were split with Mr. Richard Javick, FMC Corporation. Wells MW-1 and MW-15 were resampled because Mr. Javick arrived at the site a few days after these wells had been initially sampled.

Comments: Mr. Richard Javick, FMC Corporation joined the sampling team in the field at MW-11 during setup at 1000.

MW-18 was located and found to have been modified by Hamilton Electric Company. The well casing was cut off at the surface elevation of the surrounding parking lot and fitted with a threaded (unvented) cap. Sounding and water surface measurements only indicate the depth of water column because the new elevation of the modified top of casing is unknown.

June 7, 1983, Tuesday

Team: Same as Monday, June 6.

Samples obtained:
MW-7
MW-13[a]
Field blank
MW-12
Vaughn Construction (private well)

[a]Note: Sample from MW-13 was split with Mr. Richard Javick, FMC Corporation.

Comments: During the pouring of the field blank at MW-13, the smell of organic solvent like "paint thinner" was noticed by all field personnel and the HNU indicated 1.0 to 1.5 ppm compared to a background of approximately 0.2 ppm.

June 21, 1983, Tuesday

Team:
John T. Fleissner, CH2M HILL
Jim Emery, CH2M HILL
Ried Dennis, CH2M HILL
George Gartseff, E&E, Inc.
Nancy Aungst, E&E, Inc.

Samples obtained: Holland Residence[b]
Fuetterer Residence[b]
Hamilton Appalachian Peoples Service Organization (HAPSO) Office[b]
MW-9
MW-10
Field blank

[b]Note: These locations are served by the City of Hamilton water supply. These locations were sampled by taking tap water from indoor fixtures.

Comments: Three locations served by the City of Hamilton water supply were sampled under the direction of Don Bruce, U.S. EPA. These locations were reportedly selected because of previous requests by citizens for water analysis.

At each of the three locations served by City water, the tap was run from 5 minutes at near full flow prior to taking samples.

June 22, 1983, Wednesday

Team: Same as Tuesday, June 21

Samples obtained: MW-23
Field blank
MW-6
MW-29
MW-5
Hamilton City Well No. 11

Comments: MW-6 and MW-5 sampled with the 2-inch diameter stainless steel bailer and MW-23 and MW-29 sampled with the submersible pump.

Sampling the Hamilton City well No. 11 was under the direction of Don Bruce, U.S. EPA.

Fleissner returned to CH2M HILL Milwaukee office after the work on June 22 because of a prior commitment. Field log maintained by Jim Emery, CH2M HILL, during work on the following day.

June 23, 1983, Thursday

Team: Jim Emery, CH2M HILL
Ried Dennis, CH2M HILL
George Gartseff, E&E, Inc.
Nancy Aungst, E&E, Inc.

Samples obtained: MW-24
MW-25
Field blank
MW-27

Comments: Larry Holm, CH2M HILL, assisted sampling team during onsite sampling.

The two "deep" onsite wells, MW-28 and MW-26 were not finished and could not be sampled during this period of work.

July 11, 1983, Monday

Team: John T. Fleissner, CH2M HILL

Samples obtained: None

Comments: Day used to assemble materials and equipment for sampling.

July 12, 1983, Tuesday

Team: John T. Fleissner, CH2M HILL
Tom A. Gilgenbach, CH2M HILL
Mark J. Lepkowski, CH2M HILL
Linda J. Keppert, CH2M HILL
Diane M. Demshar, CH2M HILL

Samples obtained: MW-28
Laboratory blank
Field blank
Hamilton Electric Power Well No. 9

Comments: The sample collected from the Hamilton Electric Power Well No. 9 included a biocide additive which is continuously injected into the well water. The additive is Nalco 321 which contains 23.5 percent of the active ingredient 1 alkyl (C_6 to C_{18}) amino-3-aminopropane diacetate. Prior to sampling, the well had been pumping since Wednesday, June 6.

July 13, 1983, Wednesday

Team: Same as Tuesday, July 12

Samples obtained: MW-26
Beckett Parking Lot Well
Beckett Dayton St. Well
Champion Papers Well No. 1
Champion Papers Well No. 4
Champion Papers Well No. 10
Field Blank

Comments: The third Beckett Paper well, called the Buckeye St. well, could not be sampled because there is no access to the discharge before it joins the discharge from other wells. Beckett Paper sampling performed under coordination with Cecil Lakes, maintenance foreman.

Champion Paper wells sampled with the assistance of Julia Glazer, environmental engineer.

FIELD DATA SUMMARIES

The field data are presented on several tables which follow. These data are included without observations or evaluation since additional data will be generated from other sampling efforts. Data evaluation will be performed after all data are available under Task 5, Site Investigation Analysis in the final work plan.

The field data summaries include the following tables:

- Table 3 - Summary of Priority Pollutant Organic Analysis of Groundwater
- Table 4 - Summary of Inorganic Analysis of Groundwater
- Table 5 - Summary of Priority Pollutant Organic Analysis of Production Wells and Private Residences
- Table 6 - Summary of Inorganic Analysis of Production Wells and Private Residences
- Tentatively Identified Compounds detected in Groundwater Samples are presented in Appendix B.

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Table 3 (Page 1 of 3)
SUMMARY OF PRIORITY POLLUTANT ORGANIC ANALYSIS OF GROUNDWATER AND SURFACE WATER
AT CHEM-DYNE PHASE II - HYDROGEOLOGIC STUDY CASE NO. 1746-1878 JUNE AND JULY 1983

Compound[a]	MONITORING WELL														
	MW-1	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-6	MW-7	MW-8	MW-9	MW-10	MW-10	MW-11	MW-12
Acid Compounds, ug/l															
2-Nitrophenol													80		
Pheonol												36			
Base/Neutral Compounds, ug/l															
Bis(2-chloroethyl)ether															
Isophorone															
Bis(2-ethylhexyl)phthalate											150				
Di-n-octyl phthalate							24								
Volatiles, ug/l															
Benzene						230									
Carbon tetrachloride							2,800	2,600	4,300		1,200				
Chlorobenzene						19									
1,2-Dichloroethane						59	260	260							
1,1,1-Trichloroethane						130	120	120	820			3,700			
1,1-Dichloroethane						150									
1,1,2-Trichloroethane						40	240	240				4,400			
1,1,2,2-Tetrachloroethane						26						2,600			
Chloroform						430	13,000	13,000	7,000		920	13,000	11,000		
1,1-Dichloroethene						62									
1,2-trans-Dichloroethene					800	250	180	180				7,500	7,000		8.1
Ethylbenzene															
Methylene chloride						18	1,200	1,400				4,700			
Tetrachloroethene						100						3,900	5,400		5.7
Toluene						12									
Trichloroethene						130						4,300	5,200		8.6
Vinyl chloride						20									41
Pesticides, ug/kg															
No priority pollutant pesticides found.															
Nonpriority Pollutants															
Hazardous Substances, ug/l															
Benzoic acid													320		
Acetone			420	1,600		17,000				260		50,000		300	700
2-Butanone						1,500									
4-Methyl-2-pentanone															
O-xylene															
Dioxins															
2,3,7,8-Tetrachlorodibenso -p-dioxin															

[a]NA denotes that the compound was not analyzed for in this sample. Only compounds identified in samples are listed in this table. Compounds not identified in any sample are not listed.
[b]LT denotes compound identified at less than (LT) the specified detection limit but greater than one-half the detection limit, i.e., present but below the detection limit.
[c]PN represents pesticide or PCB which cannot be confirmed by GC/MS.
[d]1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[e]NCA denotes insufficient data available upon which to derive a criterion.

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Table (page 2 of 3)
SUMMARY OF PRIORITY POLLUTANT ORGANIC ANALYSIS OF GROUNDWATER AND SURFACE WATER
AT CHEM-DYNE PHASE II - HYDROGEOLOGIC STUDY CASE NO. 1746-1878 JUNE AND JULY 1983

	MONITORING WELL										
Compound[a]	MW-13	MW-13	MW-14	MW-15	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-21
Acid Compounds, ug/l											
2-Nitrophenol											
Pheonol											
Base/Neutral Compounds, ug/l											
Bis(2-chloroethyl)ether				28	28						
Isophorone											
Bis(2-ethylhexyl)phthalate			22								
Di-n-octyl phthalate							24				
Volatiles, ug/lkg											
Benzene											
Carbon tetrachloride											
Chlorobenzene											
1,2-Dichloroethane			1,100	2,400	1,400			50			
1,1,1-Trichloroethane											
1,1-Dichloroethane											
1,1,2-Trichloroethane	23	22		5,000	3,400			150			
1,1,2,2-Tetrachloroethane	18	18		1,600	910						
Chloroform											
1,1-Dichloroethene				1,600	1,500						
1,2-trans-Dichloroethene	19	18		2,000	1,200			320			
Ethylbenzene											
Methylene chloride											
Tetrachloroethane	8.1	7.5		1,000	1,200						
Toluene											
Trichloroethene	21	19		3,000	2,400						
Vinyl chloride				1,200	900			460			
Pesticides, ug/kg											
No priority pollutant pesticides found.											
Nonpriority Pollutants											
Hazardous Substances, ug/l											
Benzoic acid											
4-Methylphenol											
Acetone	440	490				110	440	27,000	730		650
2-Butanone											
4-Methyl-w-pentanone											
O-xylene											
Dioxins											
2,3,7,8-Tetrachlorodibenzo -p-dioxin											

[a]NA denotes that the compound was not analyzed for in this sample. Only compounds identified in samples are listed in this table. Compounds not identified in any sample are not listed.
[b]LT denotes compound identified at less than (LT) the specified detection limit but greater than one-half the detection limit, i.e., present but below the detection limit.
[c]PN represents pesticide or PCB which cannot be confirmed by GC/MS.

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Table 3 (Page 3 of 3)
SUMMARY OF PRIORITY POLLUTANT ORGANIC ANALYSIS OF GROUNDWATER AND SURFACE WATER
AT CHEM-DYNE PHASE II - HYDROGEOLOGIC STUDY CASE NO. 1746-1878 JUNE AND JULY 1983

Compound[a]	MONITORING WELL MW-22	MW-23	MW-24	MW-25	MW-26	MW-27	MW-28	MW-29	EPA AMBIENT WATER QUALITY CRITERIA[d,e] Toxicity Protection	Carcinogencity Protection ($R=10^{-5}$)
Acid Compounds, ug/l										
2-Nitrophenol									NCA	
Phenol								110	3,500	
Base/Neutral Compounds, ug/l										
Bis(2-chloroethyl)ether										0.30
Isophorone		860							5,200	
Bis(2-ethylhexyl)phthalate									15,000	
Di-n-octyl phthalate									NCA	
Volatiles, ug/l										
Benzene				650	180			1,800		6.6
Carbon tetrachloride		850								
Chlorobenzene				600					488	
1,2-Dichloroethane					5			300		9.4
1,1,1-Trichloroethane								250	18,400	
1,1-Dichloroethane		350							NCA	
1,1,2-Trichloroethane								500		6.0
1,1,2,2-Tetrachloroethane										1.7
Chloroform		1,800	500					500		1.9
1,1-Dichloroethene					5			250		0.33
1,2-trans-Dichloroethene		34,000			89		6.0	4,700	NCA	
Ethylbenzene				350	96				1,400	
Methylene chloride		550						700		1.9
Tetrachloroethene		1,900	1,700					250		8.0
Toluene				300					14,300	
Trichloroethene		800						4,300		27
Vinyl chloride					12					20
Pesticides, ug/kg										
No priority pollutant pesticides found.										
Nonpriority Pollutants										
Hazardous Substances, ug/l										
Benzoic acid		300								
4-Methylphenol				59						
Acetone		22,000			730		8,200	11,000		
2-Butanone		33,000		10,000	200					
4-Methyl-2-pentanone		10,000								
O-xylene					79					
Dioxins										
2,3,7,8-Tetrachlorodibenzo-p-dioxin										

[a]NA denotes that the compound was not analyzed for in this sample. Only compounds identified in samples are listed in this table. Compounds not identified in any sample are not listed.
[b]LT denotes compound identified at less than (LT) the specified detection limit but greater than one-half the detection limit, i.e., present but below the detection limit.
[c]PW represents pesticide or PCB which cannot be confirmed by GC/MS.
[d]1980 EPA AMBIENT WATER QUALITY CRITERIA for the protection of human health from the toxic properties of a pollutant ingested through water and contaminated aquatic organisms, assuming daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products. Concentrations corresponding to lifetime cancer risk level $R=10^{-5}$ have been estimated for those pollutants which exhibit carcinogenic and/or mutagenic effects in certain bioassay systems and which therefore are suspected of being potentially carcinogenic to humans.
[e]NCA denotes insufficient data available upon which to derive a criterion.

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Table 4 (Page 1 of 4)
SUMMARY OF INORGANIC ANALYSES OF GROUNDWATER AT CHEM-DYNE PHASE II - HYDROGEOLOGIC STUDY
CASE NO. 1746 AND 1878 JUNE-JULY 1983

	Groundwater Monitoring Wells												
Constituent[a]	MW-1	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-6	MW-7	MW-8	MW-9	MW-10	MW-10
Aluminum	<100	<100	<100	<100	<100	<100	102	67	<100	<100	237	1,524	<100
Chromium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-
Barium	145	150	104	<100	397	475	<100	<100	<100	<100	267	490	463
Beryllium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cadmium	<0.05	<1	<1	<1	1.6	<1	<1	<1	<1	1.1	<1	<1	<1
Cobalt	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Copper	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Iron	58	60	474	50	153	1,946	52	78	884	13,300	249	6,056	1741
Lead	<5	<5	<5	16	<5	<5	<5	6	<5	<5	<5	12	5
Nickel	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
Manganese	<10	14	12	12	1,030	1,546	705	723	1,110	1,130	14	2,118	2,099
Zinc	c837	c809	c439	c570	c125	79	106	125	c234	c5,930	95	995	508
Boron	100	<100	<100	<100	118	316	171	171	179	123	293	259	270
Vanadium	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
Arsenic	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	26	17
Antimony	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Selenium	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Thallium	<10	<10	<10	<10	<10	<10	<10	<10	<40	<10	<10	<10	<10
Mercury	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tin	<20	<20	<20	<20	30	150	<20	<20	<20	<20	<20	<20	<20
Silver	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cyanide	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

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Table 4 (Page 2 of 4)
SUMMARY OF INORGANIC ANALYSES OF GROUNDWATER AT CHEM-DYNE PHASE II - HYDROGEOLOGIC STUDY
CASE NO. 1746 AND 1878 JUNE-JULY 1983

	Goundwater Monitoring Wells										
Constituent[a]	MW-11	MW-12	MW-13	MW-13	MW-14	MW-15	MW-15	MW-16	MW-17	MW-18	MW-19
Aluminum	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Chromium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Barium	<100	1930	100	<100	<100	137	138	<100	213	<100	<112
Beryllium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cadmium	<1	<1.0	3.5	<1	<1	1.4	<1	1.8	<1	1.8	<1
Cobalt	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Copper	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Iron	89	8,160	<50	228	76	10,300	10,200	51	1,260	85	53
Lead	<5	-	<5	<5	<5	6	<5	<5	<5	<5	<5
Nickel	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
Manganese	<10	86	<10	<10	1,780	1,280	1,400	371	150	482	10
Zinc	c123	2,670	c43	c73	c330	c4,500	c3,520	c1,030	c2,370	c105	c488
Boron	398	507	654	638	1,760	553	593	114	151	685	159
Vanadium	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
Arsenic	<10	<10	<10	<10	<10	<10	-	<10	<10	<10	<10
Antimony	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Selenium	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Thallium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tin	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Silver	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cyanide	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

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Table 4 (Page 3 of 4)
SUMMARY OF INORGANIC ANALYSES OF GROUNDWATER AT CHEM-DYNE PHASE II - HYDROGEOLOGIC STUDY
CASE NO. 1746 AND 1878 JUNE-JULY 1983

	Goundwater Monitoring Wells									
Constituent[a]	MW-20	MW-21	MW-22	MW-23	MW-24	MW-25	MW-26	MW-27	MW-28	MW-29
Aluminum	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Chromium	<10	<10	<10	17	<10	<10	<10	<10	<10	<10
Barium	100	<100	164	603	224	547	904	690	217	141
Beryllium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cadmium	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Copper	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Iron	71	<50	96	2,953	100	172	3,716	8,102	115	1,040
Lead	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Nickel	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
Manganese	45	17	451	1,877	1,162	93	139	231	506	1,205
Zinc	c3,750	c3,240	c766	40	32	13	17	29	48	15
Boron	303	100	<100	175	301	398	263	1,690	123	3,894
Vanadium	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
Arsenic	<10	<10	<10	<10	<10	<10	<10	<17	<10	<10
Antimony	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Selenium	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Thallium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.6	<0.2
Tin	<20	<20	<20	<20	<20	28	<20	23	55	<20
Silver	<10	<10	<10	11	<10	<10	<10	<10	<10	<10
Cyanide	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

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Table 4 (Page 4 of 4)
SUMMARY OF INORGANIC ANALYSES OF GROUNDWATER AT CHEM-DYNE PHASE II - HYDROGEOLOGIC STUDY
CASE NO. 1746 AND 1878 JUNE-JULY 1983

Constituent[a]	INTERIM PRIMARY DRINKING WATER STANDARDS[b] Maximum Concentration	EPA AMBIENT WATER QUALITY CRITERION (for protection of freshwater aquatic life)[c,d,e] Acute	Chronic
Aluminum			
Chromium	50		
Barium	1,000		
Beryllium		NCA	NCA
Cadmium	10	(12)	(0.10)
Cobalt			
Copper		(77)	(5.6)
Iron			
Lead	50	(872)	(87)
Nickel		(5,067)	(263)
Manganese			
Zinc		(969)	47
Boron			
Vanadium			
Arsenic	50	440	NCA
Antimony		NCA	NCA
Selenium	10	260	35
Thallium		NCA	NCA
Mercury	2	4.1	0.2
Tin			
Silver	50	(40)*	NCA
Cyanide		52	3.5

[a]All concentrations are expressed as ug/l.
[b]Safe Water Drinking Act of 1974.
[c]1980 EPA AMBIENT WATER QUALITY CRITERIA.
[d]Values within parentheses are derived from the following equations: Calculations assume water hardness value of 378 mg/l

Cadmium:	acute	= e exp (1.05 [ln (hardness)] - 3.73)
	chronic	= e exp (1.05 [ln (hardness)] - 8.53)
Copper:	acute	= e exp (0.94 [ln (hardness)] - 1.23)
Lead:	acute	= e exp (1.22 [ln (hardness)] - 0.47)
	chronic	= e exp (2.35 [ln (hardness)] - 9.48)
Nickel:	acute	= e exp (0.76 [ln (hardness)] + 4.02)
	chronic	= e exp (0.76 [ln (hardness)] + 1.06)
Silver:	acute	= e exp (1.72 [ln (hardness)] - 6.52)
Zinc:	acute	= e exp (0.83 [ln (hardness)] + 1.95)

[e]NCA denotes no criterion available.

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Table 5
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSES OF PRODUCTION WELLS AND PRIVATE RESIDENCES
NEAR CHEM-DYNE SITE CASE NO. 1746 JUNE 1983

Compound[a]	Beckett Paper Parking Lot Well	Beckett Paper Dayton St. Well	Champion Paper Well No. 1	Champion Paper Well No. 4[b]	Champion Paper Well No. 10	Hamilton Municipal Electric No. 9	Hamilton Well No. 11	Vaughn Building Company Well	Private Residence Footterer	Private Residence Hapso	Private Residence Holland
Acid Compounds, ug/l											
No acid organic priority pollutants found.											
Base/Neutral Compounds, ug/l											
No base/neutral organic priority pollutants found.											
Volatiles, ug/l											
Methylene chloride					6.0			56,000			
Pesticides, ug/l											
No pesticide pollutants found.				NA							
Nonpriority Pollutants Hazardous Substances, ug/l											
No nonpriority pollutant hazardous substances found.											
Dioxins											
2,3,7,8-Tetrachlorodibenzo-p-dioxin				NA							

[a]NA denotes that the compound was not analyzed for in this sample.
Only compounds identified in samples are listed in this table.
Compounds not identified in any sample are not listed.
[b]Dioxin not analyzed in Well No. 4 sample because of insufficient sample size.
Dioxin was analyzed for in all other samples.

GLT432/101

Table 6
SUMMARY OF INORGANIC ANALYSES OF PRODUCTION WELL WATER AND PRIVATE RESIDENCES
NEAR CHEM-DYNE PHASE II - HYDROGEOLOGIC STUDY CASE NO. 1746 AND 1878 JUNE-JULY 1983

Constituent[a]	Beckett Paper Parking Lot Well	Beckett Paper Dayton St. Well	Champion Paper Well No. 1	Champion Paper Well No. 4	Champion Paper Well No. 9	Hamilton Municipal Electric No. 9	Hamilton Well No. 11	Vaughn Building Company Well	Private Residence Foetterer	Private Residence Hapso	Private Residence Holland
Aluminum	<100	<100	<100	<100	<100	101	<100	<100	265	238	146
Chromium	<10	<10	<10	<10	<10	<10	17	<10	<10	<10	<10
Barium	203	146	173	110	147	257	123	121	<100	<100	<100
Beryllium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cadmium	<1	1.1	<1	<1	<1	<1	<1	<1.0	<1	2.8	<1
Cobalt	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Copper	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Iron	<50	68	30	<50	200	1,477	95	2,110	<50	83	97
Lead	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	6
Nickel	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
Manganese	475	78	248	21	<10	546	203	233	<10	<10	<10
Zinc	24	46	75	24	28	32	16	56	12	15	10
Boron	<100	<100	112	124	113	<100	<100	<100	<100	<100	<100
Vanadium	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
Arsenic	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Antimony	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Selenium	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Thallium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Mercury	<0.2	0.3	<0.2	0.4	0.2	<0.2	<0.1	<0.20	<0.2	<0.2	0.32
Tin	25	20	40	35	<20	<20	<20	<20	<20	<20	<20
Silver	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cyanide	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

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Table 6 (continued)
SUMMARY OF INORGANIC ANALYSES OF PRODUCTION WELL WATER AND PRIVATE RESIDENCES
NEAR CHEM-DYNE PHASE II - HYDROGEOLOGIC STUDY CASE NO. 1746 AND 1870 JUNE-JULY 1983

Constituent[a]	INTERIM PRIMARY DRINKING WATER STANDARDS[b] Maximum Concentration	EPA AMBIENT WATER QUALITY CRITERION (for protection of freshwater aquatic life)[c,d,e] Acute	Chronic
Aluminum			
Chromium	50		
Barium	1,000		
Beryllium		NCA	NCA
Cadmium	10	(12)	(0.10)
Cobalt			
Copper		(77)	(5.6)
Iron			
Lead	50	(872)	(87)
Nickel		(5,067)	(263)
Manganese			
Zinc		(969)	47
Boron			
Vanadium			
Arsenic	50	440	NCA
Antimony		NCA	NCA
Selenium	10	260	35
Thallium		NCA	NCA
Mercury	2	4.1	0.2
Tin			
Silver	50	(40)[e]	NCA
Cyanide		52	3.5

[a]All concentrations are expressed as ug/l.
[b]Safe Water Drinking Act of 1974.
[c]1980 EPA AMBIENT WATER QUALITY CRITERIA.
[d]Values within parentheses are derived from the following equations: Calculations assume water hardness value of 378 mg/l

Cadmium: acute = e exp (1.05 [ln (hardness)] - 3.73)
chronic = e exp (1.05 [ln (hardness)] - 8.53)
Copper: acute = e exp (0.94 [ln (hardness)] - 1.23)
Lead: acute = e exp (1.22 [ln (hardness)] - 0.47)
chronic = e exp (2.35 [ln (hardness)] - 9.48)
Nickel: acute = e exp (0.76 [ln (hardness)] + 4.02)
chronic = e exp (0.76 [ln (hardness)] + 1.06)
Silver: acute = e exp (1.72 [ln (hardness)] - 6.52)
Zinc: acute = e exp (0.83 [ln (hardness)] + 1.95)

[e]NCA denotes no criterion available.

GLT443/17-2

APPENDIX A

PHASE II HYDROGEOLOGICAL INVESTIGATION
MONITORING WELL AND PRODUCTION WELL SAMPLING

PHOTOGRAPHIC LOG

PHOTO LOG

Chem-Dyne Site Remedial Investigation
Monitoring Well and Production Well Sampling
Phase II - Subtask 3-2.4

The following four photographs were taken with a Nikon FE fitted with a data back and using Kodachrome 64 slide film.

PHOTO 1: Viewing north showing groundwater sampling equipment setup at MW 24. Notice level B personnel protection [6-23-83].

PHOTO 2: Similar to Photo 1 showing closeup of equipment trailer [6-23-83].

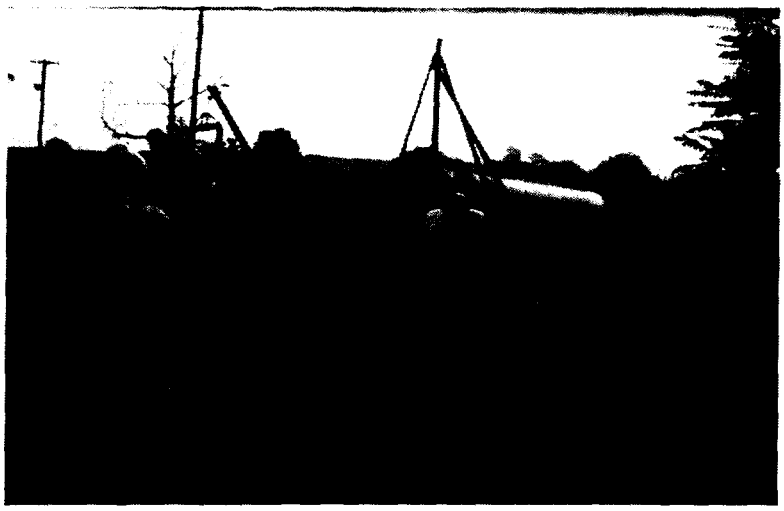

PHOTO 3: Viewing northeast showing groundwater sampling crew preparing to enter site at the hotline [6-23-83].

PHOTO 4: Similar to Photo 3 above [6-23-83].

APPENDIX B

TENTATIVELY IDENTIFIED COMPOUNDS

Table 2

SUMMARY OF TENTATIVELY IDENTIFIED COMPOUNDS IN GROUNDATER AT THE CHEM-DYNE SITE
PHASE II - HYDROGEOLOGIC STUDY (CASE NO. 1746 AND 1878)

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/L)
MW-01		none found		
MW-02		none found		
MW-03		none found		
MW-04	791-28-6	Phosphineoxide, triphenyl-	84.2	14
MW-05	68-12-2	Formamide, N,N-dimethyl-	99.3	57
MW-05	127-18-4	Ethene, tetrachloro-	93.4	17
MW-05	25144-05-2	Cyclopentanol, 2-methyl-,cis-	88.1	35
MW-05	108-94-1	Cyclohexanone	94.8	23
MW-05	27154-43-4	Piperidinone	81.1	120
MW-05	143-24-8	2,5,8,11,14-pentaoxapentadecane	81.9	44
MW-05	625-31-0	4-penten-2-ol	87.9	74
MW-05	354-23-4	Ethane, 1,2-dichloro-1,1,2-trifluoro-	94.2	30
MW-05	2233-00-3	1-propene, 3,3,3-trichloro-	81.3	12
MW-06	79-00-5	Ethane, 1,1,2-trichloro-	87.9	110
MW-06	123-63-7	1,3,5-trioxane, 2,4,6-trimethyl-	96.2	930
MW-06	7326-46-7	2-furanol, tetrahydro-2-methyl-	92.9	43
MW-06	4166-46-5	3-hexanol, 2,3-dimethyl-	91.8	33
MW-06	111-96-6	Ethane, 1,1'-oxybis/2-methoxy-	95.3	190

SHELL/CLT460/75
FILE/CLT460/100

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/L)
MW-06	918-05-8	Methanesulfonamide, N,N-dimethyl-	81.9	25
MW-06	79-00-5	Ethane, 1,1,2-Trichloro-	85.3	53
MW-06	123-63-7	1,3,5-trioxane 2,4,6-trimethyl-	97.4	510
MW-06	595-41-5	3-pentanol, 2,3-dimethyl-	93.8	12
MW-06	7326-46-7	2-furanol, tetrahydro-2-methyl-	90.1	36
MW-06	598-01-6	4-heptanol, 4-methyl-	92.9	31
MW-06	111-96-6	Ethane, 1,1'-oxybis/2-methoxy-	95.5	120
MW-06	918-05-8	Methanesulfonamide, N,N-Dimethyl-	83.4	31
MW-06	872-50-4	2-pyrrolidinone, 1-methyl-	87.9	49
MW-06	1002-69-3	Decane, 1-chloro-	82.4	13
MW-07	584-02-1	3-pentanol	84.8	11
MW-07	4798-44-1	1-hexen-3-ol	88.9	59
MW-07	589-38-8	3-hexanone	95.0	92
MW-07	565-68-4	1-pentyn-3-ol, 4-methyl-	81.0	120
MW-07	108-90-7	Benzene, chloro-	90.6	30
MW-07	6137-11-7	3-heptanone, 4-methyl-	89.7	21
MW-07	583-59-5	Cyclohexanol, 2-methyl	88.4	41
MW-07	111-96-6	Ethane, 1,1'oxybis/2-methoxy-	95.4	33
MW-08		none found		
MW-09		none found		

SHELL/GLT460/75
FILE/GLT460/100

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/L)
MW-10	544-25-2	1,3,5-cycloheptatriene	94.9	230
MW-10	100-41-4	Benzene, ethyl-	93.5	30
MW-10	149-57-5	Hexanoicacid, 2-ethyl	91.2	74
MW-10	815-24-7	3-pentanone-2,2,4,4-tetramethyl	94.9	43
MW-10	79-00-5	Ethane, 1,1,2-trichloro-	86.9	870
MW-10	68-12-2	Formamide, N,N-dimethyl-	96.0	650
MW-10	127-18-4	Ethene, tetrachloro-	95.3	930
MW-10	630-20-6	Ethane, 1,1,1,2-tetrachloro-	89.7	620
MW-10	108-38-3	Benzene, 1,3-dimethyl-	88.4	59
MW-10	111-96-6	Ethane, 1,1'-oxybis/2-methoxy-	94.7	1,500
MW-10	103-82-2	Benzeneaceticacid	86.4	38
MW-10	630-20-6	Ethane, 1,1,1,2-tetrachloro-	93.9	2,800
MW-10	108-10-1	2-pentanone, 4-methyl	95	87
MW-10	544-25-1	1,3,5-cycloheptatriene	94	390
MW-10	79-00-5	Ethane, 1,1,2-trichloro	87	1,100
MW-10	69-12-2	Formamide, N,N-dimethyl	95	1,100
MW-10	127-18-4	Ethene, tetrachloro	96	1,200
MW-10	630-20-6	Ethane, 1,1,1,2-tetrachloro	89	900
MW-10	108-38-3	Benzene 1,3-dimethyl	91	140
MW-10	142-62-1	Hexanoic acid	94	58

SHELL/GLT460/75
FILE/GLT460/100

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/L)
MW-10	149-57-5	Hexanoic acid 2-ethyl	89	210
MW-10	103-82-2	Benzeneacetic acid	90	94
MW-10	111-96-6	Ethene, 1,1'-oxybis/2-methoxy	87	1,800
MW-11	544-25-2	1,3,5-cycloheptatriene	95.8	25
MW-12	123-91-1	1,4-dioxane	94.5	33
MW-12	108-10-1	2-pentanone, 4-methyl-	92.1	9.5
MW-12	68-12-2	Formamide, N,N-dimethyl-	96.0	51
MW-12	111-96-6	Ethane,1,1'-oxybis/2-methoxy-	92.5	42
MW-12	20324-32-7	2-propanol,1-(2-methoxy-1-methylethoxy)-	90.6	10
MW-12	2568-36-9	1,3-dioxolane, 2-ethyl-	81.8	23
MW-12	149-57-5	Hexanoicacid, 2-ethyl-	89.5	8.9
MW-12	20324-32-7	2-propanol,1-(2-methoxy-1-methylethoxy)-	87.2	11
MW-12	1454-85-9	1-heptadecanol	80.6	21
MW-12	60-29-7	Ethane,1,1'oxybis-	98.0	30
MW-13		none found		
MW-14	79-00-5	Ethane, 1,1,2-trichloro-	89.0	20
MW-14	590-50-1	2-pentanone, 4,4-dimethyl-	96.7	26
MW-14	5405-79-8	3-hexanone, 2-2-dimethyl-	95.7	17
MW-14	3377-86-4	Hexane, 2-bromo-	80.1	9.2
MW-14	75-65-0	2-propanol, 2-methyl-	91.7	48

SHELL/GLT460/75
FILE/GLT460/100

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/L)
MW-14	3587-64-2	2-propanol-1 methoxy-2-methyl	81.5	61
MW-14	1072-16-8	Octane, 2,7-dimethyl-	87.7	5.7
MW-15	544-25-2	1,3,5-cycloheptatriene	93.8	150
MW-15	1871-57-4	1-propene, 3-chloro-2-(chloromethyl)-	87.5	72
MW-15	127-18-4	Ethene, tetrachloro-	91.6	150
MW-15	1190-22-3	Butane, 1,3-dichloro-	85.4	5.9
MW-15	108-90-7	Benzene, chloro-	89.7	210
MW-15	10061-01-5	1-propene, 1,3-dichloro-, (Z)-	80.0	100
MW-15	544-25-2	1,3,5-cycloheptatriene	95.0	130
MW-15	79-00-5	Ethane, 1,1,2-trichloro-	88.5	1,700
MW-15	142-28-9	Propane, 1,3-dichloro-	91.7	32
MW-15	13676-58-9	1-butene, 1,4-dichloro-	82.9	28
MW-15	127-18-4	Ethene, tetrachloro-	94.5	160
MW-15	108-90-7	Benzene, chloro-	90.1	170
MW-15	10061-01-5	1-propene, 1,3-dichloro-, (Z)-	80.2	93
MW-15	544-63-8	Tetradecanoicacid	81.0	9.4
MW-15	57-10-3	Hexadecanoicacid	81.0	42
MW-16		none found		
MW-17		none found		
MW-18	79-00-5	Ethane, 1,1,2-trichloro-	86.7	89

SHELL/GLT460/75
FILE/GLT460/100

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/L)
MW-18	111-96-6	Ethane, 1,1'-oxybis/2-methoxy-	94.5	21
MW-19	65-85-0	Benzoicacid	88.5	1.9
MW-20	65-85-0	Benzoicacid	88.5	1.9
MW-21		none found		
MW-22		none found		
MW-23	123-91-1	1,4-dioxane	95.6	230
MW-23	108-10-1	2-pentanone, 4-methyl-	95.4	2,000
MW-23	108-11-2	2-pentanol, 4-methyl-	96.4	150
MW-23	68-12-2	Formamide, N,N-dimethyl-	99.4	120
MW-23	591-78-6	2-hexanone	80.7	63
MW-23	127-18-4	Ethene, tetrachloro-	91.8	370
MW-23	123-42-2	2-pentanone, 4-hydroxy-4-methyl	95.6	46
MW-23	25144-05-2	Cyclopentanol, 2-methyl-, cis-	88.3	78
MW-23	111-96-6	Ethane, 1,1'-oxybis/2-methoxy-	95.0	140
MW-23	88-09-5	Butanoicacid, 2-ethyl-	90.8	110
MW-23	142-62-1	Hexanoicacid	87.5	310
MW-23	116-02-9	Cyclohexanol, 3,3,5-trimethyl-	81.4	190
MW-23	78-59-1	2-cyclohexen-1-one, 3,5,5-trimethyl-	82.7	1,500
MW-24	79-00-5	Ethane, 1,1,2-trichloro-	87.0	21
MW-24	590-50-1	2-pentanone, 4,4-dimethyl-	89.4	11

SHELL/GLT460/75
FILE/GLT460/100

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/L)
MW-24	127-18-4	Ethene, tetrachloro-	92.2	340
MW-24	5405-79-8	3-hexanone, 2,2-dimethyl-	93.5	10
MW-24	75-65-0	2-propanol, 2-methyl-	91.0	17
MW-24	1002-69-3	Decane, 1-chloro-	92.6	14
MW-24	109-99-9	Furan, tetrahydro-	96.6	560
MW-25	544-25-2	1,3,5-cycloheptatriene	94.2	25
MW-25	100-41-4	Benzene, ethyl-	93.2	38
MW-25	4161-32-4	1-propanol, 3,3'-/1,3-propanediylbis(oxy)/bis-	85.5	59
MW-25	120-92-3	Cyclopentanone	90.1	70
MW-25	108-90-7	Benzene, chloro-	89.6	51
MW-25	108-38-3	Benzene, 1,3-dimethyl-	90.0	66
MW-25	100-41-4	Benzene, ethyl-	91.9	18
MW-25	111-96-6	Ethane, 1,1'-oxybis/2-methoxy-	96.9	29
MW-25	108-67-8	benzene, 1,3,5-trimethyl-	85.1	12
MW-25	149-57-5	Hexanoicacid, 2-ethyl-	84.2	110
MW-25	103-82-2	Benzeneaceticacid	90.5	9.9
MW-25	74-11-3	Benzoicacid, 4-chloro-	80.6	36
MW-25	109-99-9	Furan, Tetrahydro-	84.2	370
MW-26	100-41-4	Benzene, ethyl-	92.6	150
MW-26	108-38-3	Benzene, 1,3-dimethyl-	91.3	350

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/L)
MW-26	98-82-8	Benzene, (1-methylethyl)-	90.7	35
MW-26	103-65-1	Benzene, Propyl-	92.2	25
MW-26	95-63-6	Benzene, 1,2,4-trimethyl-	87.6	63
MW-26	20324-32-7	2-propanol, 1-(2-methoxy-1-methylethoxy)-	91.2	23
MW-26	95-63-6	Benzene, 1,2,4-trimethyl-	88.0	17
MW-26	110-82-7	Cyclohexane	97.2	59
MW-26	96-37-7	Cyclopentane, methyl-	98.1	44
MW-26	79-29-8	Butane, 2,3-dimethyl-	97.5	3.9
MW-26	110-54-3	Hexane	93.2	18
MW-26	108-87-2	Cyclohexane, methyl-	91.5	33
MW-26	590-66-9	Cyclohexane, 1,1-dimethyl-	83.6	10
MW-26	2613-65-2	Cyclopentane, 1-ethyl'-3-methyl-, trans-	84.6	25
MW-26	638-04-0	Cyclohexane, 1,3-dimethyl-, cis-	92.8	13
MW-26	624-29-3	Cyclohexane, 1,4-dimethyl-, cis-	86.4	5.6
MW-26	108-38-3	Benzene, 1,3-dimethyl-	92.4	100
MW-27	108-87-2	Cyclohexane, methyl-	94.1	23
MW-27	108-10-1	2-pentanone, 4-methyl-	94.9	29
MW-27	108-88-3	Benzene, methyl-	94.0	9.5
MW-27	123-42-2	2-pentanone, 4-hydroxy-4-methyl	90.8	31
MW-27	100-41-4	Benzene, ethyl-	86.8	650

SHELL/GLT460/75
FILE/GLT460/100

Sample Number	CAS Number	Compound Name	Percent Purity	Estimated Concentration (ug/L)
MW-27	108-38-3	Benzene, 1,3-dimethyl-	87.2	900
MW-27	280-33-1	Bicyclo/2.2.2/octane	87.3	2.7
MW-27	98-82-8	Benzene, (1-methylethyl)-	91.8	75
MW-27	103-65-1	Benzene, Propyl-	91.8	70
MW-27	108-67-8	Benzene, 1,3,5-trimethyl-	90.4	50
MW-27	611-14-3	Benzene, 1-ethyl-2-methyl-	87.3	20
MW-27	108-67-8	Benzene, 1,3,5-trimethyl-	89.5	160
MW-27	95-63-6	Benzene, 1,2,4-trimethyl-	87.7	48
MW-27	109-99-9	Furan, tetrahydro-	97.5	5,400
MW-28	110-82-7	Cyclohexane	95.4	16
MW-28	96-37-7	Cyclopentane, methyl-	97.5	11
MW-29	108-10-1	2-pentanone, 4-methyl-	97.0	650
MW-29	108-11-2	2-pentanol, 4-methyl-	97.0	70
MW-29	79-00-5	Ethane, 1,1,2-trichloro-	89.5	180
MW-29	68-12-2	Formamide, N,N-dimethyl-	96.0	1,600
MW-29	591-78-6	2-hexanone	95.8	470
MW-29	123-42-2	2-pentanone, 4-hydroxy-4-methyl-	97.2	170
MW-29	107-41-5	2,4-pentanediol, 2-methyl-	94.0	2,700
MW-29	149-57-5	Hexanoicacid, 2-ethyl-	90.9	400

MEMORANDUM

TO: File

FROM: John T. Fleissner/GLO

DATE: November 16, 1983
(Revised December 9, 1983)

RE: Chem-Dyne Site Remedial Investigation
Surface Water and Sediment Sampling
Phase II Subtask 3-2.5

INTRODUCTION

Sampling the Ford Hydraulic Canal and Great Miami River for water and sediment is described in the Chem-Dyne RI/FS Final Work Plan as part of Subtask 3-2.5. This work was added to the original scope of the Work Assignment by Don Bruce, U.S. EPA, because of concern over the potential contamination of fish which are taken out of the Ford Hydraulic Canal by local fishermen.

This memorandum describes the water and sediment sampling. In addition, selected fish tissue samples were also taken from the Ford Canal as part of the same sampling effort conducted on September 14-15, 1983. The fish sampling is discussed in a separate technical memorandum.

PURPOSE

There were two purposes of the canal and river sampling work. First, sampling and analysis of selected fish tissues would determine if there is reason to call for a ban on fishing in the canal area. (The fish sampling is described in a separate technical memorandum.)

Secondly, sampling and analysis of the canal and river water would determine the present level of contamination (if any) in the surface water near the site. Sampling and analysis of the canal sediments would determine the level of contamination remaining in the sediment downstream of the site storm drains.

SCOPE

The planned scope of the surface water and sediment sampling included the following samples:

- Ten sediment samples from the Ford Hydraulic Canal (six downstream of both site drains; two downstream of the eastern site drain; and two upstream of both site drains)

- Three surface water samples from the Great Miami River

- One surface water sample from the Ford Hydraulic Canal.

Actually, only eight sediment samples were taken from the Ford Canal because the downstream portion of the canal was found to have very little sediment. The bottom of the canal is almost entirely gravel and loose stones. Therefore, only four samples were taken in this area rather than six as planned.

All of the sediment and water samples were analyzed for the inorganic and organic constituents included in the routine analytical packages by the U.S. EPA contract laboratories. Water and sediment samples collected during this effort were analyzed by two laboratories: West Coast Technical Service in Cerritos, California 90701 for all organic analysis, and Chemtech Consulting Group, Ltd. in New York, New York 10014 for all inorganic analysis.

These samples were processed through the SMO under Case Number 1964. The summary of sample descriptions and traffic report numbers is presented on Table 1.

PERSONNEL

The sampling team included the following personnel from CH2M HILL:

John T. Fleissner, Project Engineer/GLO
Gerald L. Bills/GLO
Richard R. Onderko/GLO

SURFACE WATER SAMPLING PROCEDURE

FORD HYDRAULIC CANAL

The water sample from the Ford Hydraulic Canal was collected approximately midway between the highway bridge and the small concrete service bridge as shown in Figure 1. The sample was taken by wading into the canal approximately 8 feet from the south bank and filling the sample containers directly in the canal. This sample was designated GMR-101.

Table 1
COMPOUNDS TO BE DETERMINED IN FORD CANAL
FISH TISSUE SAMPLES
COLLECTED ON SEPTEMBER 14-15,1983 UNDER SAS 736E
CHEM-DYNE SITE
W65310.C0

Base Neutral Compounds

Fluoranthene
Naphthalene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Chrysene
Acenaphthylene
Anthracene
Benzo(g,h,i)perylene
Phenanthrene
Indeno(1,2,3-cd)pyrene
Pyrene
Bis(2-ethylhexyl) phthalate

Pesticides

Aldrin
Dieldrin
Chlordane
Endrin

Other

PCB's
C56

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Table 2
FISH CAUGHT IN THE DOWNSTREAM AREA OF THE FORD CANAL
AND SAVED FOR TISSUE ANALYSIS
ON SEPTEMBER 14, 1983
CHEM-DYNE SITE
W65310.CO

Sample Number	Species	Standard Length (cm)	Total Length (cm)	Weight (gm)
01	Northern Pike (*Esox lucius*)	57.0	65.0	¶1,000
02	Northern Pike (*Esox lucius*)	54.0	62.0	¶1,000
03	Large Mouth Bass (*Micropterus salmoides*)	30.0	34.0	680
04	Large Mouth Bass (*Micropterus salmoides*)	20.5	24.2	220
05	Large Mouth Bass (*Micropterus salmoides*)	17.8	22.0	155
06	Carp (*Cyprinus carpio*)	31.5	39.0	900
07	Carp (*Cyprinus carpio*)	30.5	38.0	680
08	Carp (*Cyprinus carpio*)	30.8	37.8	690
09	Carp (*Cyprinus carpio*)	29.5	35.0	585
10	Carp (*Cyprinus carpio*)	25.5	31.2	500
11	Gizzard Shad* (*Dorosoma cepedianum*)	19.0	22.5	120
12	Gizzard Shad* (*Dorosoma cepedianum*)	19.8	23.6	110
13	Gizzard Shad* (*Dorosoma cepedianum*)	20.2	24.6	160
14	Gizzard Shad* (*Dorosoma cepedianum*)	18.8	22.1	105
15	Gizzard Shad* (*Dorosoma cepedianum*)	20.2	24.4	155
16	Black Crappie (*Pomoxis nigromaculatus*)	21.5	27.5	325
17	Black Crappie (*Pomoxis nigromaculatus*)	18.7	23.6	210
18	White Crappie (*Pomoxis annuloris*)	18.2	24.0	230
19	White Crappie (*Pomoxis annuloris*)	15.2	19.3	100
20	White Crappie (*Pomoxis annuloris*)	13.5	17.1	75
21	Bluegill (*Lepomis macrochirus*)	14.0	17.4	110
22	Bluegill (*Lepomis macrochirus*)	13.2	16.4	90
23	White Bass (*Morone chrysops*)	20.0	26.1	250
24	White Bass (*Morone chrysops*)	18.7	23.8	200

*Whole fish submitted for analysis.

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1983. No effort was made to obtain quantitative data on fish present.

The general goal was to capture up to five individuals of the same species and the same general size as were captured in the downstream area.

Eleven individual fish representing three species were caught and saved for tissue analysis. Descriptions of the upstream fish are summarized in Table 3.

FISH SAMPLE SELECTION

Most of the fish collected in the downstream portion of the canal were saved and sent to the laboratory for analysis. Fish caught but not saved included 4 quillback carpsuckers, 4 gizzard shad, 1 white bass, and 12 panfish.

The nongame fish species selected was the gizzard shad because human consumption of shad is very unlikely. The carp are filleted and consumed by some local fishermen so the carp was included in the game species category.

A small number of upstream fish were selected for analysis to minimize the analytical work required. Therefore, only two carp and two shad were selected for analysis from the fish captured upstream. Carp and shad were selected because, of all the species identified, these two are expected to have the highest potential accumulation of contaminants and would serve as the most sensitive species to show the extent of background contamination.

Some upstream fish were caught which were not saved for analysis. These fish included four gizzard shad, one bluegill, one gillback carpsucker, two channel catfish, and three yellow bullheads. The catfish and bullheads were not saved because neither of these species was captured in the downstream area.

LABORATORIES

All selected fish tissues and whole fish were sent to Systems, Science, and Software (SSS), 2298 Carmel Mountain Road, San Diego, California 92121, on September 28, 1983 for analysis. The analytical work was arranged through the SMO and assigned number 736E. The fish tissue samples descriptions and tag numbers are summarized in Table 4.

Table 3
FISH CAUGHT IN THE UPSTREAM AREA OF FORD CANAL
AND SAVED FOR TISSUE ANALYSIS
ON SEPTEMBER 15, 1983
CHEM-DYNE SITE
W65310.CO

Sample Number	Species	Standard Length (cm)	Total Length (cm)	Weight (gm)
25	Carp (*Cyprinus carpio*)	55.0	45.5	¶1,000
26	Carp (*Cyprinus carpio*)	51.4	42.5	¶1,000
27	Carp (*Cyprinus carpio*)	52.0	43.0	¶1,000
28	Carp (*Cyprinus carpio*)	40.5	33.0	¶1,000
29	Gizzard Shad* (*Dorasoma cepedianum*)	24.0	20.0	180
30	Gizzard Shad* (*Dorasoma cepedianum*)	23.5	19.5	155
31	Gizzard Shad* (*Dorasoma cepedianum*)	21.8	18.5	150
32	Gizzard Shad* (*Dorasoma cepedianum*)	23.5	19.5	180
33	Gizzard Shad* (*Dorasoma cepedianum*)	27.0	22.5	260
34	Large Mouth Bass (*Micropterus salmoides*)	25.2	22.0	250
35	Large Mouth Bass (*Micropterus salmoides*)	23.0	19.5	210

* Whole fish saved for potential analysis.

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Table 4
SUMMARY OF FISH TISSUES SENT TO
SSS FOR ANALYSIS UNDER SAS736E
CHEM-DYNE SITE
W65310.C0

Sample Number	Fish Species	Sample Tag Number	SAS Sample Number
Downstream Sampling Area			
01	N. Pike	5-110380	736-E1
02	N. Pike	5-110381	736-E2
03	Lgm Bass	5-110382	736-E3
04	Lgm Bass	5-110383	736-E4
05	Lgm Bass	5-110384	736-E5
06	Carp	5-110385	736-E6
07	Carp	5-110386	736-E7
08	Carp	5-110387	736-E8
09	Carp	5-110388	736-E9
10	Carp	5-110389	736-E10
11	Gizzard Shad[a]	5-110390	736-E11
12	Gizzard Shad[a]	5-110391	736-E12
13	Gizzard Shad[a]	5-110392	736-E13
14	Gizzard Shad[a]	5-110393	736-E14
15	Gizzard Shad[a]	5-110394	736-E15
16	Black Crappie	5-110395	736-E16
17	Black Crappie	5-110396	736-E17
18	White Crappie	5-110397	736-E18
19	White Crappie	5-110398	736-E19
20	White Crappie	5-110399	736-E20
21	Common Bluegill	5-110400	736-E21
22	Common Bluegill	5-110401	736-E22
23	White Bass	5-110402	736-E23
24	White Bass	5-110403	736-E24
Upstream Control Sampling Area			
25	Carp	5-110404	736-E25
26	Carp	5-110405	736-E26
29	Gizzard Shad[a]	5-110406	736-E27
30	Gizzard Shad[a]	5-110407	736-E28

[a]Whole fish submitted for analysis. All other samples are fillets.

GLT432/86

FIELD DATA SUMMARIES

A summary of fish tissue analysis is presented in Table 5. Tentatively Identified Compounds detected in fish tissue samples are presented in Appendix B. These data are included without observation. Data evaluation will be performed after all data are available under Task 5, Site Investigation Analysis in the final work plan.

GLT460/27

Table 1
SUMMARY OF SURFACE WATER AND
SEDIMENT SAMPLES FOR TRAFFIC REPORT NUMBERS
Chem-Dyne Site
W65310.C0

Sample Designations	Traffic Report Number	
	Inorganic	Organic
Canal Sediment Samples		
FC-SED-1	MS-0221	S 2297
FC-SED-2	MS-0222	S 2298
FC-SED-3	MS-0223	S 2299
FC-SED-4	MS-0224	S 2300
FC-SED-5	--	--
FC-SED-6	--	--
FC-SED-7	MS-0227	S 2303
FC-SED-8	MS-0228	S 2304
FC-SED-9	MS-0229	S 2305
FC-SED-10	MS-0230	S 2306
FC-SED-99[a]	--	S 2313
Surface Water Samples		
GMR-001	MS-0231	S 2307
GMR-002	MS-0232	S 2308
GMR-003	MS-0233	S 2309
GMR-101	MS-0234	S 2310
GMR-501[b]	--	S 2311
GMR-502[c]	--	S 2312

[a]Sediment field blank of diatomacious earth
[b]Laboratory water blank
[c]Field blank

GLT460/23

GREAT MIAMI RIVER

Surface water was collected in the Great Miami River by simply filling the sample containers directly in the river. The sample locations were approximately the same used by Environment and Ecology, Inc., when they sampled the river in early 1981. These locations were:

- Mid-river north of the Ford Hydraulic Canal and approximately 200 feet downstream of the dam.
- Mid-river approximately midway between the Ford Canal and the highway bridge and downstream of the Hamilton Electric Plant cooling water discharge.
- Mid-river approximately 300 feet north of the highway bridge.

These locations are shown in Figure 1.

WATER SAMPLE HANDLING AND PRESERVATION

All water samples were collected on September 15 and shipped on the same day. None of the samples were filtered prior to preservation. Preservatives included nitric acid addition to a pH less than 2.0 for the metals and sodium hydroxide to a pH greater than 12 for the cyanide sample.

SEDIMENT SAMPLING PROCEDURE

SAMPLE LOCATIONS

Sediment sampling locations were selected based upon the locations of the site storm drain discharge points in the canal. These discharge points are shown in Figure 1. The Chem-Dyne site was drained by two separate storm drain systems. The west side of the site drained to a 36-inch line which flowed by gravity through a gate structure in the levee. This line discharged into the Ford Canal at a submerged point south of the east pier of the railroad bridge. Most of the onsite catch basins and drains to this system have been plugged.

The second storm drain system drains the area generally east of the Ford Tractor factory, including the Baylor Trucking building and south parking lot. Both the building and lot are known to have been used for drum storage during Chem-Dyne operations. This system drains by gravity in a 24-inch conduit to a small pump station at the south toe of the levee. The pump station discharges stormwater through two 8-inch lines to the south bank of the canal approximately 450 feet upstream of the hydroelectric spillway. All of the drains and catch basins to this system are active, although some catch basins are clogged with accumulated dirt.

The sediment sample locations were selected to include six points downstream of both discharge lines to investigate the potentially most contaminated area; two points downstream of the eastern discharge lines to investigate contamination in the potentially affected upstream area; and two points upstream of any site discharge to investigate background contamination from other sources. The locations of the sample points are shown in Figure 1.

Ford Canal Downstream of Hydroelectric Plant

The sediment sampling plan identified six locations for sediment samples. However, the canal bottom at these locations was mostly gravel and stones with little sediment. Repeated attempts to take sediment samples with the Eckman dredge failed because the jaws of the sampler frequently closed on stones and remained partially open. A sample was obtained at the No. 8 sampling location with the Eckman dredge used in shallow water within 3 to 4 feet of the shore.

The Eckman dredge was lost at the location for sediment sample number 6. A heavy pipe dredge was tried at this location but no sediment was recovered.

The sediment sampling plan was changed in the field because of the relatively clean gravel bottom discovered in the downstream portion of the canal. The revised plan was to obtain four sediment samples from near shore locations where the canal current was slow and some sediment deposits were seen. These revised sampling locations are shown in Figure 1.

Sediment samples at locations 7, 9 and 10 were obtained by wading into the canal, scooping sediment from the bottom with a stainless steel beaker, decanting free water, mixing the sediment by swirling the material in the beaker, and pouring the sediment directly into the sample jars. These three samples were taken within 2 feet of the shore.

Ford Canal Upstream of Hydroelectric Plant

Four sediment samples were taken from the Ford Canal upstream of the hydroelectric spillway on September 15, 1983. Sample locations were generally as described in the sampling plan and shown in Figure 1.

All upstream sediment samples were taken with a stainless steel beaker taped to a section of galvanized rod. All samples were scooped from water approximately 3 to 4 feet deep.

Water in the upstream portion of the canal moves more slowly than below the spillway and the bottom is mostly muck and weeds in the areas sampled.

SAMPLE HANDLING AND PRESERVATION

All sediment samples were held on ice before shipment. The downstream samples collected on September 14 were held in a cooler overnight. All sediment samples were shipped to the contract laboratories on September 15, 1983. No preservatives were added to the ice.

FIELD DATA SUMMARIES

The field data are presented on several tables which follow. These data are included without observations or evaluation. Data evaluation will be performed after all data are available under Task 5, Site Investigation Analysis in the final work plan.

The field data summaries include the following tables and figures:

- Figure 1 - Surface Water and Sediment Sampling Locations
- Table 2 - Summary of Organic Analysis of Canal Sediment and Surface Water
- Table 3 - Summary of Inorganic Analysis of Canal Sediment and Surface Water

GLT460/24

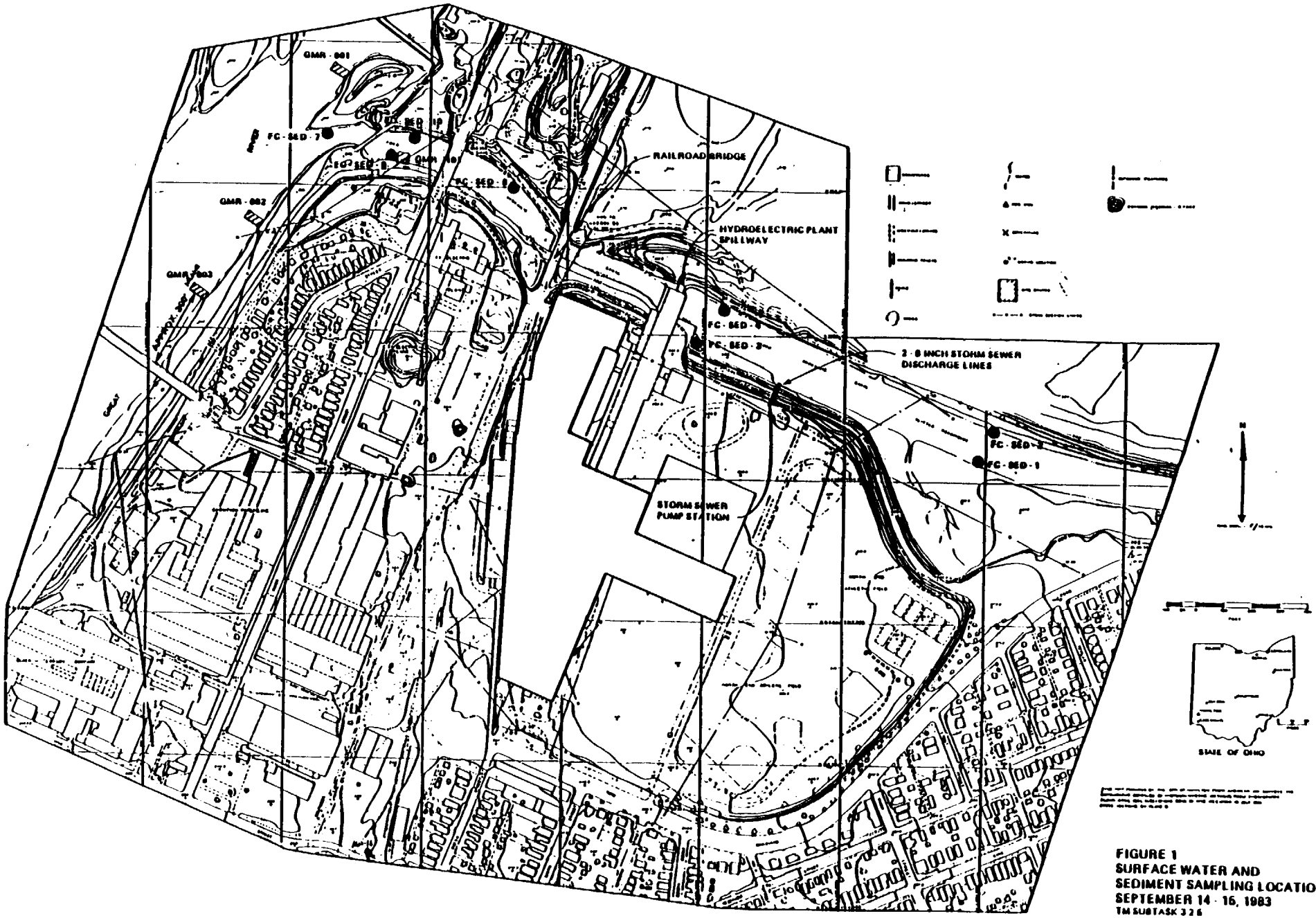

FIGURE 1
SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS
SEPTEMBER 14 - 16, 1983
TM SUBTASK 3 2 6

Table 2

SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS OF SEDIMENT AND WATER FROM THE FORD CANAL AND GREAT MIAMI RIVER (CASE NO. 1964 - SEPTEMBER 1983)

CHEM-DYNE RI REPORT (W65310.CO)

Constituent[a]	Ford Canal - Sediment Samples (ug/kg)									Great Miami River (ug/l)			Ford Canal Sample (ug/l)	Field Blanks (ug/l)	
	FC-SED-1	FC-SED-2	FC-SED-3	FC-SED-4	FC-SED-7	FC-SED-8	FC-SED-9	FC-SED-10	FC-SED-99[b]	GMR-001	GMR-002	GMR-003	GMR-101	GMR-501[c]	GMR-502[d]
Acid Compunds															
No priority pollutant acid compounds were identified.															
Base/Neutral Compounds															
Benzo(a)anthracene						260K									
Benzo(a)pyrene						260K									
3,4-benzo fluoranthene						410K									
Benzo(k)fluoranthene						410K									
Phenanthrene						250K									
Pyrene						600K									
Fluoranthene						580K									
Diethyl phthalate					260K										
Volatile Compounds															
1,1,1-trichloroethane											14	8K	40		
1,1-dichloroethene													5K		
Methylene chloride	69	46K	15K	35K		18K	27K	39K	38K	5K		5K	5K	5K	3,000
Pesticides															
No priority pollutant pesticides were identified.															
Nonpriority Pollutant Hazardous Substances															
Acetone								137K							

[a] NA denotes that the compound was not analyzed for in this sample. Only compounds identified in samples are listed. Compounds not identified in any sample are not listed.
[b] Sediment field blank of diatomacious earth.
[c] Laboratory water blank.
[d] Field blank.

GLT461/53

Table 3

SUMMARY OF INORGANIC PRIORITY POLLUTANT ANALYSES OF SEDIMENT AND WATER FROM THE FORD CANAL AND GREAT MIAMI RIVER (CASE NO. 1964 - SEPTEMBER 1983)

CHEM-DYNE RI REPORT

W65310.CO

Constitutent[a]	Ford Canal - Sediment Samples								Great Miami River-Surface Water Samples			Ford Canal Sample
	FC-SED-1	FC-SED-2	FC-SED-3	FC-SED-4	FC-SED-7	FC-SED-8	FC-SED-9	FC-SED 10	GMR-001	GMR-002	GMR-003	GMR-101
Aluminum	6050	6750	5300	6450	1430	2560	8350	2740	701	970	923	937
Chromium	32.5	26	33.0	29.4	6.4	8.6	36.5	7.6	< 10	12	13	< 10
Barium	89.5	63	60.5	66.5	11.0	124	89	29.2	114	111	132	114
Beryllium	0.6	0.4	0.25	0.25	< 0.25	< 0.25	0.45	< 0.25	< 5	< 5	12	< 5
Cadmium	1.6	1.4	1.6	1.6	0.22	0.22	1.6	0.23	1.6	1.5	1.4	1.2
Cobalt	4.0	3.2	3.0	3.2	< 2.5	< 2.5	4.9	< 2.5	< 50	< 50	< 50	< 50
Copper	31.6	25.6	28.1	29.4	7.8	12.1	36.5	8.8	< 50	62	52	< 50
Iron	12700	9000	8950	8300	3550	5250	13300	4340	859	1370	1370	1320
Lead	43.4	26.9	23.8	325	4.1	35.4	59.5	10.8	< 5	14	9	11
Nickel	20.8	16.2	20.8	18.8	4.8	7.7	23.2	6.4	< 40	44	< 40	< 40
Manganese	379	181	202	178	137	199	297	157	75	90	90	89
Zinc	201	172	177	176	25.5	46.4	185	35.4	119	95	100	82
Boron	< 5	5.2	5.6	6.7	5.2	6.0	5.4	6.2	134	212	238	223
Vanadium	11.8	13.6	10.5	12.1	< 10	7.3	16.9	< 10	< 200	< 200	< 200	< 200
Arsenic	2.3	2.1	1.7	1.7	0.5	1.7	3.6	1.1	< 10	< 10	10	< 10
Antimony	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 20	< 20	< 20	< 20
Selenium	0.2	0.15	0.45	0.1	0.15	0.3	0.15	< 0.1	< 2	< 2	< 2	< 2
Thallium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 10	< 10	< 10	< 10
Mercury	0.15	< 0.1	0.15	0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.2	< 0.2	0.2	0.2
Tin	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 20	< 20	< 20	< 20
Silver	< 0.5	0.55	0.55	0.55	< 0.5	2.1	0.65	< 0.5	< 10	< 10	< 10	< 10
Cyanide	Spot test negative for these samples											

GLT461/54

APPENDIX A

PHASE II HYDROGEOLOGICAL INVESTIGATION
SURFACE WATER AND SEDIMENT SAMPLING

PHOTOGRAPHIC LOG

PHOTO LOG
CHEM-DYNE SITE REMEDIAL INVESTIGATION SURFACE WATER
AND SEDIMENT SAMPLING, PHASE III, SUBTASK 3-2.5

All of the following photographs were taken on September 14, 1983, by John Fleissner. The camera used was a Ricoh AF-2 autofocus rangefinder. The film used was Ektachrome 64 daylight with an ASA rating of 64.

Photo 1: Near the mouth of Ford Canal viewing northwest toward Great Miami River dam. [9-14-83]

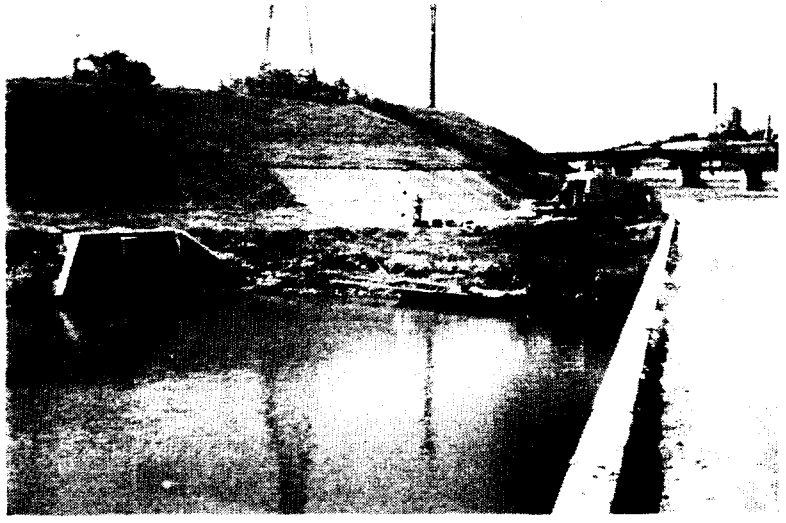

Photo 2: Viewing southwest showing fish shocking boat launch location. Ready Mix bridge across Ford Canal in lower right. [9-14-83]

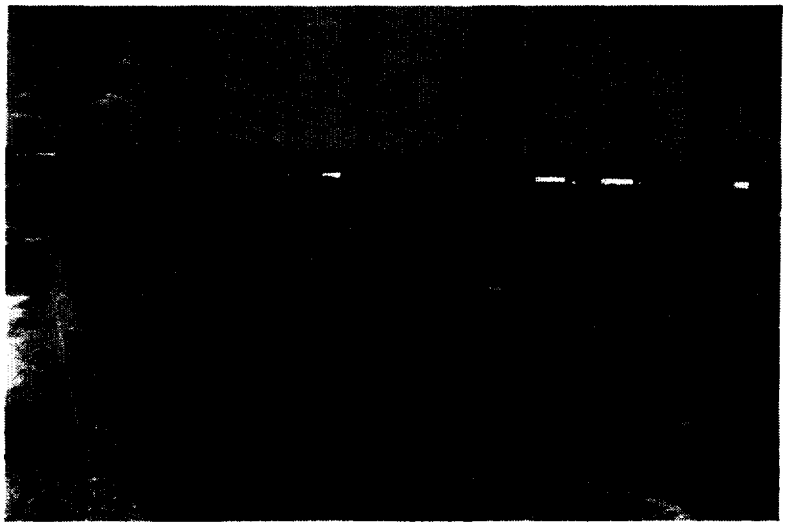

Photo 3: Viewing southwest and a pan to the right of Photo 2, showing confluence of Ford Hydraulic Canal and Great Miami River. [9-14-83]

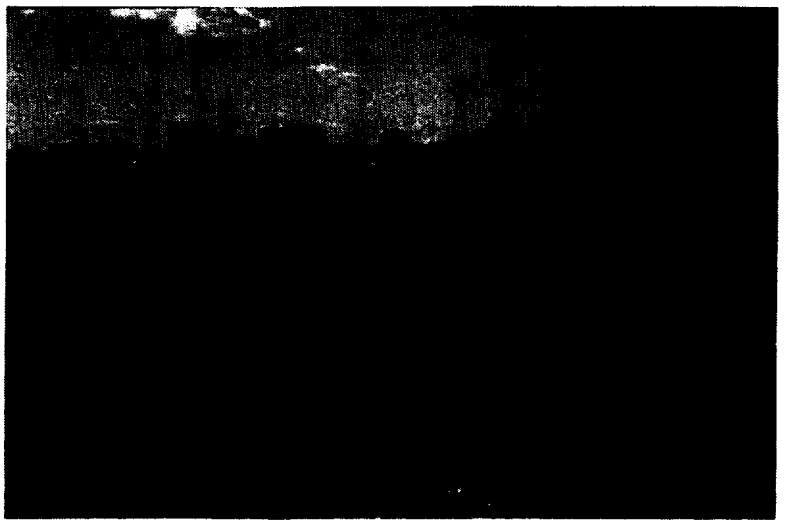

Photo 4: Viewing northwest showing the location of the sediment sample, FC-SED-7. [9-14-83]

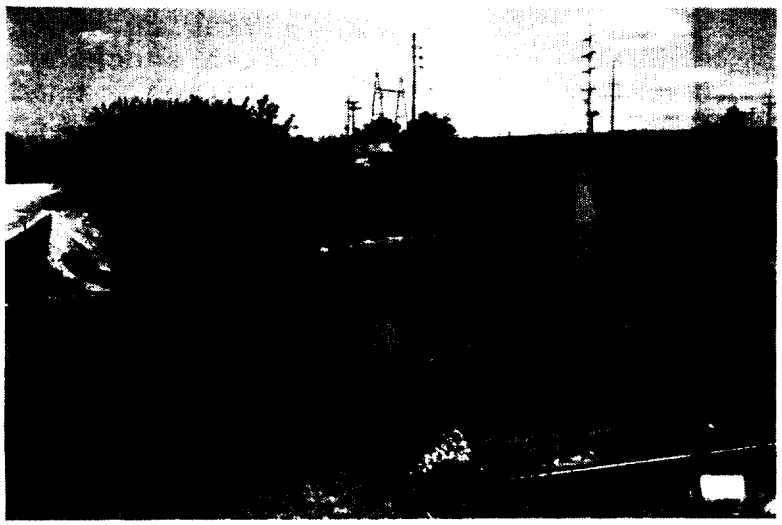

Photo 5: Viewing north or northeast showing the location of the sediment sample, FC-SED-10. [9-14-83]

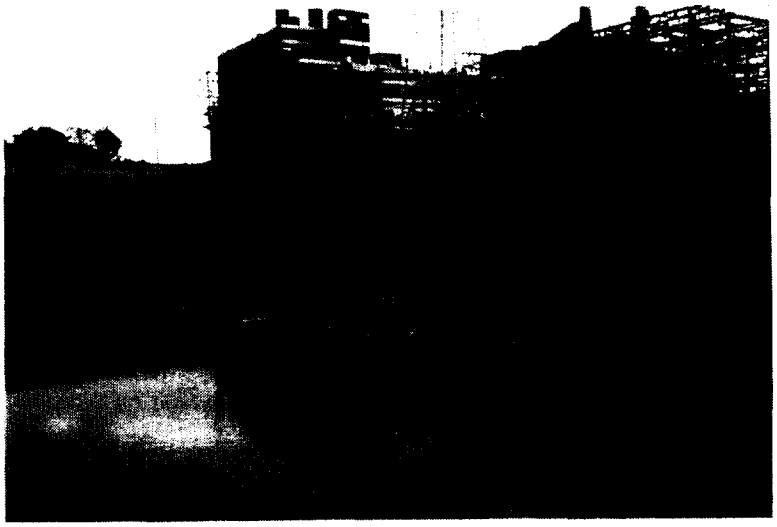

Photo 6: Viewing southeast showing the location of the sediment sample, FC-SED-9, and water sample GMR-001. [9-14-83]

Photo 7: Viewing west along the south bank of Ford Canal showing the location of the sediment sample, FC-SED-9, and water sample GMR-001. [9-14-83]

MEMORANDUM

TO: File

FROM: Gerald L. Bills/GLO
John T. Fleissner/GLO

DATE: November 16, 1983
(Revised December 9, 1983)

RE: Chem-Dyne Site Remedial Investigation
Fish Tissue Sampling
Phase II Subtask 3-2.5.

JOB NO.: W65310.C0

INTRODUCTION

According to a request from Don Bruce, U.S. EPA during a conference call on June 30, fish were sampled in the Ford Hydraulic Canal adjacent to the Chem-Dyne site on September 14-15, 1983. Fish were taken from two areas in the canal, upstream and downstream of the site as shown in Figure 1. Sampling was performed by personnel from CH2M HILL. This work was performed in partial satisfaction of Contract No. 68-10-6692, Work Assignment No. 21.5M10.0, Subtask 3-2.5.

The fish sampling work was not included in the original work assignment or the draft work plan submitted by CH2M HILL. This work was included as an addition to the work assignment and was included in the final work plan (July 1983) as Subtask 3-2.5.

This memorandum describes the fish sampling. In addition, water and sediment samples were taken from the Ford Canal as part of the same sampling effort conducted on September 14-15, 1983. The water and sediment sampling is discussed in a separate technical memorandum.

PURPOSE

The purpose of this sampling effort was to gather data to determine if fish in the waters adjacent to the Chem-Dyne site have bioaccumulated contaminants in concentrations that could pose hazards to human health through the ingestion of fish.

SCOPE

The planned scope of this sampling effort was to collect fish from the Ford Hydraulic Canal in the area above the confluence with Great Miami River and below the hydroelectric power station at the old Ford tractor factory. The goal was to capture 5 individuals of 5 species from this area for a total of 25 fish.

Additionally, as a result of discussions with Don Bruce in the field during sampling, fish were also collected from the head of the Ford Hydraulic Canal immediately downstream of the flow diversion structure on the Great Miami River.

All fish were captured by stunning the fish with a boom-type electroshocker and then netting the fish. The electroshocker was a Model VVP-15 manufactured by Coffelt Electronics Company, Incorporated. Fish shocking was performed using pulsed DC current at 200 to 225 VDC and 10 to 15 amps. The conductivity of the canal water was measured at approximately 800 mmho/cm immediately prior to shocking. Conductivity was acceptable for efficient shocking operations.

Captured fish were held on the boat in a cooler filled with canal water to keep them alive during sampling. The typical sampling run lasted about 60 minutes.

All fish captured were identified as to species, weighted, and measured. Game species were filleted. Nongame forage species were kept as whole fish. After processing, the fish were wrapped in aluminum foil, labeled, frozen with dry ice, and held for shipment to the laboratory for tissue analysis. Fish were maintained frozen with dry ice through the shipping date September 28, 1983.

PERSONNEL

The sampling team included personnel from CH2M HILL as follows:

Larry Holm, Project Manager/GLO
Gerald Bills, Project Biologist/GLO
John Fleissner, Project Engineer/GLO
Richard Onderko/GLO

Additional personnel from U.S. and Ohio EPA were also involved in the sampling effort. Mr. Don Bruce, U.S. EPA OSC, was onsite September 14, 1983 and suggested that we sample above the hydroelectric power station. Mr. David Strayer, Ohio EPA, was also onsite on September 14, 1983. He observed part of the sampling effort.

Table 5 (Page 1 of 2)
SUMMARY OF ORGANIC PRIORITY POLLUTANT[a] ANALYSIS OF FISH TISSUE FROM THE FORD CANAL (SAS CASE NO. 736E)
CHEM-DYNE (W65310.CO)

	Downstream Fish														
	Northern Pike		Largemouth Bass			Carp					Gizzard Shad				
Constituent[b,c]	736-E1	736-E2	736-E3	736-E4	736-E5	736-E6	736-E7	736-E8	736-E9	736-E10	736-E11	736-E12	736-E13	735-E14	736-E15
Acid Compounds, ug/kg															
Phenol												100K			
Base/Neutral Compounds, ug/kg															
Iosphorone											144	698	223	383	
Bis-(2-ethylhexyl) phthalate	607	135	268	719	100K	113	366		452	502	419	629	323	376	675
Di-n-butyl phthalate		277	542	5,040	547	363		204		633					
Diethyl phthalate								100K	100K				100K	214	
Pesticides, ug/kg															
PCB-1242	665	913	1,000	1,038	1,056	1,584	724	2,089	3,881	2,580	1,365	1,977	2,559	768	1,278
PCB-1254	661	636	1,099	1,120	571	1,249	420	1,129	3,703	1,235	464	1,638	310	355	539
Percent Lipid	0.9	1.1	3.6	3.6	3.0	7.0	1.7	4.8	13.2	9.6	4.0	4.2	7.1	3.4	11.7

[a] Fish tissue was not analyzed for volatile organic compounds.
[b] Only compounds identified in samples are listed. Compounds not identified in any sample are not listed.
[c] K denotes compound detected below quantitation limit (QL) were QL = 10 x detection limit.

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Table 5 (Page 2 of 2)

SUMMARY OF ORGANIC PRIORITY POLLUTANT[a] ANALYSIS OF FISH TISSUE FROM THE FORD CANAL (SAS CASE NO. 736E)

CHEM-DYNE (W65310.CO)

	Downstream Fish									Upstream Fish			
	Black Crappie		White Crappie			Bluegill		White Bass		Carp		Gizzard Shad	
Constituent[b,c]	736-E16	736-E17	736-E18	736-E19	736-E20	736-E21	736-E22	736-E23	736-E24	736-E25	736-E26	736-E27	736-E28
Acid Compounds, ug/kg													
Phenol													
Base/Neutral Compounds, ug/kg													
Isophorone	2,610	447	465	236	754	1,420	588			632	195	3,100	1,130
Bis-(2-ethylhexyl) phthalate	1,430	349	256	117	162	193	212	486	121	538	600	484	264
Di-n-butyl phthalate			322	424		507	620	1,010	578	255			
Diethyl phthalate	144	790											
Pesticides, ug/kg													
PCB-1242	180	885	893	594	827	849	516	500	635	358	1,936	2,153	909
PCB-1254		567	618	500		321			534	1,774	868	1,163	447
Percent Lipid	3.4	2.1	3.7	4.3	1.2	2.4	2.6	4.0	2.5	27.8	16.2	12.3	7.7

[a] Fish tissue was not analyzed for volatile organic compounds.

[b] Only compounds identified in samples are listed. Compounds not identified in any sample are not listed.

[c] K denotes compound detected below quantitation limit (QL) were QL = 10 x detection limit.

GLT461/42-2

APPENDIX A

PHASE II HYDROGEOLOGICAL INVESTIGATION
FISH TISSUE SAMPLING

PHOTOGRAPHIC LOG

PHOTO LOG
CHEM-DYNE SITE REMEDIAL INVESTIGATION FISH TISSUE
SAMPLING, PHASE III, SUBTASK 3-2.5

All of the following photographs were taken on September 14, 1983, by Larry A. Holm and John T. Fleissner. Cameras used were a Nikon FE with a data back and a Ricoh AF-2 autofocus rangefinder. Film used was Ektachrome 64 daylight with an ASA rating of 64.

Photo 1: At Ford Canal viewing west along south bank showing boat and shocking equipment preparation. [9-14-83]

Photo 2: Similar to Photo 1 from a higher point on the levee. [9-14-83]

Photo 3: Closeup of equipment connections on the boat. [9-14-83]

Photo 4: Similar to Photo 1. Observers shown are Dave Strayer/OEPA and Don Bruce/U.S. EPA, left to right. [9-14-83]

Photo 5: First fish shocking pass, moving upstream along the south canal bank. [9-14-83]

Photo 6: Same a Photo 5 with photo viewing east. [9-14-83]

Photo 7: Same as Photo 5 viewing south. Crew transferring fish caught in net into the onboard "live well." [9-14-83]

Photo 8: Same as Photo 5 viewing southwest. [9-14-83]

Photo 9: Same as Photo 5 viewing south. Field crew is Richard Onderko, John Fleissner, and Jerry Bills, all from CH2M HILL. (left to right) [9-14-83]

Photo 10: Closeup of field crew in action of netting a fish. [9-14-83]

Photo 11: Viewing west from north canal bank. Onderko removing fish from net. Bruce/U.S. EPA on the extreme right. [9-14-83]

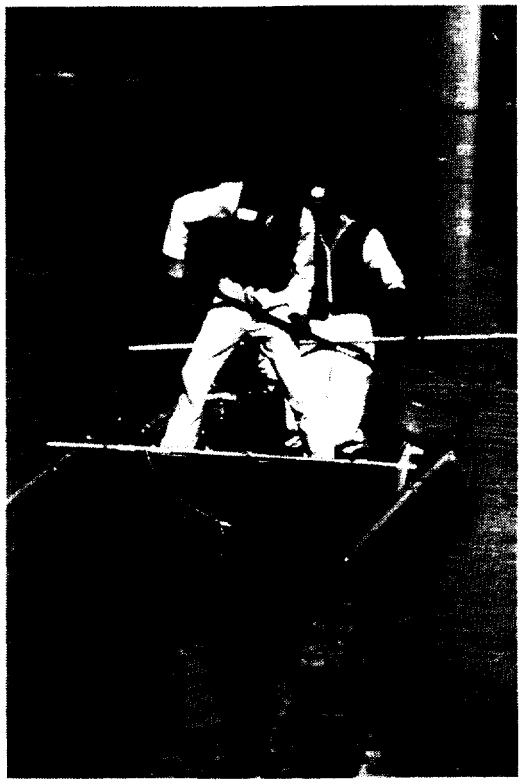

Photo 12: Similar to Photo 10. [9-14-83]

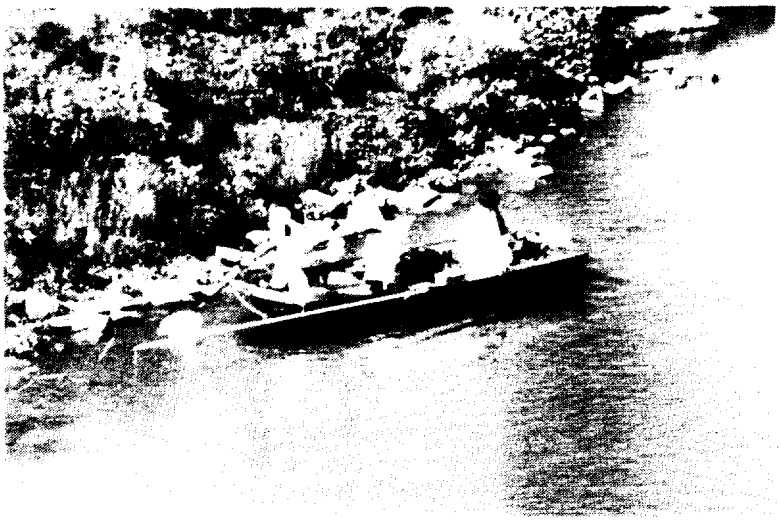

Photo 13: Crew moving downstream on the north canal bank, viewing north or northeast. [9-14-83]

Photo 14: Viewing wet from N&WRR bridge pier downstream to the Third Street bridge. [9-14-83]

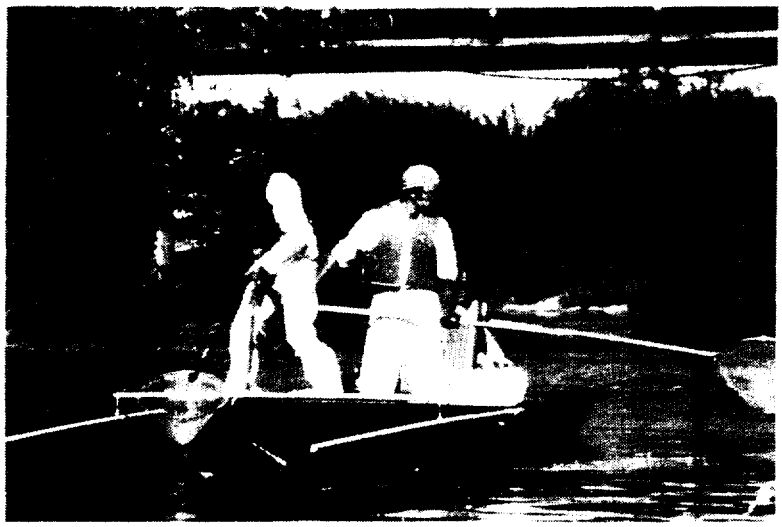

Photo 15: Similar to Photo 14 but closeup view. [9-14-83]

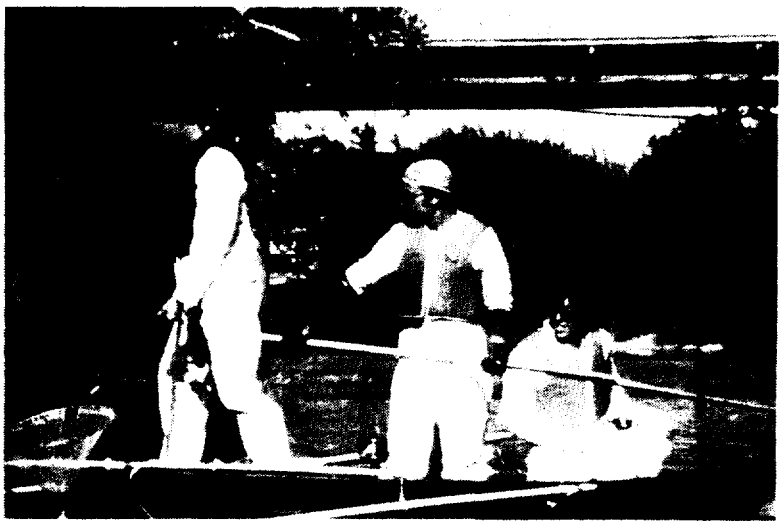

Photo 16: Similar to Photo 14 but closeup view. [9-14-83]

Photo 17: Viewing downward and southwest from the N&WRR bridge. [9-14-83]

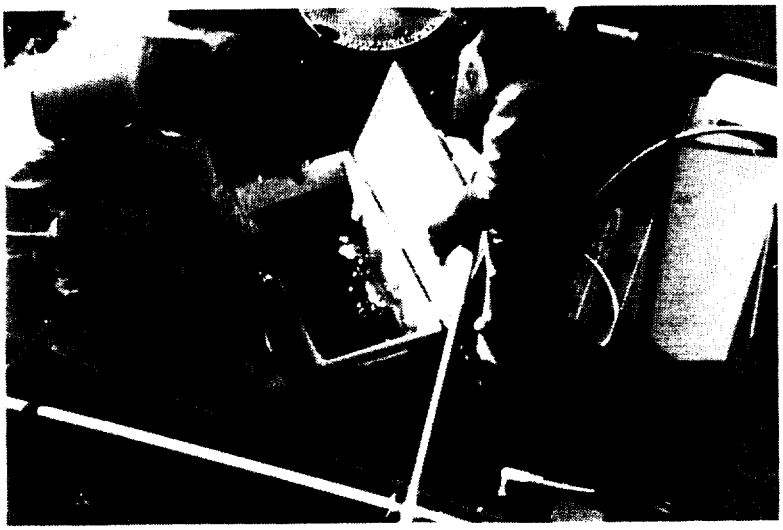

Photo 18: Photo from N&WRR bridge showing closeup of the "live well" on the boat. [9-14-83]

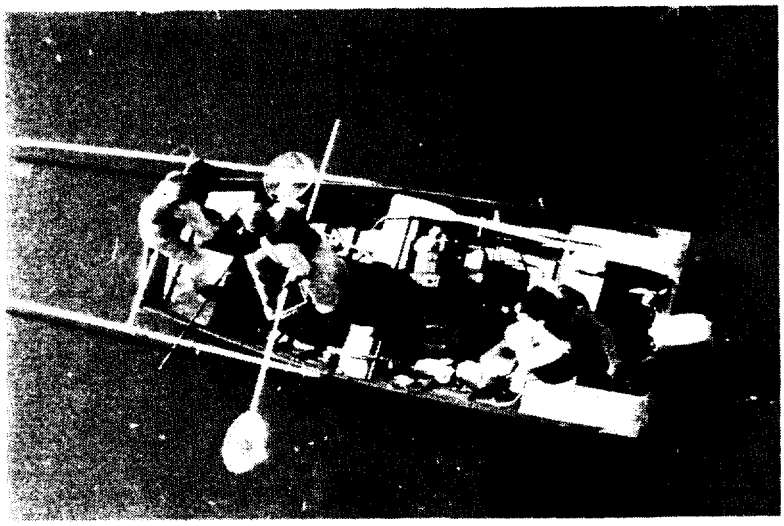

Photo 19: Similar to Photo 18 but wide angle view showing crew and shocking equipment layout on the boat. [9-14-83]

Photo 20: Wide angle viewing northwest showing the western portion of the downstream fishing area. [9-14-83]

Photo 21: Viewing west on top of south levee. Crew shown measuring and fileting fish samples. Onlooker is a private citizen who regularly takes game fish from the river and canal. [9-14-83]

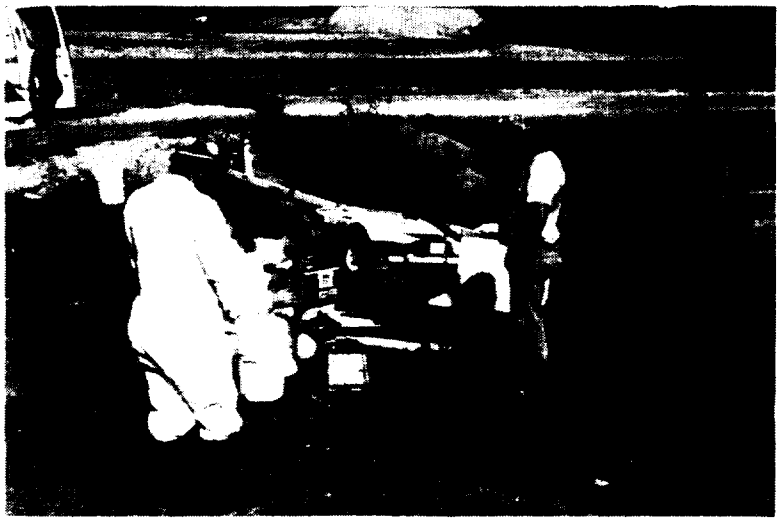

Photo 22: Similar to Photo 21. [9-14-83]

Photo 23: Similar to Photo 21. Fish being measured is one of the two northern pike caught downstream. [9-14-83]

Photo 24: Similar to Photo 21. Fileting by Bills and data recording by Onderko. [9-14-83]

Photo 25: Similar to Photo 1. Persons on levee are Larry Holm/CH2M HILL and a reporter from the local Hamilton newspaper. [9-14-83]

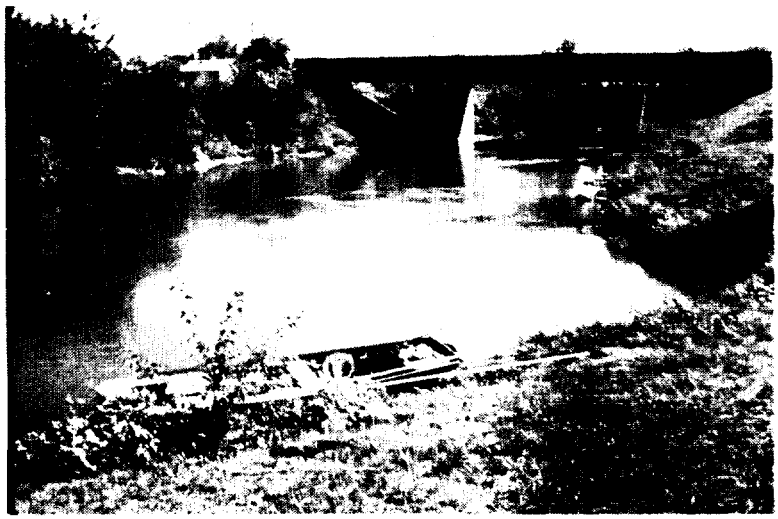

Photo 26: Viewing from the south canal bank levee upstream toward the Third Street bridge showing same canal area as Photo 20. [9-14-83]

APPENDIX B

TENTATIVELY IDENTIFIED COMPOUNDS

Table 4
SUMMARY OF TENTATIVELY IDENTIFIED COMPOUNDS IN FISH TISSUES FROM
SAMPLES TAKEN IN THE FORD CANAL CHEM-DYNE SITE

Sample Number	CAS Number	Compound Name	Percent Purity	Percent Fit	Estimated Concentration (ug/kg)
736-E01	120-29-7	1,3-propane dichlordiocthyl	844		3.25
736-E01	108-88-3	toluene	373		5
736-E01	57-10-3	hexadecanone		806	12
736-E01	105-57-7	1,1-diethoxyethane	962		42
736-E01	57-88-5	cholesterol	653		41
736-E02	3744-02-3	(Compound name unreadable on lab report copy)		999	4.6
736-E02	10570-40-8	4H,1,2,4triazole, 4 methyl		978	8.6
736-E02	155-57-7	(Compound name unreadable on lab report copy)		971	18
736-E02	129-60-4	acetic acid propylester		884	9.4
736-E02	57-88-5	cholesterol		984	19
736-E02	105-57-7	Ethane (CAN'T READ)		971	18
736-E02	129-60-4	Acetic acid propylester		884	9.4
736-E02	57-88-5	Cholesterol		984	19
736-E03	57-88-5	Cholesterol		976	31
736-E03	?	2-Pentanone, 4 hydroxy-4-methyl		972	3.8
736-E03	288-16-4	Thiazole		930	4.3
736-E03	123-51-3	3-methyl-butanol		773	28
736-E03	107-92-6	Butanoic acid		933	2.5

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Sample Number	CAS Number	Compound Name	Percent Purity	Percent Fit	Estimated Concentration (ug/kg)
736-E04	489-39-4	1H cyclopo azolenedecahydro...(As written on lab report)		900	52
736-E04	3744-02-3	3-pentenone 4-methyl		992	20
736-E04	?	2-pentanone 4-hydroxy 4-methyl		993	33
736-E04	111-46-6	2,2'-oxybisethanol		879	2.5
736-E04	38326-28-2	4H pyrido[1,2a]pyrimidin-4-on-6-ethyl, 2-methyl		718	4
736-E05	105-46-4	acetic acid-methyl propylester		995	7.0
736-E05	674-76-0	2-pentene-4-methyl		849	40
736-E05	3744-02-3	3-pentanone 4-methyl		992	52
736-E05	?	2-pentanone-4-hydroxyl 4-methyl		988	27
736-E05	57-88-5	Cholesterol		998	43
736-E06	57-88-5	Cholesterol		665	112
736-E06	34645-17-5	1,3 pentasterol,4-methyl acetate		583	13
736-E06	105-57-7	ethane diethoxy		971	25
736-E06	?	2-pentanone-4-hydroxy methyl		994	18
736-E06	760-32-7	(Compound name unreadable on lab copy)		851	15
736-E07	?	cyclopropane,1(2-methylene...(As written)		936	25
736-E07	105-46-4	acetic acid methyl propylester		998	45
736-E07	123-86-4	acetic acid butylester		993	33
736-E07	109-60-4	acetic acid methyl ethyl ester		904	53
736-E07	79-20-9	acetic acid methyl ester		909	80

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Sample Number	CAS Number	Compound Name	Percent Purity	Percent Fit	Estimated Concentration (ug/kg)
736-E08	816-79-5	ethyl pentene		906	3.8
736-E08	?	cyclopropane 1-2 methylene		928	24
736-E08	2814-79-1	ethyl silane		882	14
736-E08	55649-53-1	glycine-N-2 methyl-oxbisbutyl...(As written)		784	44
736-E08	105-57-7	ethane 1,1, diethoxy		972	30
736-E09	724-25-4	tetradecanol		990	25
736-E09	26248-42-0	tridecanol		975	20
736-E09	57-88-5	cholesterol		991	39
736-E09	?	2-pentanone-4-hydroxyl 4 methyl		98	27
736-E09	3744-02-3	4 methyl-3-pentanone		99	50
736-E10	26248-42-0	tridecanol		967	11
736-E10	56009-20-2	cyclohexane 1(1,5 dimethylhexyl...(As written)		956	13
736-E10	?	2-pentanone-4-hydroxy-4-methyl		995	24
736-E10	3744-02-3	4-methyl 3-pentanone		992	50
736-E10	?	cyclopropone 1(2-methylene)		931	50
736-E11	105-37-3	propanonic acid ethylester		992	11
736-E11	?	pentanone 4-hydroxy methyl		992	20
736-E11	3744-02-3	4-methyl pentanone		992	28
736-E11	105-57-7	1,1 diethoxyethane		977	27
736-E11	57-88-5	cholesterol		967	22

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Sample Number	CAS Number	Compound Name	Percent Purity	Percent Fit	Estimated Concentration (ug/kg)
736-E12	56009-20-2	cyclohexane 1(1-5 dimethylhex...(As written)		762	17
736-E12	13567-54-9	1H,3A,7 Methanoazulene octohydro		841	41
736-E12	13567-54-9	1H3A,7 Methanoazulene octohydro		943	31
736-E12	57-88-5	cholesterol		988	11
736-E12	105-57-7	1,1 diethoxy ethane		970	27
736-E13	105-57-7	1,1 diethoxy ethane		967	41
736-E13	79-20-9	acetic acid methylester		906	48
736-E13	57-88-5	cholesterol		989	32
736-E13	57-10-3	hexadecanoic acid		984	36
736-E13	112-80-1	9-octadecanoic acid		966	18
736-E14	57-10-3	hexadecanoic acid		989	46
736-E14	60-33-3	octadecandieroic acid		961	18
736-E14	13567-54-9	1H-3A-7 Methanoazulene octahydro...		927	51
736-E14	57-88-5	cholesterol		965	38
736-E15	56009-20-2	cyclopropane 1-(2-methylene...(As written)		960	22
736-E15	56004-20-2	cyclopropane,1-(2-methylene-3...(As written)		935	12
736-E15	57-10-3	hexadecanoic acid		980	17
736-E15	123-86-4	acetic acid butyl ester		943	29
736-E15	123-86-4	acetic acid butyl ester		993	50
736-E15	109-60-4	acetic acid methyl ester		913	53

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Sample Number	CAS Number	Compound Name	Percent Purity	Percent Fit	Estimated Concentration (ug/kg)
736-E16	57-10-3	hexadececanoic acid		989	8.8
736-E16	690-08-4	4,4 dimethyl-2-pentone		936	15
736-E16	105-37-3	propanoic acid ethyl ester		968	15
736-E16	105-57-7	1,1 diethoxy ethane		950	28
736-E16	57-88-5	cholesterol		990	30
736-E17	?	4 hydroxy-4-methylpentanone		987	44
736-E17	590-35-2	2,3 dimethyl pentanone		864	47
736-E17	123-86-4	acetic acid butyl ester		991	84
736-E17	109-60-4	acetic acid methyl ethyl ester		951	97
736-E17	489-39-4	1H cycloprop(e)azulene, hexahydro...(As written)		913	19
736-E18	123-86-4	acetic acid butyl ester		747	12
736-E18	57-88-5	cholesterol		763	7.5
736-E18	123-86-4	acetic acid butyl ester		991	20
736-E18	71-36-3	1-butanone		984	12
736-E18	868-57-5	2-butanone-3-methoxyl methyl		931	27
736-E19	71-26-3	1-butanone		986	75
736-E19	868-57-5	butanone-3-methoxy-3-methyl		948	35
736-E19	56009-20-2	cyclopropane,1-t2-methylene-3		914	20
736-E19	123-86-4	acetic acid butyl ester		981	75
736-E20	191-43-5	2 amino ethanol	648		95

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Sample Number	CAS Number	Compound Name	Percent Purity	Percent Fit	Estimated Concentration (ug/kg)
736-E20	123-86-4	acetic acid butyl ester	957		68
736-E20	123-86-4	acetic acid butyl ester	924		35
736-E20	71-36-3	1-butanol	970		45
736-E20	57-88-5	cholesterol	657		22
736-E21	123-86-4	acetic acid butyl ester	927		3.5
736-E21	?	hydroxy methyl pentanone	975		35
736-E21	57-88-5	cholesterol	654		32
736-E21	123-86-4	acetic acid butyl ester	974		80
736-E21	109-60-4	acetic acid propyl ester	850		83
736-E22	141-78-6	acetic acid ethyl ester	985		20
736-E22	57-88-5	cholesterol	656		22
736-E22	?	hydroxyl methyl pentanone	981		7.5
736-E22	556-52-5	oxide methanol (Partially readable on lab copy)	665		7.5
736-E22	109-60-4	acetic acid propyl ester	955		37
736-E23	109-60-4	acetic acid propyl ester	901		87
736-E23	125-83-4	acetic acid butyl ester	970		67
736-E23	123-83-4	acetic acid butyl ester	847		57
736-E23	57-88-5	cholesterol	650		37
736-E23	?	hydroxy methyl pentanone	974		47
736-E24	3744-02-3	3-penten-2-one, 4-methyl	900		9.8

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Sample Number	CAS Number	Compound Name	Percent Purity	Percent Fit	Estimated Concentration (ug/kg)
736-E24	57-88-5	cholesterol	633		32
736-E24	?	hydroxymethyl pentanone	969		32
736-E24	123-86-4	acetic acid butyl ester	971		47
736-E24	109-60-4	acetic acid propyl ester	970		53
736-E25	105-37-3	ethylester-propanoic acid	972		3.6
736-E25	16329-98-0	1,3 cyclopentanediol	608		32
736-E25	630-07-9	pentatriacontane (Partially readable)	761		16
736-E25	56554-96-2	2-octadecenal	667		15
736-E25	57-88-5	cholesterol	667		8.8
736-E26	105-37-3	propanonic acid ethyl ester	932		52
736-E26	763-93-9	3-hexen-2-one	930		40
736-E26	36653-82-4	hexadecanol	750		29
736-E26	123-86-4	acetic acid butyl ester	942		37
736-E26	615-29-2	methyl hexanol	614		26
736-E27	105-37-3	propanoic acid ethyl ester	456		53
736-E27	763-93-9	3-hexen-2-one	944		57
736-E27	57-10-3	hexadecanoic acid	695		47
736-E27	765-27-5	eicosyne	569		50
736-E27	126-30-7	dimethyl propane diol	695		52
736-E28	56846-98-1	6,9 octadecadiynoic acid methyl...(As written)	412		13

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Sample Number	CAS Number	Compound Name	Percent Purity	Percent Fit	Estimated Concentration (ug/kg)
736-E28	6079-19-2	cholestane 4,5 epoxy (4 alph 5)	378		16
736-E28	123-86-4	acetic acid butyl ester	954		41
736-E28	105-37-3	propanoic acid ethyl ester	889		53
736-E28	57-88-4	cholesterol	692		15

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GENERAL FISH SAMPLING PROCEDURE

SITE SELECTION

Areas downstream and upstream from the site were sampled (Figure 1). The downstream area was selected because it was immediately downstream from the Chem-Dyne site. This area has received most of the drainage from the site. Fish found in this area could travel freely between the hydroelectric power station and the Great Miami River. However, fish in the area could not travel either upstream past the hydroelectric power station because of the spillway or upstream in the Great Miami River because of a dam.

The upstream area was selected after discussions in the field with Don Bruce. Fish from this area serve as control or background samples. Fish from the background area have probably not travelled within the area subject to runoff from the Chem-Dyne site. The upstream area was selected to be as remote as possible from potential runoff contamination in the canal.

All selected fish tissues will be analyzed for the parameters listed in Table 1. These compounds were selected because they were found in a canal sediment sample taken in April 1983, and are known to bioaccumulate in fish tissues. The tissues will be analyzed through the Sample Management Office (SMO) under Special Analytical Services (SAS) request 736E. The laboratory selected for the tissue analysis was Systems, Science, and Software (SSS), 2298 Carmel Mountain Rd, San Diego, California 92121.

FISH SAMPLING

SAS #736E

Downstream Area

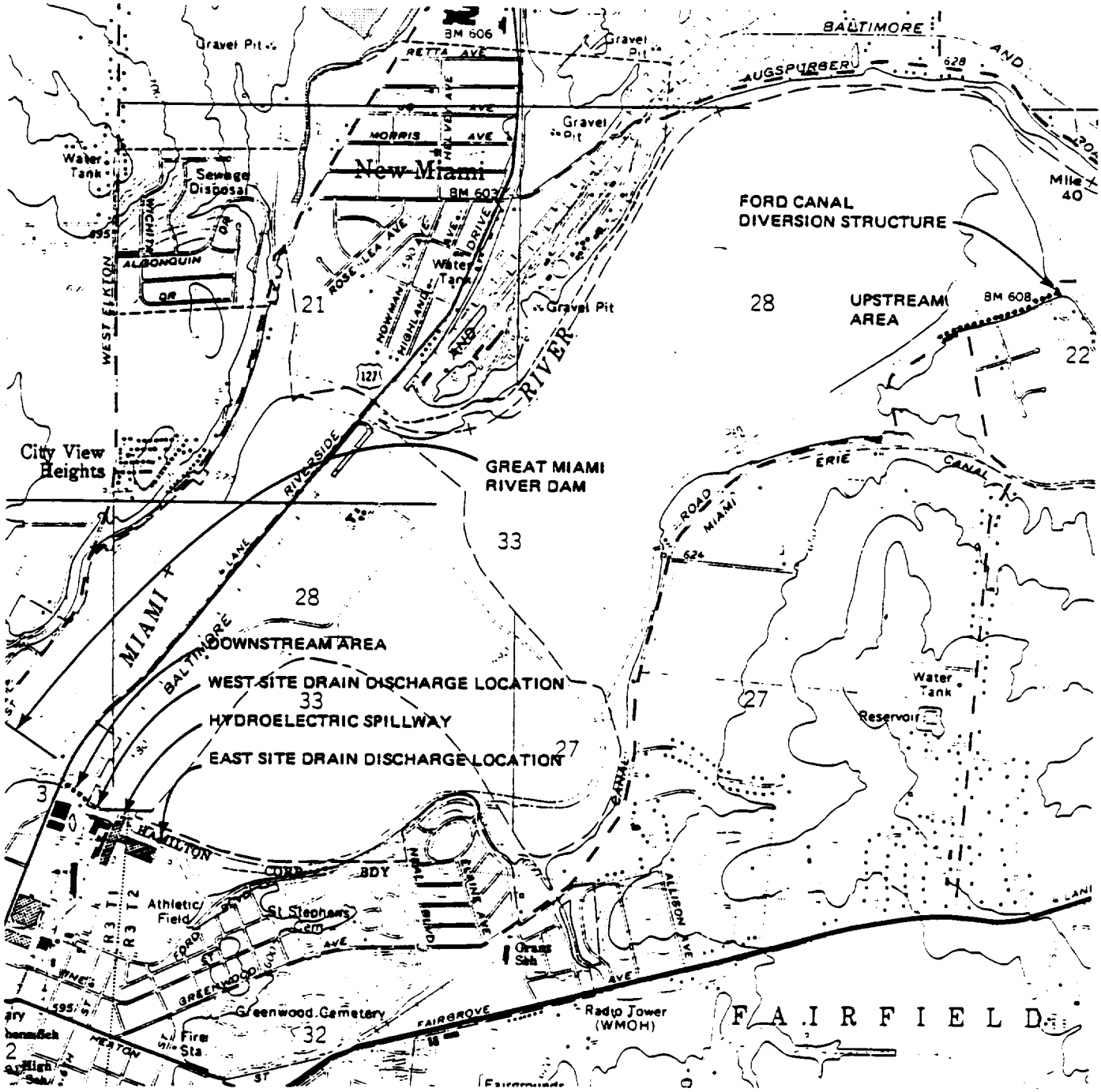
Fish were captured using the electroshocking equipment for approximately 1 hour in the downstream area on September 14, 1983. No effort was made to obtain quantitative data on the fish present.

The planned goal was to capture five individuals from five different species. One species was to be a forage species and four species were to be game fish. An effort was made to capture fish within species that were generally the same length.

During actual sampling, 24 individual fish representing 8 species were caught and saved for tissue analysis. Descriptions of these fish are summarized in Table 2.

Upstream Area

Fish were captured using the electroshocking equipment for approximately 1 hour in the upstream area on September 15,



SOURCE: USGS Hamilton, Ohio, 1974.

0 2000 4000

SCALE IN FEET

FIGURE 1
AREAS SAMPLED FOR
FISH NEAR CHEM - DYNI
TM TASK 3-1