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AERIAL PHOTOGRAPHIC ANALYSIS OF
HAZARDOUS WASTE DISPOSAL AREAS

Wisconsin

by

S. H. Page
Environmental Programs
Lockheed Engineering and Management Services Company, Inc.
Las Vegas, Nevada 89114

*Freeman
Chemical*

Contract No. 68-03-3049

Project Officer

G. A. Shelton
Advanced Monitoring Systems Division
Environmental Monitoring Systems Laboratory
Las Vegas, Nevada 89114

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
LAS VEGAS, NEVADA 89114

NO BRICKS - SER

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ABSTRACT

An aerial photographic analysis of three hazardous waste sites in Wisconsin was performed for the Environmental Protection Agency by its Environmental Monitoring Systems Laboratory in Las Vegas. The analysis was prepared at the request of the Agency's Region 5 Air and Hazardous Materials Division and Office of Emergency and Remedial Response in Washington, D.C.

All three sites were studied using both historical and recently acquired aerial photography. One site involved problems associated with polychlorinated biphenyl deposition in river harbor sediments. Another site involved a contaminated aquifer that was used for a town drinking water supply. The third site involved uncontrolled industrial dumping at an abandoned farm site that has been suspected as a potential groundwater contamination source.

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INTRODUCTION

It is estimated that between 30 and 40 million metric tons of hazardous wastes were generated in the United States in 1980. This corresponds to between 66 and 88 billion pounds, or 300 to 400 pounds of waste per person.¹ By the year 2000, annual hazardous wastes generation may double. Disposal of this tremendous quantity of waste is a matter of great public concern, especially when negligent dumping practices lead to contamination damaging environment and threatening human health.

The Environmental Protection Agency has initiated a major effort to identify and clean up uncontrolled and abandoned disposal sites that are hazardous to the surrounding environment. This effort includes investigation and monitoring of potentially hazardous uncontrolled sites throughout the nation. Recent legislation entitled "Comprehensive Environmental Response, Compensation, and Liability Act of 1980", or Superfund, has given increased emphasis to Agency activities.

Implementation and enforcement of Superfund and other environmental protection legislation require reliable and cost-effective monitoring tools. The Agency's Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, is taking part in an Agency-wide effort to identify hazardous waste sites and to

¹Research Summary-Controlling Hazardous Wastes (Cincinnati: Center for Environmental Research Information, U.S. Environmental Protection Agency, 1980), p. 1.

investigate those with high potential for release of hazardous materials into the environment. Central to this effort is the acquisition and analysis of historical (archived) and current aerial photography. This report provides an aerial photographic assessment of three Wisconsin hazardous waste disposal areas submitted for study (Figure 1) by the Air and Hazardous Materials Division, Environmental Protection Agency, Region 5, and the Office of Emergency and Remedial Response in Washington, D.C.

FIGURE 1

WISCONSIN HAZARDOUS WASTE DISPOSAL AREAS



METHODOLOGY

HISTORICAL AERIAL PHOTOGRAPHY

In order to develop a record of historical activity and physical changes occurring at the three hazardous waste sites in Wisconsin, archival aerial photography was required. In all cases, available photography was panchromatic (black and white) and relatively small scale (1:15,000 to 1:40,000). While these characteristics are not always ideal for photo interpretation of hazardous waste sites, such historical coverage dating from the mid-1930's is easily obtainable from various federal and state agencies.

CURRENT AERIAL PHOTOGRAPHY

New aerial photography was acquired to provide sufficient area coverage to cover each site in one aircraft pass but at a scale with sufficient photographic detail to enable accurate and useful information to be extracted from the photography. Color positive film (Type 2448) was selected for recent coverage due to its sensitivity to minor color variations of both land and water resources and its rendition of ground features in familiar, natural tones. Table 1 provides specifications of both current and historical photography stereoscopically examined for this report.

TABLE 1. HISTORICAL AND CURRENT PHOTOGRAPHY SPECIFICATIONS

Site	Figure	Acquisition Date	Nominal Scale	Data Type	Image Quality & Utility	Source
Hagen's Farm						
(42°54.4'N, 89°11.0'W)	3	7/21/40	1:20,000	BW neg trans	3	NARS
	4	9/11/55	1:20,000*	BW neg trans	2	ASCS
	5	5/21/68	1:20,000	BW neg trans	2	ASCS
	6	9/10/81	1:6,000	Color pos trans	1	EPA
Freeman Chemical Co.						
(43°15.7'N, 87°56.8'W)	8	10/03/50	1:20,000	BW neg trans	2	ASCS
	9	6/04/64	1:20,000	BW neg trans	2	ASCS
	10	8/25/71	1:40,000*	BW neg trans	3	ASCS
	11-14	12/10/81	1:6,000†	Color pos trans	1	EPA
Sheboygan River and Harbor (43°44'N, 87°41'W)						
	16,17	10/18/50	1:20,000	BW neg trans	2	ASCS
	18,19	9/26 &				
		11/02/61	1:20,000	BW neg trans	2	ASCS
	20	10/24/74	1:38,000	BW neg trans	3	ASCS
	21,23	12/06/81	1:12,000	Color pos trans	1	EPA

*Enlarged print only

†Contact and enlarged prints presented in report.

Data Type: BW - Black and white

neg trans - negative film transparency

pos trans - positive film transparency

Image Quality and Utility: 1-Excellent, 2-Good, 3-Fair.

Source: ASCS - U.S. Agricultural Stabilization and Conservation Service, Salt Lake City, Utah.

EPA - U.S. Environmental Protection Agency, Las Vegas, Nevada.

AERIAL PHOTOGRAPHIC ANALYSIS

Photo analysis of color positive transparencies was carried out on a light table equipped with a Bausch and Lomb zoom stereoscope. This instrument has a continuously variable magnification capability to allow the image analyst to view the photography at the best possible magnification for observing image detail. Black and white film negatives were printed (either contact or enlarged) and prints examined with a pocket lens stereoscope and on a scanning mirror stereoscope. The use of forward overlapping stereo photography is valuable for site analysis because of the added dimension of verticality (height) and relief not available in ordinary monoscopic (direct visual) examination.

In addition to stereoscopically distinguishing and identifying various shapes, tones, textures, and colors which lead to the interpretation of ground activity, the objectives of aerial photographic analysis in this study involved the following:

- 1) An initial documentation of on-the-ground conditions without reference to, or bias from, background information. This step involved a straightforward, reconnaissance "reading" of the film data. Information thus derived is synoptic, single source, and provides a unique view of the problem.
- 2) Uncovering new information. Previously unsuspected information may be derived from the photography. Such information may alter or enhance remedial strategies, expanding the scope of study of the problem.
- 3) Highlighting important spatial relationships. The environmental pathways between a hazardous waste disposal area and adjacent resources such as surface waters, crops, vegetation, residences, and other environmentally sensitive areas can be assessed. Potential threats to public health as a function of residential proximity to a site may be gauged.
- 4) Developing the site's operational and physical history. In addition to providing a clear indication of a site's activity through time (disposal

practices, types of waste, and expansion areas), historical photographs can remove the "disguise" of current land use and uncover the source of environmental problems.

For accurately locating and transferring details from one photographic image to another a zoom stereo-transfer scope was used. This instrument enables graphical data transfer between two photographs of different scales and/or dates. This capability is valuable in precisely relocating removed or covered hazardous waste site features on recent aerial photography. Conversely, this instrument may also be used to establish the future position of development activities on older photographs which record original conditions that were present in the area.

BACKGROUND INFORMATION

Valuable and detailed information on many of the sites was provided by the Remedial Response Branch of the Surveillance and Analysis Division, U.S. EPA Region 5, Chicago, Illinois, and the Wisconsin Department of Natural Resources - Bureau of Solid Waste Management, Madison, Wisconsin. This information consisted of site investigation reports, field sketches, interoffice memoranda, and other on-file data that had been developed on the sites. Soil data, where available, was obtained from district field offices of the U.S. Soil Conservation Service.

FREEMAN CHEMICAL COMPANY STUDY AREA

SUMMARY

Located in the southwest limits of the Village of Saukville (Figure 7), the Freeman Chemical Company and the Northern Signal Company (moved in 1971) began their operations during the early 1950's.

As a manufacturer of resin and varnish, Freeman Chemical has had problems in the past with disposing of their wastes. During the early 1950's, it was suggested by the State of Wisconsin Board of Health to dispose of untreated reactor distillate rejects from the plants resin and varnish manufacturing to the ground for soil absorption in the vicinity of the plant. Approximately 25 gallons per day for an unknown period of time was allegedly disposed of in this manner. This waste was highly acidic and contained an appreciable amount of suspended oil. A seepage pit located on the plant property may have been used for this disposal technique (this pit has since been covered). This process, however, was stopped during the 1960's, when the company hired a private contractor to haul and dispose of their by-products. Several incinerators were eventually installed by the plant to help in the disposal of their wastes. An offsite incinerator located directly southwest from the plant was constructed (date of initial operation in unknown) and used until approximately 1972 when it was ultimately shut down by the company. The plant still operates a liquid and solid incinerator onsite.

The Northern Signal Company (presently Laubenstein Roofing Company) was a manufacturer of electronic fence chargers. The company operated at this site until 1971 when the operation was moved to Rochester, Minnesota. Minimal quantities of wastes were allegedly produced by the company in their manufacturing process during their peak period of operation. Waste material that was produced was allegedly disposed of onsite or incinerated. (The preceding site history was excerpted from a preliminary hydrogeological study performed for EPA, see bibliographic reference 4.

Chemical analysis by EPA of water samples collected from wells surrounding Freeman Chemical Company indicated the presence of benzene, trichloroethylene, toluene, xylene and other organic chemical compounds. The site has also been implicated in violation of hazardous waste regulations adopted under Subtitle C of the Resource Conservation and Recovery Act (RCRA). A Determination of Substantial Hazard due to contaminated water wells involving the site has also been made by EPA.

Aerial photography analyses covered a 31-year period and included the years 1950, 1964, 1971, and 1981. Analysis focused on locating and identifying possible sources of contamination to the aquifer that supplies drinking water to the town of Saukville. Specifically, the photography was examined for such sources as: direct dumping on the ground near or within the Freeman facility, disposal into gravel pits or municipal dumps, disposal into the river, incinerator disposal with attendant contamination, and burial.

Northern Signal Company preceded Freeman Chemical Company in the study area. By 1950, Northern Signal's buildings were present west of the Freeman plant site, across the Chicago-Milwaukee and St. Paul Railroad tracks. Freeman was under construction and only a single building had been erected. Gravel pits southeast of the study area were the only possible areas of

waste disposal noted in the photography. By 1964, a gravel pit near the town cemetery and three new areas of surface disturbance were found. The Freeman facility had expanded substantially to include a processing area, tank farm, storage buildings, and a parking area. At Northern Signal, a series of vertical and horizontal storage tanks suggested the presence of large quantities of potentially hazardous substances. A lack of adequate secondary containment around some tanks indicated a possible pollution source. By 1971 a number of new potential contamination sources was noted, including two pits, a solid waste disposal area, and a fifth surface disturbance area. Additionally, the Freeman facility had again expanded over its 1964 size.

By 1981, an old seepage pit was located on Freeman plant property. This pit, suspected to have been used for direct ground disposal of wastes from plant operations, was developed sometime between 1971 and 1981.

OCTOBER 3, 1950, EARLY STUDY AREA CONDITIONS

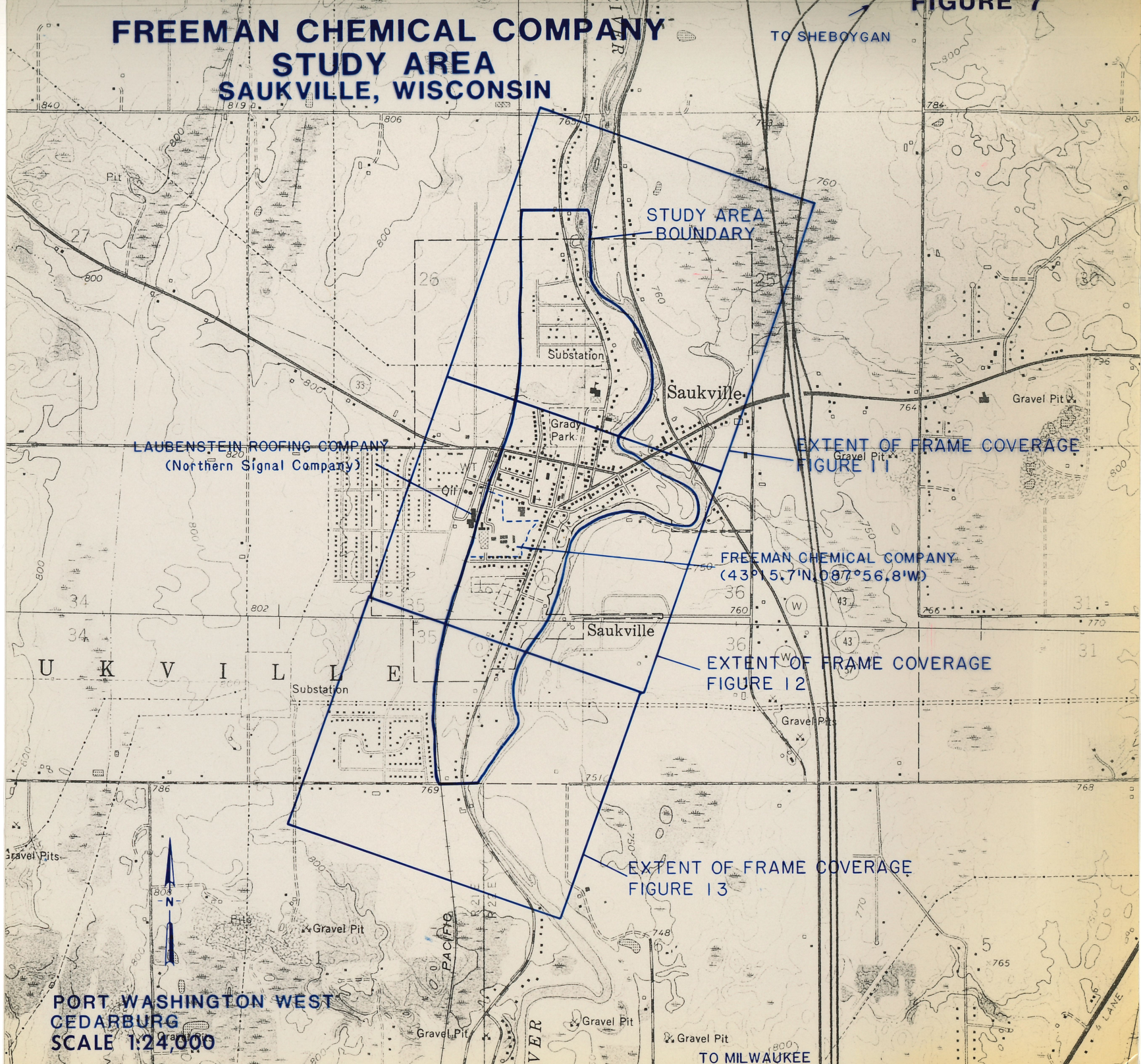
Only a single building had been erected at the Freeman Chemical Company site by late 1950 (Figure 8). (The structure, with the lettered name SAUKVILLE painted on a south facing roof slope, is also present in the 1981 photography, Figure 14.) The remainder of the site is occupied by agricultural land.

Northern Signal Company, located immediately west of this building across a rail line, was fully built by this date. Located west of the main plant buildings is a large cleared area. Within this area are a variety of unidentified materials and objects. The possibility of waste disposal in this area exists, but the nature of such potential disposal remains unclear. Southwest of this cleared area is another plant building.

In addition to potential waste disposal activities associated with Northern Signal Company, a number of gravel pits were also in existence in 1950. A small pit is located south of Northern Signal, just east of the rail line. A series of larger pits are found in the photography on the east side of the Milwaukee River. Although no direct evidence of dumping into these gravel pits is noted, the possibility for such dumping may exist.

FREEMAN CHEMICAL COMPANY STUDY AREA SAUKVILLE, WISCONSIN

FIGURE 7



LAUBENSTEIN ROOFING COMPANY
(Northern Signal Company)

STUDY AREA
BOUNDARY

EXTENT OF FRAME COVERAGE
FIGURE 11

FREEMAN CHEMICAL COMPANY
($43^{\circ}15.7'N, 097^{\circ}56.8'W$)

EXTENT OF FRAME COVERAGE
FIGURE 12

EXTENT OF FRAME COVERAGE
FIGURE 13

PORT WASHINGTON WEST
CEDARBURG
SCALE 1:24,000

TO MILWAUKEE

XFIGURE-81

FREEMAN CHEMICAL COMPANY STUDY AREA

10-3-50

STUDY AREA BOUNDARY

SAUKVILLE

FUTURE SITE -
FREEMAN CHEMICAL COMPANY

NORTHERN
SIGNAL
COMPANY

FIRST BUILDING
CONSTRUCTED AT
FREEMAN PLANT SITE

GRAVEL
PIT

GRAVEL PITS

COUNTY ROAD 0

Milwaukee River

CHICAGO MILWAUKEE
AND ST. PAUL RAILROAD



OCTOBER 3, 1950
APPROX. SCALE 1:20,000
1 INCH=1666 FEET

JUNE 4, 1964 FREEMAN CHEMICAL FACILITY PRESENT

By 1964, Freeman Chemical Company had expanded substantially over its size in 1950 to include a main processing area, tank farm, a storage building, and a parking area. Although the site is now fenced, the physical plant has not expanded to the property limit (Figure 9) it will occupy by 1981.

Four areas of non-specific surface disturbances and a gravel pit were noted in the 1964 photography. Disturbed Area 1 is located between the rail line and a small cemetery south of the Freeman facility. It is characterized by simple vegetation removal and soil exposure. No indication of excavation or burial was apparent in the photography. South of this area, a very small gravel pit has been developed into the hillside cemetery. A portion of the hillside has been excavated and the ground surface in the immediate area disturbed. Disturbed Areas 2 and 3 are both located on the west bank of the Milwaukee River, east of County Trunk Road O. Area 2 is slightly larger than 3 and appears to involve construction of some type. Area 3, more suspicious in terms of being a waste disposal site, appears to be a small landfill-like deposition of light-colored material. Disturbed Area 4 is located immediately adjacent to Freeman Chemical Company (southwest corner), and is characterized by dark ground coloration, possibly resulting from liquid waste disposal. Area 4, by virtue of its close proximity to the plant facility and its appearance in the aerial photography during a period when untreated reactor distillate rejects from the plant were allegedly disposed of to the ground, appears particularly likely to be a waste disposal site.

At the Northern Signal site, five small vertical storage tanks, two large vertical storage tanks, and nine small horizontal storage tanks were located north of the plant buildings. Although no indication of uncontrolled waste disposal was noted

in the photography, the presence of the bulk liquids storage tanks suggests that the Northern Signal facility was handling large quantities of potentially hazardous substances. The lack of adequate secondary containment around some of the tanks, coupled with the possibility of small releases and/or spills of the liquid, suggests a possible source of groundwater contamination that could be associated with this facility.

FREEMAN CHEMICAL COMPANY STUDY AREA



JUNE 4, 1964
 APPROX. SCALE 1:24,000
 1 INCH = 2000 FEET

AUGUST 25, 1971, NEW SURFACE DISTURBANCES

By 1971, additional areas of surface disturbance indicative of potential waste disposal activities were present both inside and beyond the study area boundary (Figure 10).

Outside the study area to the west, a new road has been established southwest of the former Northern Signal Company (now Laubenstein Roofing Company). The road leads to a small area of cleared agricultural land or possibly a pit. The pit appears to be spatially associated with construction or operation of an offsite incinerator known to have been operated by Northern Signal until about 1972 when it was deactivated by the company. The road then continues beyond the pit to a small area of solid waste disposal. The material covers less than 2,000 square feet, is piled from 1-8 feet high, and is rather dark in coloration.

Inside the study area and southwest of the cemetery, a new road provides access to a large cleared area with a substantial pit in its center. This area occupies the site of a gravel pit first observed in the 1964 photography, and has the potential to receive both liquid and solid wastes. Also inside the study area is an additional area of surface disturbance (Area 5) located adjacent to County Trunk Road O on the east side.

FIGURE 10

FREEMAN CHEMICAL COMPANY STUDY AREA



STUDY AREA
BOUNDARY

Milwaukee
River

SAUKVILLE

CEMETERY

SURFACE
DISTURBANCE

FREEMAN
CHEMICAL
COMPANY

LAUBENSTEIN
ROOFING
COMPANY

NEW
ROAD

CLEARED
AREA

PIT

NEW
ROAD

PIT

NEW
ROAD

SOLID WASTE
DISPOSAL PILE

COUNTY ROAD 6



AUGUST 25, 1971
APPROX. SCALE 1:16,000

DECEMBER 10, 1981

Figures 11, 12, and 13 provide the first large-scale, color aerial photography over the study area. Figure 14, an enlarged portion of Figure 13, provides a detailed view of the Freeman Chemical Company plant facility. Potential sources of groundwater contamination observed in historical photography are re-established on the recent photography where adequate coverage is available. New potential sources observed in the recent coverage are also annotated. Table 2 lists and summarizes all potential threats observed throughout the photographic study period.

A major soil type associated with the Freeman Chemical Company study area is the Matherton silt loam, a moderately permeable soil with slow internal drainage due to a high water table, varying temporarily from 1 to 3 feet from the surface.²

Groundwater supplies in Ozaukee County, Wisconsin are supplied from both shallow and deep aquifers.³ Three main aquifers underlie the study area: Sand and Gravel Aquifer, Niagara Dolomite Aquifer, and Sandstone Aquifer. Groundwater movement in the area follows a southeasterly direction.⁴

²Thomas Lentzen and Rodney Bloese, Preliminary Hydrogeological Report and Proposed Monitoring Program at Saukville, Wisconsin (Chicago: Ecology and Environment, Inc., 1981) p. 4.

³Ibid, p. 9.

⁴Ibid, p. 9.

TABLE 2. POTENTIAL GROUNDWATER CONTAMINATION SOURCES
AT SAUKVILLE, WISCONSIN

Figure	Feature	Location	First Observed	Feature Present in 1981 Coverage
8	Gravel pit	SW of cemetery	10/03/50	Yes
	Construction activity at Northern Signal Co.	W of rail line, and W of plant buildings	10/03/50	No
	Gravel pits	E of Milwaukee River outside study area	10/03/50	Partially
9	Gravel pit	SW of cemetery	10/03/50	Partially
	Surface Disturbance 1	Between rail line and cemetery S of Freeman plant	06/04/64	No, obscured
	Surface Disturbance 2	W bank of Milwaukee River, E of County Road O	06/04/64	No, obscured
	Surface Disturbance 3	W bank of Milwaukee River, E of County Road O	06/04/64	No, obscured
	Surface Disturbance 4	SW corner of Freeman facility	06/04/64	No, obscured
	Freeman Chemical Company	W of rail line, E of County Road O	06/04/64	Yes
10	Cleared Area, pit (incinerator construction)	SW of Laubenstein Roofing Company	08/25/71	Yes
	Solid waste disposal pile	SW of cleared area, pit	08/25/71	No, obscured
	Pit	SW of cemetery	10/03/50	Partially
	Surface Disturbance 5	Adjacent to and east of County Road O	08/25/71	No, obscured

(continued)

TABLE 2 (continued)

Figure	Feature	Location	First Observed	Feature Present in 1981 Coverage
11	Landfill	N of East Greenbay Avenue, E of Milwaukee River	12/10/81	No
12	Old incinerator site and gravel pits	SW of Laubenstein Roofing Company	08/25/71	No
	Surface Disturbance 2	W bank of Milwaukee River E of County Road O	08/25/71	Partially
	Freeman Chemical Company plant	See Figure 14		
	Solid waste disposal pile area	SW of old incinerator site	08/25/71	No, obscured
13	Surface Disturbance 3	W bank of Milwaukee River, E of County Road O	06/04/64	No, obscured
	Surface Disturbance 5	Adjacent to and E of County Road O	08/25/71	No, obscured
	Landfill	Between County Road O and Milwaukee River	12/10/81	No
14	Old seepage pit	SE corner of plant	12/10/81	Partially
	Bulk storage containers (tanks, drums)	Throughout plant site	12/10/81	Yes
	Possible buried holding and storage	Unknown	-	-

12-10-82005 1:6000 S26LN2-RN1

123
FIGURE 11

FREEMAN CHEMICAL COMPANY STUDY AREA



STUDY AREA BOUNDARY

Milwaukee River

LANDFILL

CHICAGO MILWAUKEE AND ST. PAUL RAILROAD (CM&ST.P. RR)

MILL STREET

DEVON STREET

EASY STREET

W. FRANKSEE STREET

W. STONEY RIDGE WAY

N. DRIES STREET

DECEMBER 10, 1981
APPROX. SCALE 1:6000
1 INCH = 500 FEET

SEE FIGURE 12

12-10-81 82005 1 6000 S26LN21RN1

FREEMAN CHEMICAL COMPANY STUDY AREA

FIGURE 12



12-10-81 82005 1 6000 S26LN21RN1

FOR ENLARGED VIEW, SEE FIGURE 14

OLD SURFACE DISTURBANCE AREA 2

SEE FIGURE 11

SEE FIGURE 14

SEE FIGURE 13

SEE FIGURE 15

SEE FIGURE 16

SEE FIGURE 17

SEE FIGURE 18

SEE FIGURE 19

SEE FIGURE 20

SEE FIGURE 21

SEE FIGURE 22

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SEE FIGURE 90

SEE FIGURE 91

SEE FIGURE 92

SEE FIGURE 93

SEE FIGURE 94

SEE FIGURE 95

SEE FIGURE 96

SEE FIGURE 97

SEE FIGURE 98

SEE FIGURE 99

SEE FIGURE 100

DECEMBER 10, 1981
APPROX. SCALE 1:6000
WELL LOCATIONS
SEE APPROPRIATE
1 INCH = 500 FEET



FIGURE 13

**FREEMAN
CHEMICAL COMPANY
STUDY AREA**

S26LN2-RN1

17 6000

82005

12-10-81

SEE FIGURE 12

OLD SURFACE
DISTURBANCE
AREA 3

OLD SURFACE
DISTURBANCE
AREA 5

Milwaukee River

COUNTY TRUNK ROAD 0

LANDFILL

CM & ST. P. RR.

STUDY AREA BOUNDARY



10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0

PEEMAN CHEMICAL COMPANY
(ENLARGED VIEW)



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