ND 2900 D1722

Copy 1

ENGINEERING INVESTIGATIONS AT INACTIVE HAZARDOUS WASTE SITES

PHASE I INVESTIGATION

FMC CORP.-CHEMICAL DIVISION, SITE NUMBER: 915025
TOWN OF TONAWANDA, ERIE COUNTY

June 1989

Prepared for:

New York State Department
of Environmental Conservation

50 Wolf Road, Albany, New York 12233
Thomas C. Jorling, Commissioner

Division of Hazardous Waste Remediation
Michael J. O'Toole, Jr., P.E., Director

Prepared by:

Ecology and Environment Engineering, P.C.

ND-2900 D1722

ENGINEERING INVESTIGATIONS AT INACTIVE HAZARDOUS WASTE SITES

PHASE I INVESTIGATION

FMC CORP.-CHEMICAL DIVISION, SITE NUMBER: 915025
TOWN OF TONAWANDA, ERIE COUNTY

June 1989

STATE OF NEW YORK
ALEXANDER H. WHITMAN, JR.
No. 063202-1
LICENSED PROFESSIONAL ENGINEER

Prepared for:
New York State Department
of Environmental Conservation
50 Wolf Road, Albany, New York 12233
Thomas C. Jorling, Commissioner
Division of Hazardous Waste Remediation
Michael J. O'Toole, Jr., P.E., Director

Prepared by:

ecology and environment
engineering, p.c.
BUFFALO CORPORATE CENTER
368 PLEASANTVIEW DRIVE, LANCASTER, NEW YORK 14086, TEL. 716/684-8060

recycled paper

TABLE OF CONTENTS

Table of Contents (Cont.)

LIST OF ILLUSTRATIONS

LIST OF TABLES

1. EXECUTIVE SUMMARY

1.1 SITE BACKGROUND

The FMC Corporation-Chemical Division (FMC Corporation) site is a former waste disposal area, consisting of several waste disposal pits, which are presently covered by clay and gravel. The site is 1 acre in size and is located at the southwest corner of the FMC Corporation property, located in the Town of Tonawanda, Erie County, New York (see Figures 1-1 and 1-2).

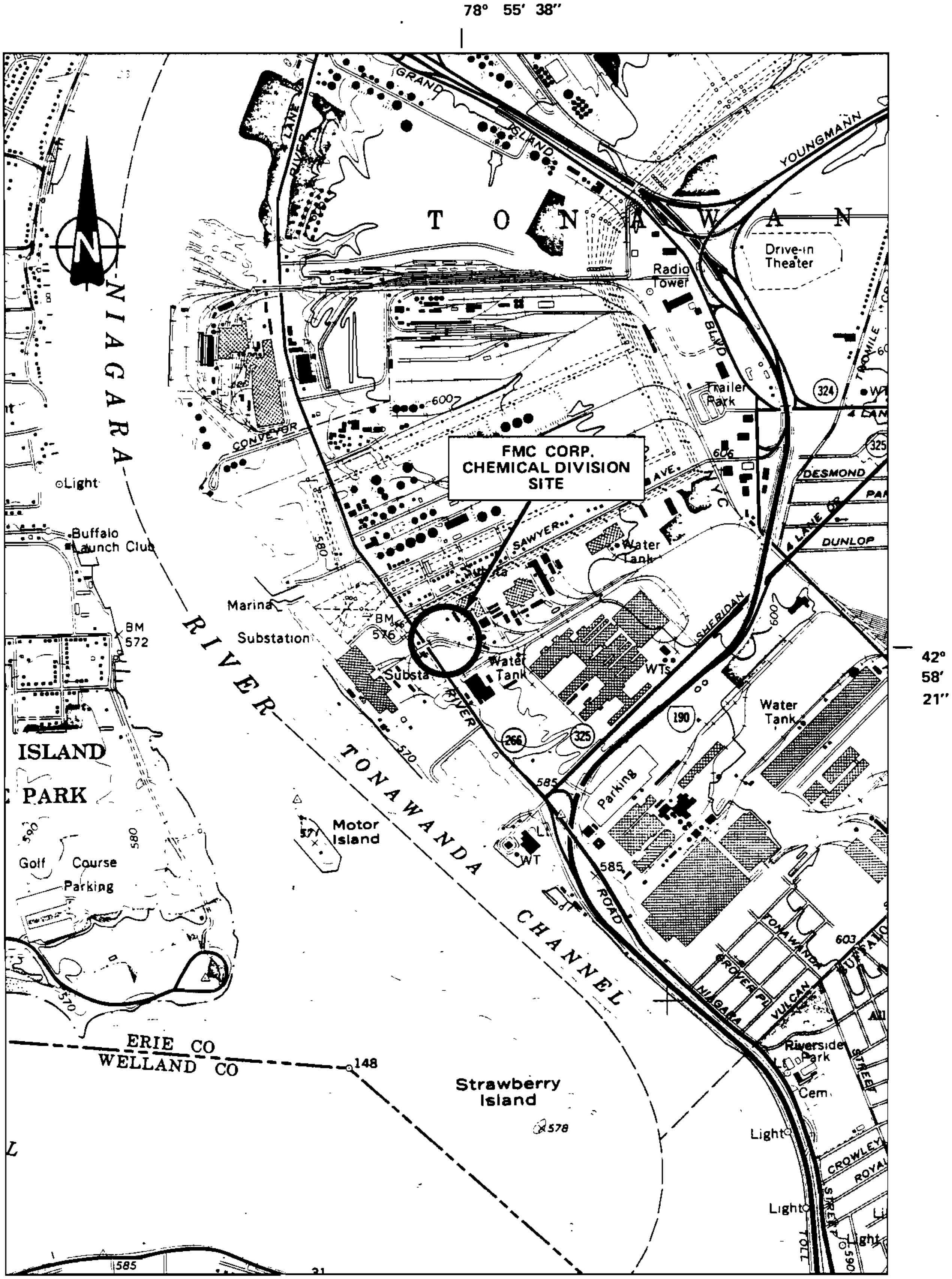
FMC Corporation utilized four pits for the disposal of an estimated 100 tons of persulfates, perborates, sodium carbonate peroxide, hydrogen peroxide, peracetic acid, calcium and zinc peroxide, and dipicolinic acid between the years 1964 and 1976. The use of the pits ceased in 1976 and they were covered with clay.

The United States Geological Survey conducted sub-surface soil sampling at the site in 1982 and 1983. There were many organic compounds tentatively detected, but not quantifiable due to exceeded holding times.

The site is currently used as an equipment storage area. Access is controlled by fences and 24-hour security.

1.2 PHASE I EFFORTS

On September 24, 1987, Ecology and Environment, Inc. (E & E) conducted a site inspection in support of this investigation. Prior to the inspection, available federal, state, county, and municipal files were reviewed. The site inspection consisted of a visual survey of the property that included:



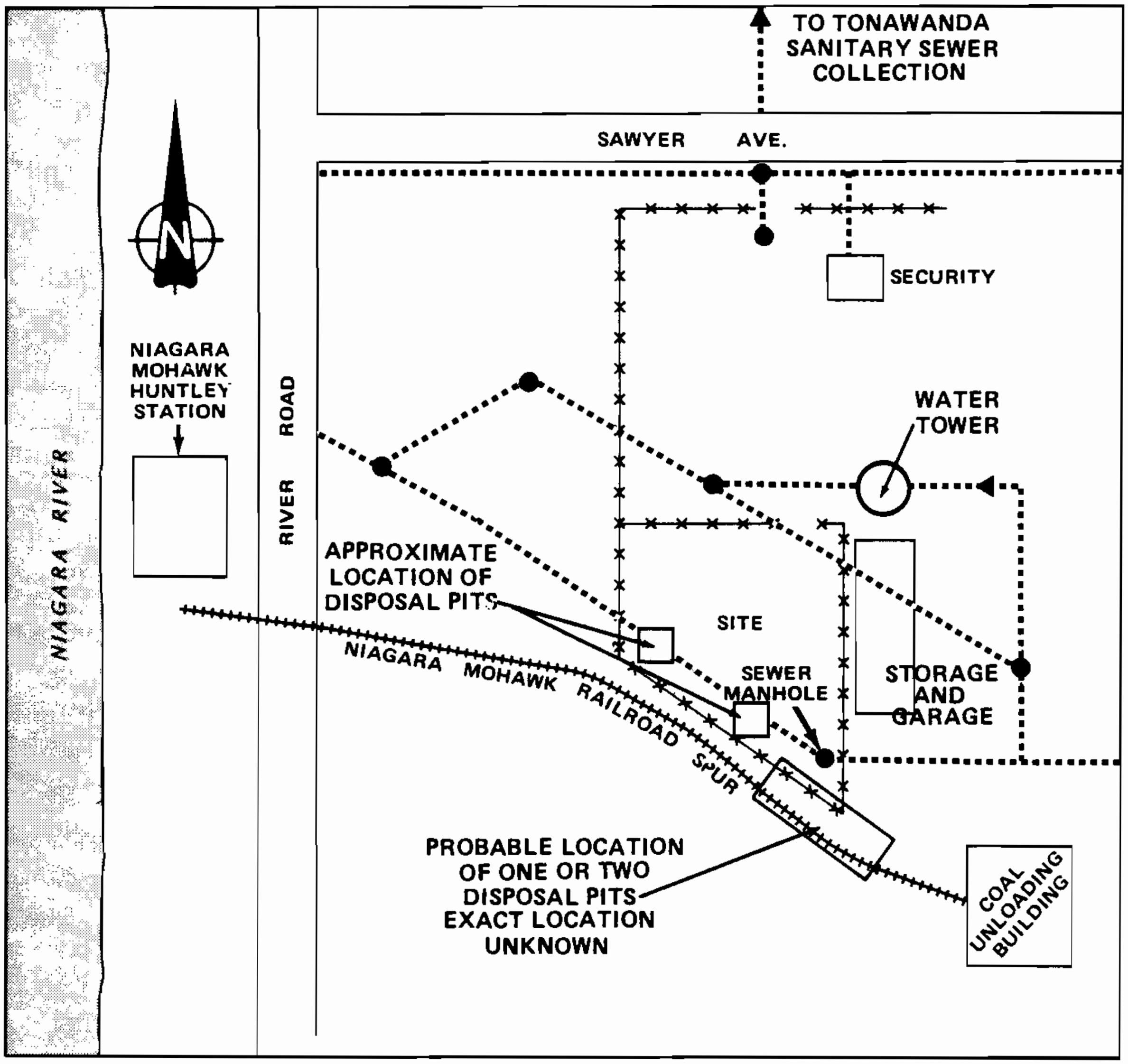
SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangle, Buffalo NW, N.Y.-Ont., 1965.

SCALE

0 ½ 1 MILE

0 .5 1 KILOMETER

Figure 1–1 LOCATION MAP



SOURCE: Ecology and Environment, Inc., 1987.

NOT TO SCALE

•••••• SEWER LINE

Figure 1—2 SITE MAP - FMC CORP., CHEMICAL DIVISION

- Overall site conditions;
- Description of vegetation and a survey for stressed vegetation;
- Presence of structures on the site;
- Distance to nearest residence;
- Location of nearest agricultural land;
- Location of nearest surface water and wells, and type of use;
- Visual delineation of waste disposal areas;
- Air quality survey using an HNu photoionizer; and
- Photodocumentation of the site.

All observations were recorded in a field logbook and recorded in the United States Environmental Protection Agency (EPA) Site Inspection Report form.

1.3 ASSESSMENT

The FMC Corporation site is an equipment storage lot 1 acre in size. FMC operated several waste disposal pits between 1964 and 1976 which contained an estimated 100 tons of persulfates, perborates, sodium carbonate peroxide, hydrogen peroxide, peracetic acid, calcium and zinc peroxide, and dipicolinic acid. In 1976 the pits were closed and capped with clay. Since 1976, a layer of plastic was placed at the site for weed control and gravel placed on top of the plastic.

Subsurface soil samples were collected in 1982 and 1983 by the United States Geological Survey. The analysis tentatively identified many organic compounds, but the data are questionable due to exceeded holding times.

Test borings conducted at the FMC plant indicated a presence of silty clay and an absence of water at a 25-foot depth.

1.4 HRS SCORE

A preliminary application of the Hazard Ranking System (HRS) has been made to quantify the risk associated with this site. As the Phase I investigation is limited in scope, not all the information needed to fully evaluate the site is available. An HRS score was completed on the basis of the available data. Absence of necessary data may result in an unrealistically low HRS score.

Under the HRS, three numerical scores are computed to express the site's relative risk or damage to the population and the environment. The three scores are:

- S_M reflects the potential for harm to humans or the environment from migration of a hazardous substance away from the facility by routes involving groundwater, surface water, or air. It is a composite of separate scores for each of the three routes (S_{GW} = groundwater route score, S_{SW} = surface water route score, and S_A = air route score).

- S_{FE} reflects the potential for harm from substances that can explode or cause fires.

- S_{DC} reflects the potential for harm from direct contact with hazardous substances at the facility (i.e., no migration need be involved).

The preliminary HRS score was:

$S_M = 3.72$ ($S_{GW} = 2.64$; $S_{SW} = 5.87$; $S_A = 0$)
S_{FE} = Not scored
$S_{DC} = 0$

2. PURPOSE

This Phase I investigation was conducted under contract to the NYSDEC Superfund Program. The purpose of the investigation was to provide a preliminary evaluation of the potential hazardous waste present at the site, to estimate the potential pollutant migration pathways leading off site, and to determine the natural resources or extent of the human population that might be affected by the pollutants. This initial investigation consisted of conducting a detailed file review of available information and a site inspection. The evaluation includes preparation of a narrative site description, initial characterization of the hazardous substances on site, and calculation of a preliminary HRS score. This assessment will be used to determine what additional actions, if any, should be conducted at the site.

3. SCOPE OF WORK

The Phase I effort involved the following tasks:

- A review of available information from state, county, municipal, and private files;
- Interviews with individuals knowledgeable of the site; and
- Physical inspection of the site that included review of USGS 15-minute topographic maps. No samples were collected, although air monitoring was performed using an HNu photoionizing organic vapor detector.

Photographs were taken during the site inspection and are included in Appendix A. Table 3-1 lists sources contacted for the Phase I investigation. References are included in Section 7.

Table 3-1

SOURCES CONTACTED FOR THE NYSDEC PHASE I INVESTIGATION AT FMC CORPORATION

Agencies Contacted

U.S. Environmental Protection Agency
Region II Office
26 Federal Plaza, Room 900
New York, New York 10278
Contact: Ben Conetta
Telephone No.: (212) 264-6696
Date: 5/20/87
Information Gathered: File search for FMC Corporation.

New York State Department of Environmental Conservation
Division of Solid and Hazardous Waste
50 Wolf Road
Albany, New York 12233-0001
Contact: Raymond Lupe
Telephone No.: (518) 457-9538
Date: 6/22/87
Information Gathered: File search for FMC Corporation - no files found.

New York State Department of Environmental Conservation, Region 9
Solid and Hazardous Waste Division
600 Delaware Avenue
Buffalo, New York 14202
Contact: Lawrence Clare
Telephone No.: (716) 847-4585
Date: 4/29/87
Information Gathered: File search for FMC Corporation.

New York State Department of Environmental Conservation, Region 9
Division of Environmental Enforcement
600 Delaware Avenue
Buffalo, New York 14202
Contact: Joann Gould
Telephone No.: (716) 847-4582
Date: 6/22/87
Information Gathered: File search for FMC Corporation.

New York State Department of Environmental Conservation, Region 9
Division of Water, Fish, and Wildlife
600 Delaware Avenue
Buffalo, New York 14202
Contact: Rebecca Anderson, Jim Farquar
Telephone No.: (716) 847-4590; (716) 847-4550
Date: 6/13/87, 8/26/87
Information Gathered: Floodplains, significant habitats, fisheries resources, plant species of concern, wetlands in vicinity of the FMC Corporation.

New York State Department of Health
584 Delaware Avenue
Buffalo, New York 14202
Contact: Linda Rusin, Cameron O'Connor
Telephone No.: (716) 847-4500
Date: May 5, 1987; June 4, 1987; April 13, 1989
Information Gathered: Contact with NYSDOH on May 5, 1987, indicated that files were being transferred from Albany to Buffalo so the files were not accessible. Further correspondence in June 1987 indicated that the office was newly established and file information was extremely limited; therefore, the county health departments were visited in lieu of NYSDOH. NYSDOH files were searched on April 13, 1989.

Table 3-1 (Cont.)

New York State
Department of Health
Corning Tower
The Governor Nelson A. Rockefeller Empire State Plaza
Albany, New York 12237
Telephone No.: (518) 458-6310
Contact: Lani Rafferty
Date Contacted: April 5, 6, 1989
Information Gathered: File search for site history, correspondence, background information.

Erie County Department of Environmental Planning
95 Franklin Avenue
Buffalo, New York 14202
Contact: Kermit Studley
Telephone No.: (716) 846-6370
Date: 7/23/87
Information Gathered: File search for FMC Corporation.

United States Department of Agriculture (USDA)
Soil Conservation Service
21 South Grove Road
East Aurora, New York 14731
Contact: John Whitney
Telephone No.: (716) 655-1210
Date: 8/25/87
Information Gathered: Agricultural district lands and distance to productive prime agricultural lands.

Erie County Real Property Tax Division
95 Franklin Street
Buffalo, New York 14202
Contact: Tax Assistant
Telephone No.: (716) 846-8333
Date: September 21, 1987
Information Gathered: Property ownership for FMC Corporation.

Erie County Water Authority
Ellicott Square Building
Buffalo, New York 14202
Contact: Robert Wruck, Peter Rescka
Telephone No.: (716) 873-8884
Date: 9/23/87
Information Gathered: Location of water intake, population served.

Interviews

Contact: Richard Wise
Agency: FMC Corporation
Box 845
Buffalo, New York 14240
Telephone No.: (716) 879-0405
Date: 9/24/87
Information Gathered: Site history, FMC file information.

---

4. SITE ASSESSMENT

4.1 SITE HISTORY

The FMC Corporation was established in Buffalo in 1925; at that time it was known as the Food Machinery and Chemical Corporation. Before 1925, the FMC Corporation was known as the Buffalo Electro-Chemical Company (BECCO). In 1961, the name was shortened to the FMC Corporation. (Interagency Task Force on Hazardous Wastes 1979).

Beginning in 1964, the FMC Corporation utilized two to four waste disposal pits which reportedly measured 20 feet by 20 feet by 10 feet deep (ECDEP 1982). These pits were used for the disposal of an estimated 100 tons of persulfates, perborates, sodium carbonate peroxide, hydrogen peroxide, peracetic acid, calcium and zinc peroxide, and dipicolinic acid. The pits were closed in 1976 and covered with a clay cap (Yochum 1987). According to a NYSDEC Hazardous Waste Disposal Site report, the pits have been properly closed (Knowles 1980).

In 1979, part of the FMC plant including a former disposal pit was sold to the Niagara Mohawk Power Corporation of Syracuse, New York. The property was used by Niagara Mohawk for coal unloading and modernization. A rail line now exists in this area (Wilding 1978).

In 1982 and 1983, the United States Geological Survey conducted subsurface soil borings at the site. Samples from the borings were analyzed and many organic compounds were detected, but not quantified due to exceeded holding times. The borings also indicated the subsurface soil as being clay (Koszalka _et al_. 1985).

At an undetermined time between 1976 and the present, a thin layer of plastic was applied to the site for weed control and gravel was laid over the site. During the fall of 1983, a sewer line was also installed through the area. The sewer line is a combination of 24-inch vitrified tile and 36-inch reinforced concrete. The sewer lines are indicated on Figure 1-2 and a diagram of the sewer lines is included in Appendix C. The excavated material was broadcast on the FMC property in the vicinity of the sewer line. The line was backfilled with granular material up to the spring line of the pipe; the balance of the fill consisted of compacted excavated material (Wise 1988). The site is presently utilized by FMC as an equipment storage area (E & E 1987).

4.2 SITE TOPOGRAPHY

The FMC Corporation is located in the Erie-Ontario lowland physiographic province, which is an area of low relief. It is approximately 1 acre in size and is located along the north edge of the Niagara Mohawk railroad spur approximately 600 feet southeast of the corner of River Road and Sawyer Avenue in the Town of Tonawanda. The elevation at the site is 600 feet above mean sea level. The Niagara River-Tonawanda Channel is located 1,900 feet to the southwest of the site. The surrounding industrial area is generally flat with less than 1% slope. Site drainage to the Niagara River occurs through a ditch located along the railroad spur at the south end of the site.

4.2.1 Soils

The soil type in the FMC area is classified by the U.S. Department of Agriculture as urban land (Ud). This unit is characterized as an area in which 80 percent or more of the soil surface is covered by asphalt, concrete, or buildings.

The nearest classified soil type is the Odessa Silt Loam (Od). This nearly level soil is deep and somewhat poorly drained, high in clay content, and is found on flat, broad plains, which were formally the bottoms of glacial lakes. It typically has a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsoil extends to a depth of 22 inches and is mottled, red or pinkish brown silty clay. The substratum extends to a depth of 60 inches and is varved, reddish brown clay.

The Odessa soils have a perched water table in the upper part of the subsoil during the winter and spring. It is a prime farmland soil if drained (USDA SCS 1986).

The United States Geological Survey performed soil borings at the site in 1982 and 1983. The borings extended from a depth of 3.5 feet to 11.5 feet. The soil was reported dark green and red clays with some fill, sand, and gravel (Koszalka 1985).

FMC also conducted test borings at the plant in 1969. These borings extended to a depth of 25 feet. The soils were described as brown silty clay with some embedded gravel (FMC Corporation 1969).

The USDA SCS has reported the permeability of the Odessa silty loam as greater than 10^{-3} cm/sec. Soil boring descriptions by the USGS indicated tight compacted clays (Koszalka 1985). Also, soil borings conducted at the DuPont facility located 1/2 mile southeast indicated permeabilities in the 10^{-8} cm/sec range (Empire Soils 1980).

4.2.2 Wetlands

Both federally and state-designated wetlands are located near the FMC Corporation site. Federal wetlands may be a minimum of 0.5 acre. State wetlands are classified by NYSDEC into four ranked groups based on the relative value and the degree of benefits supplied by the wetland. A Class I wetland is considered the most valuable wetland type while a Class IV wetland lacks the characteristics justifying a higher classification (e.g., habitat for endangered species, proximity to reservoirs, etc.); however, a Class IV wetland still qualifies as a regulated wetland. State wetlands are a minimum of 12.4 acres.

Two NYSDEC-designated wetlands are located near the FMC site. The Sawyer Avenue Wetland, No. BW-6, is located approximately 0.6 mile to the northeast. It encompasses 30 acres and is a Class II wetland (Farquar 1987).

The East River Wetland, No. BW-2, located 0.8 mile to the west, is 9 acres in size. The wetland is located in the Beaver Island State Park on the Grand Island shoreline of the Niagara River. It is classified as a Class I wetland (Farquar 1987). Although the wetland does not qualify as a protected wetland under the state size criteria, it is an area that has been reported by NYSDEC as outstanding wildlife habitat for breeding, nesting, feeding, and cover. The wetland is reported to have some value for fish spawning and provides an excellent recreation area for hiking, bird watching, and photography (Snider 1977). It is also considered to be a significant coastal fish and wildlife habitat area as part of the Strawberry Island-Motor Island Shallows (Farquar 1987).

Both Strawberry Island and the East River wetland are federal wetlands. Strawberry Island has both palustrine emergent and palustrine forested characteristics. The East River Wetland is a palustrine emergent system (Farquar 1987).

Between Strawberry Island and Motor Island in the Niagara River-Tonawanda Channel, is a federally designated wetland that is of the riverine, lower perennial, aquatic bed type. This wetland is 1.8 miles from the site (Farquar 1987).

Located 0.3 mile to the northwest and southwest of the FMC site are two small palustrine, open water federal wetlands. In addition to the Sawyer Avenue federal wetland, there is another federal wetland located 0.6 mile east of the site (Farquar 1987).

4.2.3 Surface Waters

The FMC site is located 0.3 mile northeast of the Niagara River/ Tonawanda Channel. The entire river is designated as Class A water and is a natural reproduction area for many fish. Although the Niagara River is not stocked, salmon and trout stocked in Lake Erie may migrate into the river channel (Evans, 1987).

The Niagara River is approximately 37 miles long with an average flow of 5,700 cubic meters per second. The Tonawanda Channel is 15 miles long and carries 43 percent of the flow as the river divides around Grand Island. The river is used as a source of drinking water, recreation, transportation, and is a water source for industrial uses as well as a receptor for industrial wastes. Point and non-point discharges have had a significant adverse impact on the river's quality (Niagara River Toxics Committee 1984).

The FMC Corporation site is not located in a 100-year floodplain (Federal Emergency Management Agency 1975).

4.2.4 Land Use

The land use in the area is primarily commercial and industrial. Directly east of the site is the FMC Corporation manufacturing facility and north is the office building. West of the site is the Niagara Mohawk Huntley Power Station and south of the site is the Niagara Mohawk railroad spur (E & E 1987).

The nearest residential area is located 0.85 mile to the east of the site. The total population residing within 1 mile of the site is 782 persons (General Sciences Corporation 1986). There are no historically significant sites within sight of the FMC property (Murtagh 1976). The nearest prime agricultural land that has been in production in the last 5 years is greater than 2 miles away (Whitney 1987).

4.2.5 Critical and Sensitive Habitats

NYSDEC has classified Strawberry Island as a critical and sensitive wildlife habitat area. Strawberry Island is a 20-acre island located 0.9 mile southwest of the site in the middle of the Niagara River. The island is reported to provide a major waterfowl feeding and resting area, as well as important game fish spawning habitat. The island has been degraded over the years due to gravel removal. Although the activity has stopped, there is a potential that erosion could continue to degrade the island (Farquar 1987).

4.3 SITE HYDROLOGY

4.3.1 Regional Geology and Hydrogeology

The FMC Corporation site lies within the Erie-Niagara basin and the Erie-Ontario lowland physiographic province. The overburden consists mainly of glacial till, an unconsolidated poorly sorted mix of clay, silt, and/or sand. It forms a thin mantle over the bedrock and exhibits low permeability. The region between the Onondaga Escarpment to the north and the hilly areas to the south also received lacustrine clay and silt deposits during late Pleistocene time from the larger ancestral Great Lakes. These deposits exhibit very low permeabilities. As the ancestral lakes retreated, sandy beach sediments were also deposited in this region. These deposits exhibit relatively high permeabilities (Buehler and Tesmer 1963).

The bedrock in the region is exclusively sedimentary. The shale, limestone, and dolomite units dip gently southward approximately 40 feet per mile. Although the bedrock dips southward, the land surface is flat or actually increases in elevation to the south. Therefore, the further south the location, the younger the underlying bedrock (LaSala 1968).

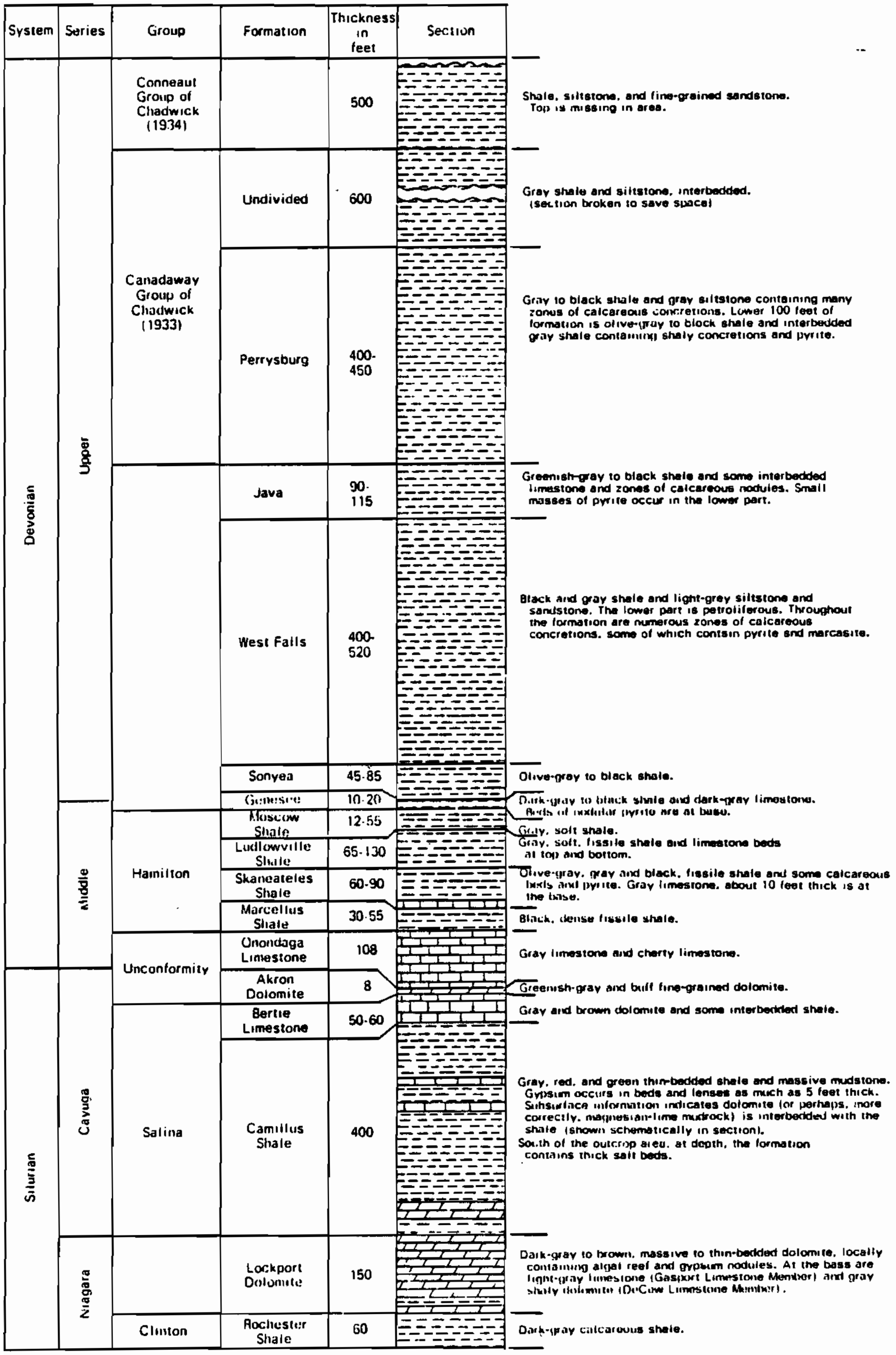
Up to 32 distinct bedrock members have been identified in Erie County (see Figure 4-1). The oldest unit, Silurian in age, underlying the northern part of the county is the Camillus Shale. This member, which is 30 to 100 feet thick, contains significant reserves of groundwater in cavities formed by the dissolution of gypsum (LaSala 1968).

Several limestone members also of Silurian age overlie the Camillus Shale. The Bertie limestone, approximately 50 feet thick, overlies the Camillus Shale and is in turn overlain by the Akron Dolomite, which is about 8 feet thick. Little record of latest Silurian or Early Devonian history is preserved in Western New York. However, the Middle and Late Devonian record is well preserved beginning with the Onondaga Limestone unconformably overlying the Akron Dolomite. The unit comprises three distinct members that cumulatively are approximately 140 feet thick (Buehler 1966).

The Marcellus Shale member overlies the limestone units. This dense, black, fissile shale is approximately 30 to 55 feet thick. This shale, unlike the Camillus Shale, is impermeable. It confines the limestone and Camillus Shale aquifers below (LaSala 1968).

The Skaneateles Formation overlies the Marcellus Shale. This 60- to 90-foot-thick formation is represented by the Stafford Limestone and Levanna Shale. The black, fissile shale is expected to be impermeable and will therefore confine groundwater found in the lower limestone units (Buehler 1966).

Overlying the Skaneateles is the Ludlowville formation represented by the Centerfield Limestone, Ledyard Shale, Wanakah Shale, and Tichenor Limestone members. The shale members contain numerous limestone beds. The Ludlowville Formation is followed by the Moscow Formation represented by the Kashong shale and Windom shale. The Moscow Formation is followed by 2,500 feet of upper Devonian rocks in southwestern New York State consisting of the Genesee, Sonyea, West Falls,



System	Series	Group	Formation	Thickness in feet	Section	
Devonian	Upper	Conneaut Group of Chadwick (1934)		500		Shale, siltstone, and fine-grained sandstone. Top is missing in area.
		Canadaway Group of Chadwick (1933)	Undivided	600		Gray shale and siltstone, interbedded. (section broken to save space)
			Perrysburg	400-450		Gray to black shale and gray siltstone containing many zones of calcareous concretions. Lower 100 feet of formation is olive-gray to block shale and interbedded gray shale containing shaly concretions and pyrite.
			Java	90-115		Greenish-gray to black shale and some interbedded limestone and zones of calcareous nodules. Small masses of pyrite occur in the lower part.
			West Falls	400-520		Black and gray shale and light-grey siltstone and sandstone. The lower part is petroliferous. Throughout the formation are numerous zones of calcareous concretions, some of which contsin pyrite snd marcasite.
			Sonyea	45-85		Olive-gray to black shale.
			Genesee	10-20		Dark-gray to black shale and dark-gray limestone. Beds of nodular pyrite are at base.
	Middle	Hamilton	Moscow Shale	12-55		Gray, soft shale.
			Ludlowville Shale	65-130		Gray, soft, fissile shale and limestone beds at top and bottom.
			Skaneateles Shale	60-90		Olive-gray, gray and black, fissile shale and some calcareous beds and pyrite. Gray limestone, about 10 feet thick is at the base.
			Marcellus Shale	30-55		Black, dense fissile shale.
		Unconformity	Onondaga Limestone	108		Gray limestone and cherty limestone.
Silurian	Cayuga		Akron Dolomite	8		Greenish-gray and buff fine-grained dolomite.
		Salina	Bertie Limestone	50-60		Gray and brown dolomite and some interbedded shale.
			Camillus Shale	400		Gray, red, and green thin-bedded shale and massive mudstone. Gypsum occurs in beds and lenses as much as 5 feet thick. Subsurface information indicates dolomite (or perhaps, more correctly, magnesian-lime mudrock) is interbedded with the shale (shown schematically in section). South of the outcrop area, at depth, the formation contains thick salt beds.
	Niagara		Lockport Dolomite	150		Dark-gray to brown, massive to thin-bedded dolomite, locally containing algal reef and gypsum nodules. At the bass are light-gray limestone (Gasport Limestone Member) and gray shaly dolomite (DeCow Limestone Member).
		Clinton	Rochester Shale	60		Dark-gray calcarous shale.

Figure 4—1 BEDROCK UNITS OF THE ERIE-NIAGARA BASIN

Java, Canadaway, Chodakoin, and Cattaraugus formations. These consist almost exclusively of shale members. The Canadaway formation is by far the thickest (up to 1,000 feet) and underlies the southern third of Erie County (LaSala 1968).

Significant amounts of groundwater occur only in the overburden and in the lower bedrock units. The Camillus shale contains numerous cavities formed by the dissolution of gypsum and is thus a very productive aquifer. The Onondaga, Akron, and Bertie Dolomite and limestones contain water in bedding joints widened by dissolution. Vertical fractures in the limestone provide hydraulic connections among the many bedding planes (LaSala 1968).

Very little groundwater is found in the formations above the limestone unit. These formations, principally shale, are impermeable. Some water transmission occurs in small fractures in the bedrock, but no wells of significant yield are found in these units. Groundwater in these regions is obtained mainly from glacial overburden deposits (LaSala 1968).

4.3.2 Site Hydrogeology

The FMC Corporation site is located in an area which has a soil type classified as urban land. This soil type is characterized as an area in which 80% or more of the soil surface is covered by asphalt, concrete, or buildings.

The nearest classified soil type is the Odessa silt loam. This nearly level soil is deep and somewhat poorly drained, high in clay content, and is on broad flat plains which were formerly the bottoms of glacial lakes. The upper portion of this soil type is characterized as brown or reddish-brown clay (USDA SCS 1986).

The United States Geological Survey performed soil borings at the site in 1982 and 1983. The borings extended from a depth of 3.5 feet to 11.5 feet and the soil type was reported as dark green and red clays with some fill, sand, and gravel (Koszalka 1985).

FMC also conducted test borings at the plant in 1969. These borings extended to a depth of 25 feet. The soils were described as brown silty clay with some embedded gravel (FMC Corporation 1969).

The depth to the Camillus Shale bedrock is unknown, but well data from the Dunlop and DuPont plants located to the south of FMC indicated depth to bedrock at 60 to 70 feet deep. Data from these wells also indicated an aquifer located at a depth of 35 to 54 feet (ECDEP 1982).

The hydrology of the site is likely governed by the Niagara River and by a sewer which transects the site (FMC Corporation 1983).

4.3.3 Hydraulic Connections

The movement of groundwater from the site is likely impeded or prevented by the thick glacial lacustrine clay deposits. The nearest aquifer is reported at 35 feet or greater and a hydraulic connection is unlikely. The Camillus Shale, located at a depth greater than 60 feet, is relatively permeable, but is not hydraulically connected to the site.

A sewer line transects the FMC site from the southeast to northwest. The date of installation or details on construction are not known. It is possible that contaminants from the site may be infiltrating the line or that the line acts as a pathway for contaminants escaping the site. This sewer line is an eventual outfall to the Niagara River (FMC Corporation 1983). More information is necessary to assess this possible hydraulic connection.

4.4 SITE CONTAMINATION

The waste disposal pits were utilized by FMC for the disposal of an estimated 100 tons of the following substances: borax, hydrogen peroxide, sodium carbonate, sodium persulfate, ammonium bicarbonate, ammonium carbonate, ammonium hydroxide, ammonium sulfate, persulfates, perborates, sodium carbonate peroxides, peracetic acid, calcium and zinc peroxide, and dipicolinic acid.

These substances are oxidizing agents which can react violently with organic compounds when mixed. They have a Sax Toxicity Rating of 3 because of this characteristic (Sax 1984).

The United States Geological Survey collected subsurface soil samples from the FMC site. These samples were analyzed for organic priority and non-priority pollutants. Although many compounds were detected, the results are questionable due to exceeded holding times for these samples (Koszalka 1985).

Additional data is needed to fully evaluate and assess the contaminants on the site (see Section 6).

5. PRELIMINARY APPLICATION OF THE HAZARD RANKING SYSTEM

5.1 NARRATIVE SUMMARY

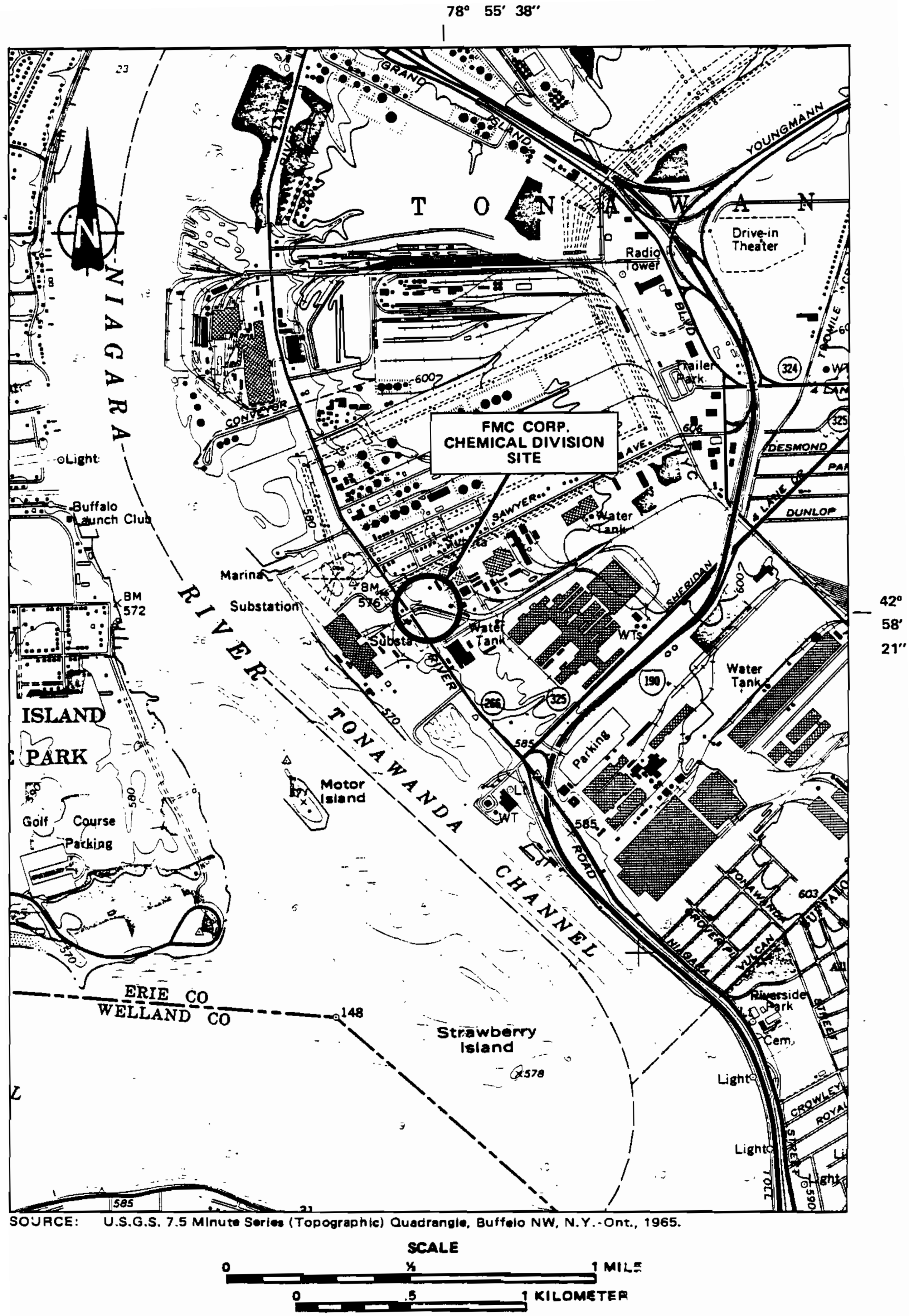
The 1-acre FMC Corporation site is located in the Town of Tonawanda, Erie County, New York (see Figure 5-1). The FMC Corporation is the only domestic producer of sodium, potassium, and ammonium persulfates, which are used in the electronics industry. In addition, FMC produces monocalcium phosphate, a chemical used widely as a food ingredient. The site contained four waste disposal pits used between 1964 and 1976.

The four disposal pits, each 20 x 20 x 10 feet, were used by FMC for the disposal of an estimated 100 tons of mixed wastes such as plant floor sweepings and spent products. These wastes included persulfates, perborates, calcium and zinc peroxides, sodium carbonate peroxide, hydrogen peroxide, peracetic acid, and dipicolinic acid. In 1976, the pits were closed and capped with clay. A portion of the site was sold to Niagara Mohawk Power Corporation in 1979. The U.S. Geological Survey performed soil borings in 1982 and 1983. Subsurface soil samples were analyzed and several organic compounds were detected, but not quantified due to exceeded holding times.

Land use in the area is primarily commercial and industrial. Directly east of the site is the FMC manufacturing facility and north is the office building. West of the site is the Niagara Mohawk Huntley Power Station. The nearest residential area is 0.85 mile to the east of the site. The total population residing within 1 mile of the site is 782 (General Sciences Corporation 1986).

The site is located 0.3 mile northeast of the Niagara River. The nearest aquifer is reported at a depth of 35 to 54 feet (ECDEP 1982).

Presently, the site is covered with a layer of plastic and gravel and is used as an equipment storage lot. The access is controlled by a perimeter fence and the plant has 24-hour security. No cleanup actions have been conducted and the site is not monitored.



SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangle, Buffalo NW, N.Y.-Ont., 1965.

Figure 5–1 LOCATION MAP

FIGURE 1

HRS COVER SHEET

Facility Name: FMC Corporation

Location: 34 Sawyer Road, Tonawanda, NY 14150

EPA Region: II

Person(s) in Charge of Facility: Paul R. Yochum - Manager

Box 845

Buffalo, NY 14240

Name of Reviewer: A. Mark Sienkiewicz Date: 10-6-87

General Description of the Facility:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action; etc.)

A 1-acre site which contains several covered waste disposal pits that were used by FMC for the disposal of an estimated 100 tons of persulfates, perborates, sodium carbonate peroxide, hydrogen peroxide, calcium and zinc peroxide, and dipicolinic acid. Presently the site is used as an equipment storage lot.

Scores: $S_M = 3.72$ $(S_{gw} = 2.64$ $S_{sw} = 5.87$ $S_a = 0)$

S_{FE} = Not scored

$S_{DC} = 0$

D1722

Ground Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
$\boxed{1}$ Observed Release	[✓ 0] 45	1	0	45	3.1
If observed release is given a score of 45, proceed to line $\boxed{4}$. If observed release is given a score of 0, proceed to line $\boxed{2}$.					
$\boxed{2}$ Route Characteristics					3.2
Depth to Aquifer of Concern	0 1 [✓ 2] 3	2	4	6	
Net Precipitation	0 1 [✓ 2] 3	1	2	3	
Permeability of the Unsaturated Zone	0 1 2 [✓ 3]	1	3	3	
Physical State	0 1 2 [✓ 3]	1	3	3	
	Total Route Characteristics Score		12	15	
$\boxed{3}$ Containment	0 1 [✓ 2] 3	1	2	3	3.3
$\boxed{4}$ Waste Characteristics					3.4
Toxicity/Persistence	0 3 6 9 12 15 [✓ 18]	1	18	18	
Hazardous Waste Quantity	0 1 2 [✓ 3] 4 5 6 7 8	1	3	8	
	Total Waste Characteristics Score		21	26	
$\boxed{5}$ Targets					3.5
Ground Water Use	0 [✓ 1] 2 3	3	3	9	
Distance to Nearest Well/Population Served	[✓ 0] 4 6 8 10 12 16 18 20 24 30 32 35 40	1	0	40	
	Total Targets Score		3	49	
$\boxed{6}$ If line $\boxed{1}$ is 45, multiply $\boxed{1}$ x $\boxed{4}$ x $\boxed{5}$ If line $\boxed{1}$ is 0, multiply $\boxed{2}$ x $\boxed{3}$ x $\boxed{4}$ x $\boxed{5}$			1512	57,330	
$\boxed{7}$ Divide line $\boxed{6}$ by 57,330 and multiply by 100		S_{gw} =	2.64		

FIGURE 2
GROUND WATER ROUTE WORK SHEET

Surface Water Route Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
$\boxed{1}$ Observed Release	[✓ 0] 45	1	0	45	4.1
If observed release is given a value of 45, proceed to line $\boxed{4}$. If observed release is given a value of 0, proceed to line $\boxed{2}$.					
$\boxed{2}$ Route Characteristics					4.2
Facility Slope and Intervening Terrain	[✓ 0] 1 2 3	1	0	3	
1-yr. 24-hr. Rainfall	0 1 [✓ 2] 3	1	2	3	
Distance to Nearest Surface Water	0 1 [✓ 2] 3	2	4	6	
Physical State	0 1 2 [✓ 3]	1	3	3	
	Total Route Characteristics Score		9	15	
$\boxed{3}$ Containment	0 1 [✓ 2] 3	1	2	3	4.3
$\boxed{4}$ Waste Characteristics					4.4
Toxicity/Persistence	0 3 6 9 12 15 [✓ 18]	1	18	18	
Hazardous Waste Quantity	0 1 2 [✓ 3] 4 5 6 7 8	1	3	8	
	Total Waste Characteristics Score		21	26	
$\boxed{5}$ Targets					4.5
Surface Water Use	0 1 [✓ 2] 3	3	6	9	
Distance to a Sensitive Environment	0 1 [✓ 2] 3	2	4	6	
Population Served/Distance to Water Intake Downstream	[✓ 0] 4 6 8 10 12 18 18 20 24 30 32 35 40	1	0	40	
	Total Targets Score		10	55	
$\boxed{6}$ If line $\boxed{1}$ is 45, multiply $\boxed{1}$ x $\boxed{4}$ x $\boxed{5}$ If line $\boxed{1}$ is 0, multiply $\boxed{2}$ x $\boxed{3}$ x $\boxed{4}$ x $\boxed{5}$			3780	64,350	
$\boxed{7}$ Divide line $\boxed{6}$ by 64,350 and multiply by 100		S_{sw} =	5.87		

FIGURE 7
SURFACE WATER ROUTE WORK SHEET

Air Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
$\boxed{1}$ Observed Release	[✓ 0] 45	1	0	45	5.1
Date and Location:					
Sampling Protocol:					
If line $\boxed{1}$ is 0, the S_a = 0. Enter on line $\boxed{5}$. If line $\boxed{1}$ is 45, then proceed to line $\boxed{2}$.					
$\boxed{2}$ Waste Characteristics					5.2
Reactivity and Incompatibility	0 1 2 3	1		3	
Toxicity	0 1 2 3	3		9	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
	Total Waste Characteristics Score			20	
$\boxed{3}$ Targets					5.3
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30	
Distance to Sensitive Environment	0 1 2 3	2		6	
Land Use	0 1 2 3	1		3	
	Total Targets Score			39	
$\boxed{4}$ Multiply $\boxed{1}$ x $\boxed{2}$ x $\boxed{3}$				35,100	
$\boxed{5}$ Divide line $\boxed{4}$ by 35,100 and multiply by 100	S_a = 0				

FIGURE 9
AIR ROUTE WORK SHEET

	S	S^2
Groundwater Route Score (S_{gw})	2.64	6.97
Surface Water Route Score (S_{sw})	5.87	34.51
Air Route Score (S_a)	0	0
$S_{gw}^2 + S_{sw}^2 + S_a^2$	▨	41.47
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$	▨	6.44
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} / 1.73 = S_M =$	▨	3.72

FIGURE 10
WORKSHEET FOR COMPUTING S_M

Fire and Explosion Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
$\boxed{1}$ Containment	1 3	1		3	7.1
$\boxed{2}$ Waste Characteristics					7.2
Direct Evidence	0 3	1		3	
Ignitability	0 1 2 3	1		3	
Reactivity	0 1 2 3	1		3	
Incompatibility	0 1 2 3	1		3	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
	Total Waste Characteristics Score			20	
$\boxed{3}$ Targets					7.3
Distance to Nearest Population	0 1 2 3 4 5	1		5	
Distance to Nearest Building	0 1 2 3	1		3	
Distance to Sensitive Environment	0 1 2 3	1		3	
Land Use	0 1 2 3	1		3	
Population Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Buildings Within 2-Mile Radius	0 1 2 3 4 5	1		5	
	Total Targets Score			24	
$\boxed{4}$ Multiply $\boxed{1}$ x $\boxed{2}$ x $\boxed{3}$				1,440	
$\boxed{5}$ Divide line $\boxed{4}$ by 1,440 and multiply by 100		S_{FE} =	Not scored		

FIGURE 11
FIRE AND EXPLOSION WORK SHEET

Direct Contact Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
$\boxed{1}$ Observed Incident	[✓ 0] 45	1	0	45	8.1
If line $\boxed{1}$ is 45, proceed to line $\boxed{4}$ If line $\boxed{1}$ is 0, proceed to line $\boxed{2}$					
$\boxed{2}$ Accessibility	[✓ 0] 1 2 3	1	0	3	8.2
$\boxed{3}$ Containment	[✓ 0] 15	1	0	15	8.3
$\boxed{4}$ Waste Characteristics Toxicity	0 1 2 [✓ 3]	5	15	15	8.4
$\boxed{5}$ Targets					8.5
Population Within a 1-Mile Radius	0 1 [✓ 2] 3 4 5	4	8	20	
Distance to a Critical Habitat	[✓ 0] 1 2 3.	4	0	12	
Total Targets Score			8	32	
$\boxed{6}$ If line $\boxed{1}$ is 45, multiply $\boxed{1}$ x $\boxed{4}$ x $\boxed{5}$ If line $\boxed{1}$ is 0, multiply $\boxed{2}$ x $\boxed{3}$ x $\boxed{4}$ x $\boxed{5}$			0	21,600	
$\boxed{7}$ Divide line $\boxed{6}$ by 21,600 and multiply by 100		S_{DC} =	0		

FIGURE 12
DIRECT CONTACT WORK SHEET

DOCUMENTATION RECORDS
FOR
HAZARD RANKING SYSTEM

Instructions: As briefly as possible summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference. Include the location of the document.

Facility Name: FMC Corporation Site

Location: 34 Sawyer Avenue, Tonawanda, New York

Date Scored: October 6, 1987

Person Scoring: A. Mark Sienkiewicz

Primary Source(s) of Information (e.g., EPA region, state, FIT, etc.):

New York State Department of Environmental Conservation files
Environmental Protection Agency Region II files
Erie County Department of Environment and Planning files
Ecology and Environment Site Inspection

Factors Not Scored Due to Insufficient Information:

Comments or Qualifications:

Fire and explosion not scored as site has not been declared a fire hazard by a fire marshal.

GROUNDWATER ROUTE

1. OBSERVED RELEASE

Contaminants detected (3 maximum):

No documented release of contaminants

Rationale for attributing the contaminants to the facility:

NA

* * *

2. ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

Perched aquifer in unconsolidated deposits
Ref. No. 9

Depth(s) from the ground surface to the highest seasonal level of the saturated zone [water table(s)] of the aquifer of concern:

35-54 feet
Ref. No. 9

Depth from the ground surface to the lowest point of waste disposal/storage:

12 feet (2 foot cap and 10 foot deep pit)
Ref. No. 9

Net Precipitation

Mean annual or seasonal precipitation (list months for seasonal):

36 in/yr
Ref. No. 1

Mean annual lake or seasonal evaporation (list months for seasonal):

27 in/yr
Ref. No. 1

Net precipitation (subtract the above figures):

36 - 27 = 9 in/yr
Ref. No. 1

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

Odessa Silty Loam
Ref. No. 2

Permeability associated with soil type:

8×10^{-3} to 2×10^{-2} cm/sec
Ref. No. 2

Physical State

Physical state of substances at time of disposal (or at present time for generated gases):

Liquids and solids
Ref. No. 10

* * *

3. CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Natural clay tomb with clay cap, moderately permeable. No leachate collection system.
Ref. No. 9

Method with highest score:

4. WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Hydrogen peroxide, sodium carbonate, sodium persulfate, ammonium bicarbonate, ammonium hydroxide, ammonium sulfate

Compound with highest score:

Ammonium bicarbonate
Ref. Nos. 14, 1

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (give a reasonable estimate even if quantity is above maximum):

100 tons
Ref. Nos. 9, 12

Basis of estimating and/or computing waste quantity:

FMC reported quantity
Ref. Nos. 9, 12

* * *

5. TARGETS

Groundwater Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

Not used. Drinking water from intakes from Lake Erie and Niagara River.
Ref. No. 6

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

>2 miles
Ref. No. 6

Distance to above well or building:

>2 miles
Ref. No. 6

Population Served by Groundwater Wells Within a 3-Mile Radius

Identified water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

None
Ref. No 6

Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):

NA

Total population served by groundwater within a 3-mile radius:

NA

SURFACE WATER ROUTE

1. OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):

No release observed

Rationale for attributing the contaminants to the facility:

NA

* * *

2. ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:

0-3%
Ref. No. 11

Name/description of nearest downslope surface water:

Niagara River
Ref. No. 4

Average slope of terrain between facility and above-cited surface water body in percent:

0-3%
Ref. Nos. 11, 4

Is the facility located either totally or partially in surface water?

No
Ref. No. 11

Is the facility completely surrounded by areas of higher elevation?

No
Ref. No. 11

1-Year 24-Hour Rainfall in Inches

2.1 inches
Ref. No. 1

Distance to Nearest Downslope Surface Water

1,600 feet
Ref. No. 4

Physical State of Waste

Liquid
Ref. No. 9

* * *

3. CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Clay entombed waste, no diversion structures, ditches lead away from site. Adequately covered.
Ref. No. 11

Method with highest score:

Landfill, no diversion system
Ref. No. 1

4. WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Hydrogen peroxide, sodium carbonate, sodium persulfate, ammonium bicarbonate, ammonium hydroxide, ammonium sulfate

Compound with highest score:

Ammonium bicarbonate
Ref. Nos. 1, 14

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (give a reasonable estimate even if quantity is above maximum):

100 tons
Ref. Nos. 9, 12

Basis of estimating and/or computing waste quantity:

FMC reported quantity
Ref. Nos. 9, 12

* * *

5. TARGETS

Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:

Industrial process waters, recreation
Ref. Nos. 11, 6, 3

Is there tidal influence?

No
Ref. No. 3

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

0.8 miles East River Wetland
Ref. No. 5

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

0.3 miles (1,580 feet)
Ref. No. 5

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

>2 miles
Ref. No. 5

Population Served by Surface Water

Location(s) of water-supply intake(s) within 3 miles (free-flowing bodies) or 1 mile (static water bodies) downstream of the hazardous substance and population served by each intake:

>3 miles
Ref. No. 6

Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre):

NA

Total population served:

NA

Name/description of nearest of above water bodies:

NA

Distance to above-cited intakes, measured in stream miles:

NA

AIR ROUTE

1. OBSERVED RELEASE

Contaminants detected:

None detected, no release observed.

Date and location of detection of contaminants:

N/A

Methods used to detect the contaminants:

HNu photoionization detector

Rationale for attributing the contaminants to the site:

N/A

* * *

2. WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:

N/A

Most incompatible pair of compounds:

N/A

Toxicity

Most toxic compound:

Ammonium bicarbonate
Ref. Nos. 1, 14

Hazardous Waste Quantity

Total quantity of hazardous waste:

100 tons
Ref. Nos. 9, 12

Basis of estimating and/or computing waste quantity:

FMC reported quantity
Ref. Nos. 9, 12

* * *

3. TARGETS

Population Within 4-Mile Radius

Circle radius used, give population, and indicate how determined:

0 to 4 mi [✓ 0 to 1 mi] 0 to 1/2 mi 0 to 1/4 mi

782
Ref. No. 13

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

0.8 mile - East River Wetland
Ref. No. 5

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

0.6 mile
Ref. No. 5

Distance to critical habitat of an endangered species, if 1 mile or less:

>2.0 miles
Ref. No. 5

Land Use

Distance to commercial/industrial area, if 1 mile or less:

Adjacent
Ref. Nos. 4, 11

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

>2.0 miles
Ref. Nos. 4, 5, and 11

Distance to residential area, if 2 miles or less:

>2.0 miles
Ref. Nos. 4, 11

Distance to agricultural land in production within past 5 years, if 1 mile or less:

>2.0 miles
Ref. Nos. 2, 16

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

>2.0 miles
Ref. Nos. 2, 16

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

No
Ref. No. 15

FIRE AND EXPLOSION

1. CONTAINMENT

NOT SCORED

Hazardous substances present:

Hydrogen peroxide, sodium bicarbonate, sodium persulfate, ammonium bicarbonate, ammonium hydroxide, ammonium sulfate
Ref. Nos. 9, 12

Type of containment, if applicable

Clay entombed pit
Ref. No. 11

* * *

2. WASTE CHARACTERISTICS

Direct Evidence

Type of instrument and measurements:

N/A

Ignitability

Compound used:

N/A

Reactivity

Most reactive compound:

N/A

Incompatibility

Most incompatible pair of compounds:

N/A

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility:

100 tons
Ref. Nos. 9, 12

Basis of estimating and/or computing waste quantity:

FMC reported quantity
Ref. Nos. 9, 12

* * *

3. TARGETS

Distance to Nearest Population

0.8 mile
Ref. Nos. 4, 11

Distance to Nearest Building

0.1 mile
Ref. Nos. 4, 11

Distance to a Sensitive Environment

Distance to wetlands:

0.6 mile
Ref. No. 5

Distance to critical habitat:

>2.0 miles
Ref. No. 5

Land Use

Distance to commercial/industrial area, if 1 mile or less:

Adjacent
Ref. Nos. 4, 11

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

>2.0 miles
Ref. Nos. 4, 5, 11

Distance to residential area, if 2 miles or less:

>2.0 miles
Ref. Nos. 4, 11

Distance to agricultural land in production within past 5 years, if 1 mile or less:

>2.0 miles
Ref. Nos. 2, 16

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

>2.0 miles
Ref. Nos. 2, 16

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

No
Ref. No. 15

Population Within 2-Mile Radius

18,113
Ref. No. 13

Buildings Within 2-Mile Radius

7,004
Ref. No. 13

DIRECT CONTACT

1. OBSERVED INCIDENT

Date, location, and pertinent details of incident:

No observed incidents.

* * *

2. ACCESSIBILITY

Describe type of barrier(s):

Security (24-hour) and fence.
Ref. No. 11

* * *

3. CONTAINMENT

Type of containment, if applicable:

Clay cover, est. 2 feet
Ref. No. 11

* * *

4. WASTE CHARACTERISTICS

Toxicity

Compounds evaluated:

Hydrogen peroxide, sodium carbonate, sodium persulfate, ammonium bicarbonate, ammonium hydroxide, ammonium sulfate

Compound with highest score:

Ammonium bicarbonate
Ref. Nos. 1, 14

* * *

5. TARGETS

Population within one-mile radius

782 people
Ref. No. 13

Distance to critical habitat (of endangered species)

>2 miles
Ref. No. 5

REFERENCES

If the entire reference is not available for public review in the EPA regional files on this site, indicate where the reference may be found:

Reference Number	Description of the Reference
1	Mitre Corporation, 1982, Uncontrolled Hazardous Waste Site Ranking System, A Users Manual, McLean, Virginia. Document location: E & E, Buffalo, New York.
2	United States Department of Agriculture, Soil Conservation Service, 1986, Soil Survey of Erie County, 1986, Published in Cooperation with Cornell University, Ithaca, NY. Document location: E & E, Buffalo, New York.
3	Niagara River Toxics Committee, October, 1984, Report of the Niagara River Toxics Committee, 1984. Document location: E & E, Buffalo, New York.
4	United States Geological Survey, 1965, Buffalo NW-Ontario Quadrangle, 15-Minute Series (topographic), Washington, D.C. Document location: E & E, Buffalo, New York.
5	Farquar, James, NYSDEC, August 26, 1987, personal communication and review of wetland, sensitive habitat, and floodplain file information, Olean, New York. Document location: NYSDEC, Olean, New York.
6	New York State Department of Health, Division of Environmental Protection, Bureau of Public Water Supply Protection, 1982, New York State Atlas of Community Water Supply Sources, 1982, Albany, New York. Document location: E & E, Buffalo, New York.
7	Wruck, Robert, September 23, 1987, personal communication, Pump Operator - Erie County Water Authority, Van DeWater Station. Document location: E & E, Buffalo, New York.
8	Rescka, Peter, September 23, 1987, personal communication, Erie County Water Authority, Buffalo, New York. Document location: E & E, Buffalo, New York.
9	Erie County Department of Environment and Planning, 1982, Hazardous Waste Site Profile FMC Corporation, Buffalo, New York. Document location: Erie County Department of Environment and Planning Files, Buffalo, New York.
10	Interagency Task Force on Hazardous Wastes, 1979, Draft Report on Hazardous Waste Disposal in Erie and Niagara Counties, New York. Document location: E & E, Buffalo, New York.
11	Ecology and Environment, September 9, 1987, Site Inspection and Photographic Log, Buffalo, New York. Document location: E & E, Buffalo, New York.
12	Yochum, Paul R., September 24, 1987, personal communication, Manager, FMC Corporation. Document location: E & E, Buffalo, New York.
13	General Sciences Corporation, 1986, Graphical Exposure Modeling System (GEMS) Volume 3, Graphics and Geodata Handling, Prepared by the USEPA Office of Pesticides and Toxic Substances Exposure Evaluation Division. Document location: E & E, Buffalo, New York.

References (Continued)

Reference Number	Description of the Reference
14	Irving, N., 1984, Dangerous Properties of Industrial Materials, Van Nostrand Reinhold Co., New York. Document location: E & E, Buffalo, New York.
15	Murtagh, W. J., 1976, The National Register of Historic Places, with Updates from the Federal Register in 1979, 1980, 1981, and 1982, USDI, National Park Service, Washington, DC. Document location: E & E, Buffalo, New York.
16	Whitney, John, August 25, 1987, personal communication, USDA Soil Conservation Service. Document location: E & E, Buffalo, New York.

REFERENCE NO. 1

Uncontrolled Hazardous Waste Site Ranking System

A Users Manual

Kris W. Barrett
S. Steven Chang
Stuart A. Haus
Andrew M. Platt

August 1982

MTR-82W111

SPONSOR:
U.S. Environmental Protection Agency
CONTRACT NO.:
68-01-6278

The MITRE Corporation
Metrek Division
1820 Dolley Madison Boulevard
McLean, Virginia 22102

S 202 5-26 .36

REFERENCE NO. 2

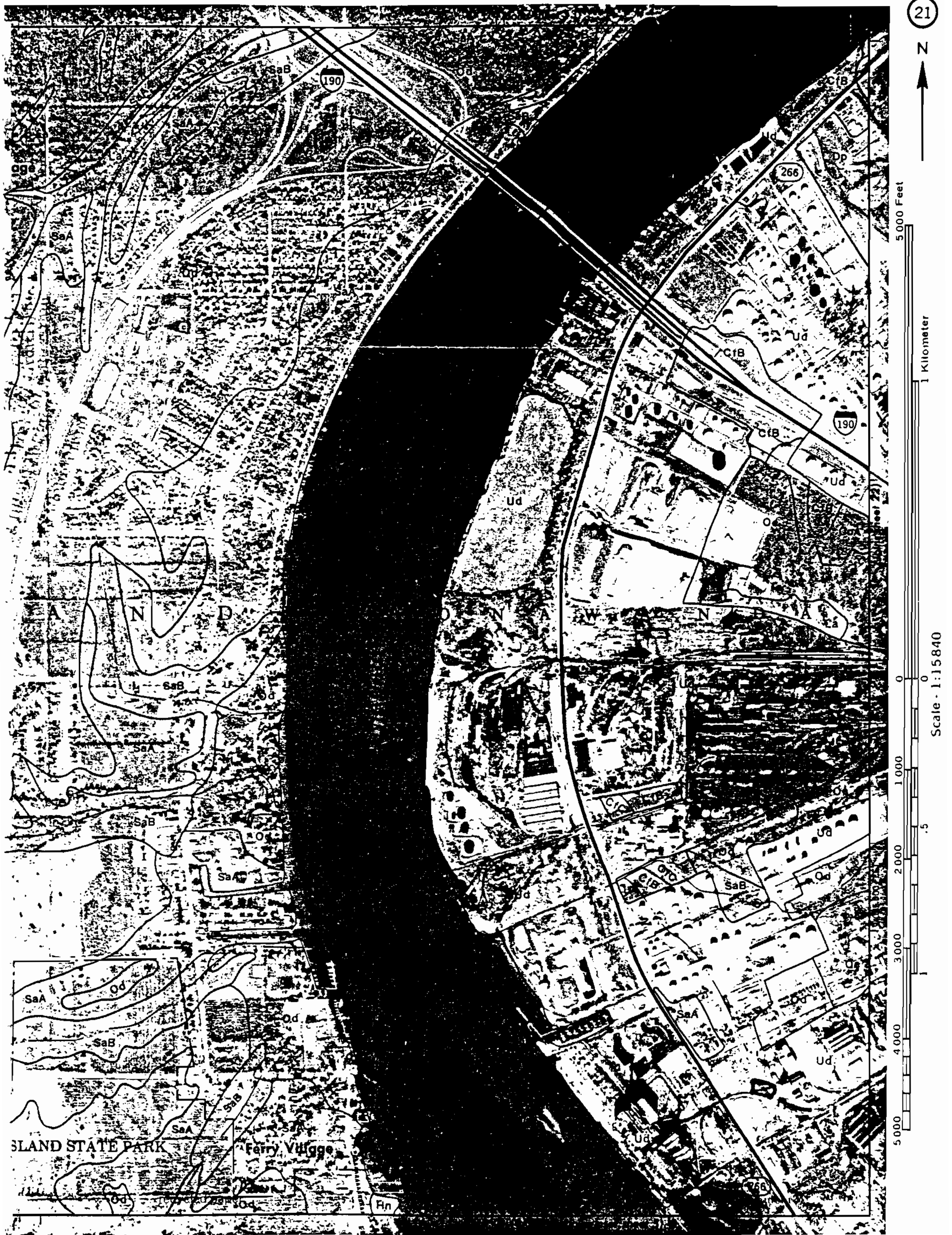
United States
Department of
Agriculture

Soil
Conservation
Service

FMC

In Cooperation with
the Cornell University
Agricultural
Experiment Station

Soil Survey of Erie County, New York


21
N
190
SaB
Od
266
Dp
CtB
Ud
SaA
La
CtB
190
Ud
Od
A N D
O N A W A N D A
SaB
SaA
SaB
Od
SaA
SaB
Od
Ud
SaA
Od
Ud
ISLAND STATE PARK
Ferry Village
Od
Rn
266
5000 Feet
1 Kilometer
Scale - 1:15840
0
1000
2000
3000
4000
5000
.5
0
1

crops and sod crops in the cropping system the surface from scour when flooding occurs. early level soil is well suited to special crops that e irrigation and a stone-free plow layer.

s soil is also well suited to pasture and hay. razing can restrict plant growth and cause the loss pasture seeding. Proper stocking, rotation of res, yearly mowing, and deferment of grazing when oil is wet are the main management concerns. cations of lime are needed for optimum growth of re grasses.

e potential of this soil for wood crops is good. Only all acreage is wooded. There are few limitations for er production. Trees that require acid conditions do on this soil.

ooding is a serious limitation for most urban uses of soil. Where the soil is used for septic tank rption fields, pollution of the water supply can occur ause of flooding and because the substratum is erately to rapidly permeable. Some areas are well ed to recreational uses, such as athletic fields that ire a gravel- and stone-free, nearly level site. This is an excellent source of topsoil.

his Tioga soil is in capability class I.

c—Udorthents, smoothed. These soils formed in p manmade cuts or fills. Most of these areas are r industrial sites, urban developments, or construction s. These soils consist of various kinds of excavated thy material that has been stockpiled for use as fill or dressing, soil and rock material that has been trucked m other areas and leveled, or soil deposits that are in areas that have been excavated or deeply alped. Fill material is variable in composition, but amy, earthy material is dominant. In some places, the is mixed with slag or cinders around abandoned ilroad yards. In other places, the earthy fill contains up 10 percent concrete or asphalt and other trashy astes.

This map unit is mainly nearly level or gently sloping. ome areas are steeper, particularly at the edge of cuts nd along the sides of mounded fill. The areas are ariable in shape, depending mostly on ownership oundaries. They range from 5 to 700 acres or more. The larger areas are in the city of Buffalo and adjacent suburbs near the larger industrial complexes.

Udorthents are too variable to have a typical profile, ut in one of the more common profiles the surface layer s brown or grayish brown very gravelly loamy sand to silty clay loam 1 to 8 inches thick. The substratum is commonly light olive brown, brown, or dark yellowish rown and varies widely in texture from very gravelly loamy sand to silty clay.

Most areas are idle and support scattered weeds and grasses. A few areas have reverted to brush and tree saplings. Some areas, particularly around railroad yards, are used for urban development.

These Udorthents are mostly excessively drained to moderately well drained. Often the fill has been placed on very poorly drained to moderately well drained soils. Texture, stone content, soil reaction, and depth to bedrock vary considerably from one area to another. Bedrock, however, is usually at a depth of more than 5 feet. Depth to the seasonal high water table and permeability are variable and depend on topography, degree of compaction, soil texture, and other related factors.

These cut and fill areas are usually poorly suited to farm or recreational uses. Onsite investigation is essential to determine the feasibility of using areas for any purpose.

These Udorthents have not been assigned a capability subclass.

Ud—Urban land. This map unit is a miscellaneous area in which 80 percent or more of the soil surface is covered by asphalt, concrete, buildings, or other impervious structures. It includes parking lots, shopping and business centers, and industrial parks—in the cities of Buffalo and Lackawanna but also the business districts and adjacent shopping centers of villages in the suburban area near Buffalo. These areas generally range from 3 to 500 acres or more and are mostly nearly level to sloping.

Included in mapping are some landfills that have not been built upon or covered with asphalt. In many of these, several feet of fill has been placed over marshes and flood plains. The included areas range up to 3 acres.

It was not practical to examine and identify the soils underlying these impervious Urban land areas. Careful onsite investigation is necessary to determine the suitability and limitations of any abandoned areas for any proposed use. Some abandoned areas are suitable for asphalt-covered playgrounds or other recreation uses requiring a hard, impervious surface.

These Urban lands have not been assigned a capability subclass.

UeB—Urban land-Benson complex, 3 to 6 percent slopes. This complex is made up of gently sloping areas of Urban land and excessively drained and somewhat excessively drained Benson soils. Some areas of the Benson soils have been graded, scalped, or filled during urbanization. This complex is underlain by shallow limestone bedrock. These areas are generally about 5 to 100 acres. Slopes are long and gradual and are occasionally interrupted by ledges of rock outcrop.

A typical area of this complex is about 60 percent Urban land that is covered by concrete, asphalt, buildings, or other impervious surfaces; about 25 percent undisturbed Benson soils; and 15 percent other soils. Urban land and Benson soils occur together in such an grazing when the soil is wet are the chief management needs.

The potential of this soil for wood crops is good. Uprooting of trees during windstorms, erosion hazard, equipment limitations, and seedling mortality are generally not problems on this soil. Large areas are suited to mechanical planting of seedlings.

The temporary seasonal wetness, low soil strength, poor soil compaction, clayey texture, and slow or very slow permeability are serious limitations for many urban uses of this soil. Subsurface drains around foundations are needed to minimize the wetness. Disturbance of the clayey subsoil during constuction makes it difficult to recompact and can result in uneven settling under a load. The clayey subsoil is erosive, unstable, and difficult to revegetate where exposed or disturbed. Some areas are adequate sites for recreational uses, such as picnic areas and campsites.

This Schoharie soil is in capability subclass IIw.

SaB—Schoharie silt loam, 3 to 8 percent slopes. This gently sloping soil is deep and well drained to moderately well drained. It formed in reddish glacial lake sediments that are high in clay. This soil is on convex parts of shoulder slopes that parallel dissected drainageways on the lowland lake plain. It is also on convex knolls and ridges. Areas of this soil are large and irregular in shape and range from 3 to 200 acres or more, but areas of 5 to 75 acres are most common.

Typically, this soil has a surface layer of dark brown silt loam 9 inches thick. The subsoil extends to a depth of 31 inches. It is brown silty clay loam in the upper part; reddish brown silty clay in the middle; and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches is reddish brown silty clay and clay varved with silt.

Included with this soil in mapping are small intermingled areas of the Odessa, Lakemont, Niagara, and Collamer soils. The somewhat poorly drained Odessa soils are along drainageways, on foot slopes, and in nearly level spots. The Lakemont soils are poorly drained and are in small depressions and along deeply dissected drainageways. The Niagara and Collamer soils are in scattered areas and are more silty and less clayey than this Schoharie soil. Also included are some soils that formed in loamy glacial till deposits 3 to 5 feet thick. Areas of included soils range up to 3 acres.

From March through May this Schoharie soil has a perched seasonal high water table that rises into the lower part of the subsoil. Permeability is slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is medium. There is generally no gravel in the soil. Bedrock is at a depth of 5 feet or more. Unless limed, the soil is medium acid to neutral in the surface layer.

This soil is moderately suited to farming, but has limitations for urban uses. Current land use includes urban development and farming, and some areas of this soil are idle.

This Schoharie soil is moderately suited to cultivated crops. Sheet erosion and gullying are serious hazards in intensively cultivated areas. Puddling and crusting of the surface layer are likely, particularly if the soil is tilled when wet. Temporary wetness in the spring can delay normal tillage. Keeping tillage to a minimum, using cover crops, tilling across slopes, and rotating crops improve tilth, help maintain the organic matter content, and control erosion. The efficiency of many fields is improved by subsurface drainage of included wet spots.

This soil is suited to hay and pasture. Grazing when the soil is wet causes soil compaction and puddling and restricts forage growth. Overgrazing can lead to the eventual loss of the pasture seeding and can increase the erosion hazard. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing when the soil is wet are the chief management needs.

The potential of this soil for wood crops is good. Uprooting of trees during windstorms, erosion hazard, equipment limitations, and seedling mortality are generally not problems on this soil. Placing logging trails across the slope reduces the hazard of trail gullying.

The temporary seasonal wetness, low soil strength, poor soil compaction, clayey texture, and slow or very slow permeability are serious limitations for many urban uses of this soil. Subsurface drains around foundations are needed to minimize wetness. Interceptor drains placed upslope from buildings divert surface runoff and seepage and also minimize the wetness. Disturbance of the clayey subsoil during construction makes it difficult to recompact and can cause it to settle unevenly under a load. The clayey subsoil is erosive, unstable, and difficult to revegetate when exposed or disturbed. Some areas are adequate sites for recreational uses, such as picnic areas and campsites.

This Schoharie soil is in capability subclass IIe.

SbC3—Schoharie silty clay loam, 8 to 15 percent slopes, severely eroded. This sloping soil is deep and well drained to moderately well drained. It formed in reddish glacial lake sediments that are high in clay. This soil is on convex side of dissected drainageways on the lake plain. Much of the original surface layer has been mixed with the subsoil by erosion. In many places rills and small gullies are common. Areas of this soil are mostly elongated and range from 3 to 75 acres, but areas of 5 to 30 acres are most common.

Typically, this soil has a surface layer of brown silty clay loam 9 inches thick. The subsoil extends to a depth of 31 inches. It is brown silty clay loam in the upper part; reddish brown silty clay in the middle; and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches is reddish brown silty clay and clay varved with silt.

surface layer. Reaction ranges from strongly acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

Seasonal wetness, slow permeability in the substratum, and instability of cut banks limit many uses of this soil. This soil is used for various purposes, including residential and commercial development, farming, and woodland. Many areas are idle.

This Niagara soil is not well suited to farming, unless drained. Erosion is not a problem on this nearly level soil, but it tends to puddle and compact if tilled when wet. In some areas drainage is difficult to install because of the nearly level slopes, instability of cut banks, and lack of suitable outlets. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for most crops grown in the county except early-market and long-season varieties. Keeping tillage to a minimum, using cover crops, including grasses and legumes in the cropping system, and plowing at the proper soil moisture level help maintain good tilth.

Without adequate drainage, this soil is best suited to hay and pasture plants that can withstand seasonal wetness. Grazing when the soil is wet is the major concern of pasture management. It causes soil compaction, restricts plant growth, and can lead to the loss of the pasture grasses. Restricting grazing in wet periods, rotational grazing, and yearly mowing are desirable practices.

The potential of this soil for wood crops is fair. Seasonal wetness limits the use of planting and harvesting equipment and increases seedling mortality. Trees rooted in this soil are generally able to withstand all but excessive windstorms. Trees that can withstand seasonal wetness are best suited to this soil.

The seasonal high water table, poor soil compaction, and slow permeability in the loamy substratum are serious limitations for most urban uses of this Niagara soil. If storm sewers or other outlets are available, drains can be installed around foundations to minimize the seasonal wetness. This soil has much greater stability and strength than the other Niagara soils because the substratum is loamy glacial till. Because this soil has a high silt content, frost may damage roads and dwellings without basements.

This Niagara soil is in capability subclass IIIw.

Od—Odessa silt loam. This nearly level soil is deep and somewhat poorly drained. This soil is high in clay content and is on broad, flat plains in the northern part of the county. These plains were formerly the bottoms of glacial lakes. This soil generally is on interfluves between streams and intermittent drainageways. Slope is 0 to 3 percent. Areas of this soil are large and irregular in shape and roughly parallel the streams. Areas range from 5 to 200 acres or more.

Typically, this soil has a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsoil extends to a depth of 22 inches. It is mottled, pinkish gray silty clay in the upper part and mottled, reddish brown silty clay in the lower part. The substratum to a depth of 60 inches is varved, reddish brown, gray, reddish gray, and weak red silty clay.

Included with this soil in mapping are small areas of the Lakemont, Schoharie, Niagara, Churchville, and Cosad soils. The Lakemont soils are wetter than this Odessa soil; the Schoharie soils are on small rises on the landscape; the Niagara soils are more silty than this Odessa soil; the Churchville soils are underlain by stony glacial till at a depth of 20 to 40 inches; and the Cosad soils have a 20- to 40-inch sandy overburden underlain by clayey lake sediments. Areas of included soils range up to 3 acres.

From December through May the Odessa soils have a perched water table in the upper part of the subsoil. Permeability is slow or very slow in the subsoil and substratum. The available water capacity is moderate to high, and runoff is slow. There is usually no gravel in the soil. Bedrock is at a depth of 5 feet or more. In unlimed areas, reaction ranges from medium acid to neutral in the surface layer and from medium acid to mildly alkaline in the subsoil.

This soil has limited suitability for farm and urban uses. Current land use includes urban and suburban residential and commercial development and farming. Some areas are idle.

Seasonal wetness limits the suitability of this Odessa soil for cultivated crops. Erosion does not present a problem, but puddling and soil compaction are likely in wet seasons. Keeping tillage to a minimum, using cover crops, and including grasses and legumes in the cropping system improve tilth and maintain or improve crop yields. Artificial drainage is difficult to install because the soil is nearly level, and drains must be closely spaced because percolation is slow. With adequate drainage and maintenance of tilth and fertility, this soil is suitable for crops grown in the county except early-market and long-season varieties.

Without adequate drainage this soil is best suited to hay and pasture. Grazing when the soil is wet is the major concern of pasture management. It causes soil compaction, restricted plant growth, and the loss of the pasture seeding. Proper stocking, rotation of pastures, yearly mowing, and deferment of grazing during wet periods are the chief management needs.

The potential of this soil for wood crops is fair to good. Seasonal wetness is a limitation to equipment use. Trees rooted in this soil are able to withstand all but excessively strong winds. Without intensive site preparation and maintenance, plant competition will prevent regeneration of conifers.

The seasonally perched water table, low soil strength, poor soil compaction, clayey textures, and slow or very slow permeability are serious limitations for many urban uses of this soil (fig. 7). Septic tank absorption fields

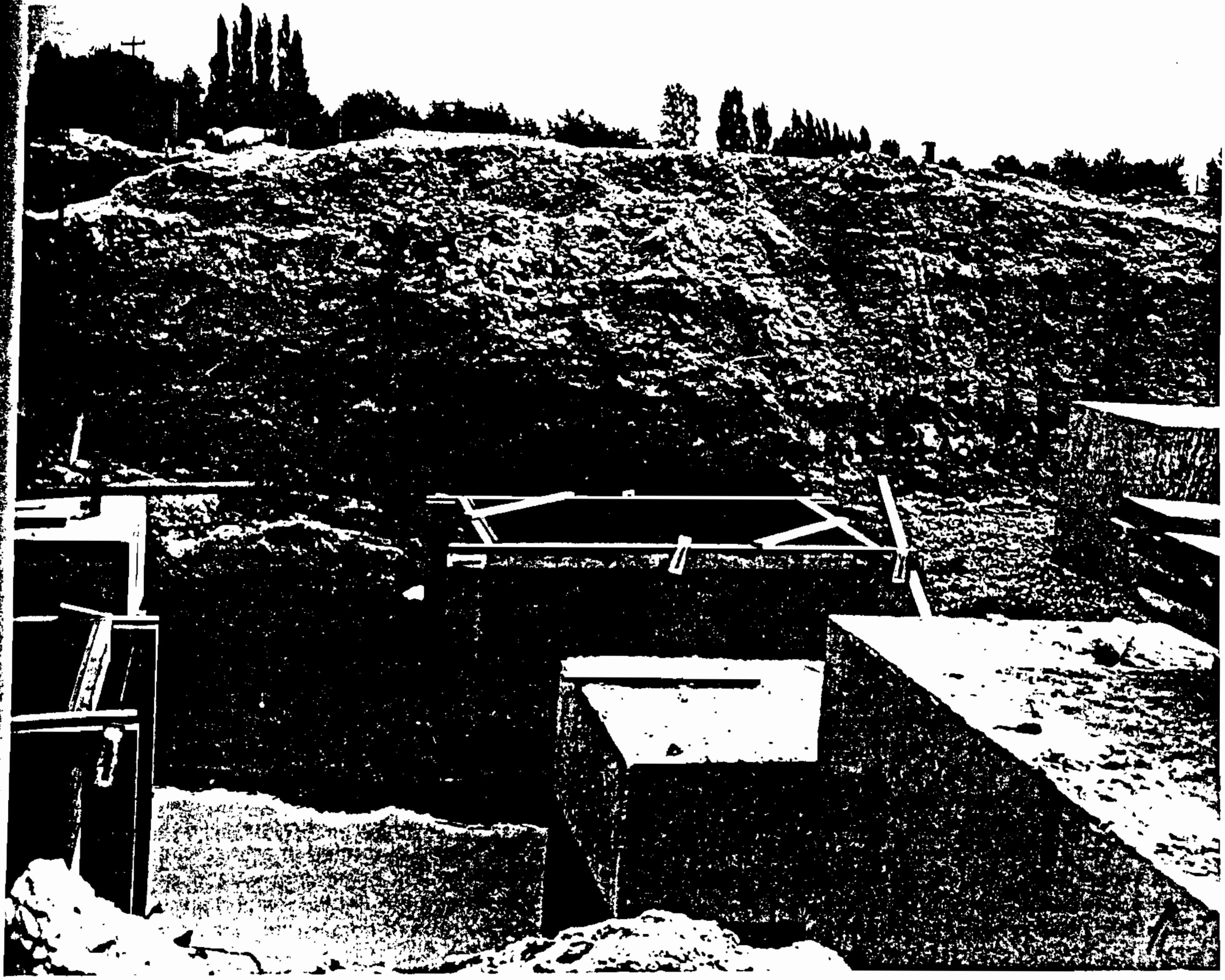


Figure 7.—The seasonal high water table in these Odessa silt loam soils is a limitation for basements. Excavated material in the background is on the original soil surface.

need to be specially designed and installed because of the seasonal wetness and slow permeability of the soil. Basements are difficult to keep dry. Where the clayey subsoil is disturbed during construction, the soil is difficult to vegetate. This soil is a poor source of roadfill because of its low strength and high clay content. Some areas provide good sites for dugout ponds; but if the ponds are used for irrigation, they tend to refill slowly.

This Odessa soil is in capability subclass IIIw.

Oe—Odessa-Lakemont silt loams. This complex consists of the nearly level, somewhat poorly drained Odessa soil and poorly drained Lakemont soil in broad, flat areas that were the bottoms of glacial lakes. The two soils differ only slightly in elevation; the Odessa soil is about a foot or so above the Lakemont soil. This complex generally is on broad interfluves between major and intermittent drainageways. Areas of this complex are mainly irregular in shape, but they are roughly elongated when parallel to drainageways. Slope ranges from 0 to 3 percent. Individual areas range from 5 to 200 acres or more.

This complex is about 65 percent Odessa silt loam, 30 percent Lakemont silt loam, and 5 percent other soils. The Odessa and Lakemont soils form such an intricate

Organic matter
Pct
3-15
10-20
1-5
1-5
3-7
3-7
3-7
2-6
3-7
3-7
3-6
3-10
2-6
2-6

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

il name and p symbol	Depth	Clay <0.002mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
----------	0-14	15-25	1.20-1.50	0.6-2.0	0.17-0.22	5.1-7.3	Low----------	0.49	3	2-6
gara	14-40	18-35	1.20-1.50	0.2-0.6	0.16-0.20	5.6-7.8	Low----------	0.43		
	40-60	8-35	1.7-1.95	0.06-0.6	0.08-0.13	6.6-8.4	Low----------	0.28		
----------	0-9	20-40	1.00-1.25	0.2-0.6	0.17-0.21	5.6-7.3	Moderate-----	0.49	3	3-9
essa	9-22	35-60	1.20-1.40	<0.2	0.12-0.17	5.6-7.8	Moderate-----	0.28		
	22-60	35-60	1.15-1.40	<0.2	0.12-0.14	7.4-8.4	Moderate-----	0.28		
:										
essa----------	0-9	20-40	1.00-1.25	0.2-0.6	0.17-0.21	5.6-7.3	Moderate-----	0.49	3	3-9
	9-22	35-60	1.20-1.40	<0.2	0.12-0.17	5.6-7.8	Moderate-----	0.28		
	22-60	35-60	1.15-1.40	<0.2	0.12-0.14	7.4-8.4	Moderate-----	0.28		
kemont--------	0-9	20-40	1.00-1.25	0.2-0.6	0.17-0.21	6.1-7.3	Moderate-----	0.49	3	3-10
	9-29	35-60	1.20-1.40	<0.06	0.12-0.17	6.1-7.3	Moderate-----	0.28		
	29-60	35-60	1.15-1.40	<0.06	0.12-0.14	7.4-8.4	Moderate-----	0.28		
, OrB, OrC----	0-9	18-35	1.10-1.40	0.6-2.0	0.14-0.21	4.5-5.5	Low----------	0.37	3	3-7
park	9-27	18-35	1.20-1.60	0.06-0.6	0.14-0.20	4.5-5.5	Low----------	0.37		
	27	---	---	---	---	---	-------------	----		
, OvB---------	0-10	15-35	1.00-1.25	0.6-2.0	0.13-0.21	5.6-6.5	Low----------	0.37	3	2-7
id	10-20	28-35	1.20-1.40	0.2-0.6	0.09-0.16	5.6-7.3	Moderate-----	0.37		
	20-60	28-35	1.60-1.80	0.06-0.2	0.11-0.17	7.4-8.4	Low----------	0.28		
------------	0-38	---	0.25-0.45	0.2-6.0	0.35-0.45	5.1-8.4	-------------	----	---	>75
lms	38-60	7-35	1.46-2.00	0.2-2.0	0.14-0.22	6.1-8.4	Low----------	----		
, PbB---------	0-9	10-27	1.10-1.40	0.6-2.0	0.10-0.16	5.6-7.3	Low----------	0.24	3	3-7
lmyra	9-28	10-35	1.25-1.55	0.6-2.0	0.07-0.15	6.1-7.8	Low----------	0.28		
	28-60	0-5	1.45-1.65	>20	0.01-0.02	7.4-8.4	Low----------	0.17		
------------	0-10	18-35	1.20-1.50	0.2-0.6	0.15-0.21	4.5-5.5	Low----------	0.37	3	3-8
tchin	10-23	18-35	1.40-1.70	0.06-0.2	0.14-0.20	4.5-5.5	Low----------	0.37		
	23	---	---	---	---	---	-------------	----		
, PhB---------	0-10	10-28	1.10-1.40	0.6-2.0	0.10-0.16	5.6-7.3	Low----------	0.24	3	3-6
helps	10-15	18-35	1.25-1.55	0.6-2.0	0.08-0.13	5.6-7.3	Low----------	0.28		
	15-32	18-35	1.25-1.55	0.6-2.0	0.09-0.18	5.6-7.3	Low----------	0.28		
	32-60	1-5	1.45-1.65	2.0-20	0.01-0.04	7.4-8.4	Low----------	0.17		
, Pu.										
its										
*.										
uarries										
, RaB---------	0-8	3-16	1.2-1.5	0.6-2.0	0.20-0.25	5.1-7.3	Low----------	0.49	3	---
aynham	8-26	3-16	1.2-1.5	0.2-2.0	0.18-0.22	5.1-7.3	Low----------	0.64		
	26-60	3-16	1.2-1.5	0.06-0.2	0.18-0.22	5.6-8.4	Low----------	0.64		
------------	0-10	8-18	1.10-1.40	0.6-2.0	0.14-0.19	5.1-6.5	Low----------	0.49	3	3-12
ed Hook	10-23	5-18	1.25-1.55	0.6-2.0	0.04-0.17	5.6-7.8	Low----------	0.43		
	23-60	5-18	1.45-1.65	0.6-2.0	0.04-0.11	6.1-8.4	Low----------	0.20		
A, RfB, RfC----	0-9	20-40	1.10-1.40	0.6-2.0	0.16-0.21	5.1-6.5	Moderate-----	0.43	3	3-6
emsen	9-36	40-60	1.60-1.85	<0.06	0.12-0.14	5.6-7.8	Moderate-----	0.28		
	36-60	40-60	1.60-1.85	<0.06	0.10-0.14	7.4-8.4	Moderate-----	0.28		
A, RgB, RhC3---	0-9	15-40	1.00-1.25	0.2-0.6	0.16-0.21	5.1-7.3	Moderate-----	0.49	3	3-7
hinebeck	9-37	35-60	1.20-1.40	0.06-0.2	0.12-0.14	5.1-7.8	Moderate-----	0.28		
	37-70	35-60	1.15-1.40	0.06-0.2	0.12-0.14	6.1-8.4	Moderate-----	0.28		
A, RkB---------	0-9	15-40	1.00-1.25	0.2-0.6	0.11-0.15	5.1-7.3	Moderate-----	0.37	3	3-7
hinebeck	9-37	35-60	1.20-1.40	0.06-0.2	0.12-0.14	5.1-7.8	Moderate-----	0.28		
	37-70	35-60	1.15-1.40	0.06-0.2	0.12-0.14	6.1-8.4	Moderate-----	0.28		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <0.002mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm3	In/hr	In/In	pH				Pct
RmA, RmB----------	0-8	15-40	1.00-1.25	0.2-0.6	0.16-0.21	5.1-7.3	Moderate-----	0.49	3	3-7
Rhinebeck	8-38	35-60	1.20-1.40	0.06-0.2	0.12-0.14	5.1-7.8	Moderate-----	0.28		
	38-46	35-60	1.15-1.40	0.06-0.2	0.12-0.14	6.1-8.4	Moderate-----	0.28		
	46-60	1-10	1.25-1.55	2.0-6.0	0.04-0.06	6.1-8.4	Low-----------	0.17		
	60-80	18-27	1.60-1.95	0.06-0.2	0.08-0.13	6.1-8.4	Moderate-----	0.28		
Ro*.										
Rock outcrop										
SaA, SaB, SbC3---	0-9	20-40	1.00-1.25	0.2-0.6	0.17-0.21	5.6-7.3	Moderate-----	0.49	3	3-6
Schoharie	9-31	35-60	1.20-1.40	<0.2	0.12-0.17	5.6-7.8	Moderate-----	0.28		
	31-60	35-60	1.15-1.40	<0.2	0.12-0.14	7.4-8.4	Moderate-----	0.28		
ScD, ScE----------	0-6	10-27	1.10-1.40	0.6-2.0	0.12-0.19	3.6-6.0	Low-----------	0.37	3	2-6
Schuyler	6-42	18-35	1.20-1.50	0.2-2.0	0.11-0.18	3.6-6.0	Low-----------	0.37		
	42-48	18-35	1.70-1.95	0.06-0.6	0.09-0.18	3.6-6.0	Low-----------	0.28		
	48	---	---	---	---	---	-------------	----		
Sd---------------	0-10	2-15	1.2-1.5	0.6-2.0	0.18-0.21	4.5-6.0	Low-----------	0.49	3	2-8
Scio	10-42	2-15	1.2-1.5	0.6-2.0	0.17-0.20	4.5-6.0	Low-----------	0.64		
	42-60	0-5	1.45-1.65	2.0-20.0	0.02-0.19	5.1-7.8	Low-----------	0.17		
Sw---------------	0-8	18-35	1.20-1.50	0.2-0.6	0.17-0.22	5.1-7.3	Low-----------	0.49	3	3-6
Swormville	8-20	18-35	1.55-1.70	0.06-0.6	0.15-0.17	5.6-7.3	Low-----------	0.43		
	20-26	5-20	1.60-1.75	2.0-6.0	0.03-0.08	6.1-7.8	Low-----------	0.17		
	26-60	0-10	1.60-1.75	2.0-6.0	0.02-0.08	6.6-8.4	Low-----------	0.17		
Te---------------	0-9	8-18	1.15-1.40	0.6-2.0	0.18-0.21	5.1-7.3	Low-----------	0.49	3	2-6
Teel	9-48	5-18	1.15-1.45	0.6-2.0	0.17-0.19	5.1-7.8	Low-----------	0.49		
	48-60	3-10	1.25-1.55	0.6-2.0	0.12-0.19	5.6-7.8	Low-----------	0.49		
To---------------	0-10	5-18	1.15-1.40	0.6-6.0	0.15-0.21	5.1-7.3	Low-----------	0.49	4	2-6
Tioga	10-43	5-18	1.15-1.45	0.6-6.0	0.07-0.20	5.1-7.3	Low-----------	0.37		
	43-60	3-15	1.25-1.55	0.6-20	0.02-0.20	5.6-7.8	Low-----------	0.37		
Uc*.										
Udorthents										
Ud*.										
Urban land										
UeB*:										
Urban land.										
Benson----------	0-6	10-17	1.10-1.40	0.6-2.0	0.12-0.18	5.6-7.3	Low-----------	0.28	2	2-6
	6-15	10-17	1.20-1.50	0.6-2.0	0.08-0.16	6.1-7.8	Low-----------	0.28		
	15	---	---	---	---	---	-------------	----		
Uf*:										
Urban land.										
Canandaigua-----	0-9	18-35	1.00-1.25	0.6-2.0	0.20-0.35	5.6-7.8	Low-----------	0.49	3	4-15
	9-37	18-35	1.20-1.40	0.2-0.6	0.19-0.20	6.1-7.8	Low-----------	0.49		
	37-60	18-35	1.15-1.40	0.2-0.6	0.19-0.20	6.6-8.4	Low-----------	0.49		
Ug*:										
Urban land.										
Cayuga----------	0-10	10-35	1.00-1.25	0.6-2.0	0.15-0.21	5.6-7.3	Low-----------	0.49	3	2-6
	10-26	28-40	1.20-1.40	0.06-0.2	0.11-0.17	5.6-7.8	Low-----------	0.28		
	26-60	5-40	1.60-1.85	0.06-0.2	0.08-0.18	6.6-8.4	Low-----------	0.28		
Uh*:										
Urban land.										
Churchville-----	0-11	15-35	1.00-1.25	0.6-2.0	0.16-0.21	5.6-7.3	Low-----------	0.49	3	2-6
	11-26	40-60	1.20-1.40	<0.2	0.13-0.17	6.1-7.8	Moderate-----	0.28		
	26-60	15-40	1.50-1.80	<0.2	0.07-0.17	7.4-8.4	Low-----------	0.28		

See footnote at end of table.

REFERENCE NO. 3

REPORT OF

The Niagara River Toxics Committee

OCTOBER 1984

recycled paper

FROM: The Niagara River Toxics Committee

TO: Mr. C. Daggett, Regional Administrator, Region II
U.S. Environmental Protection Agency
New York, N.Y.

Mr. J.W. Giles, Associate Deputy Minister
Ontario Ministry of the Environment
Toronto, Ontario

Dr. J.D. Kingham, Regional Director General
Ontario Region, Environment Canada
Toronto, Ontario

Mr. H. Williams, Commissioner
N.Y. State Department of Environmental Conservation
Albany, New York

Gentlemen:

The Niagara River Toxics Committee is pleased to submit, herewith, its final report and associated summary. The report is a comprehensive and detailed review of the project studies and their results. It assesses toxic chemicals and their sources, reviews toxic chemical control programs, recommends improvement to these programs and proposes a long term monitoring program. The summary highlights the general findings of the Committee and includes the Committee's recommendations.

Respectfully submitted, October 1984.

E. Tony Wagner
E.T. Wagner
Co-Chairman
Environment Canada

Robert L. Collin
R.L. Collin
Co-Chairman
N.Y. State Dept. of Env. Conservation

Peter Crabtree
P.J. Crabtree
Ontario Ministry of the Environment

V.J. Saulys
U.S. Environmental Protection Agency

D.J. Pascoe
Environment Canada

J.C. McMahon
N.Y. State Dept. of Env. Conservation

F.C. Fleischer
Ontario Ministry of the Environment

Roland B. Hemmett
R.B. Hemmett
U.S. Environmental Protection Agency

1.1 Pollution in the Niagara River

On its route from Lake Erie to Lake Ontario, the Niagara River passes through a complex of steel, petrochemical, and chemical manufacturing industries. The Niagara Frontier's proximity to a source of cheap electrical power and water for use in industrial processing has caused it to become a highly industrialized area, particularly on the U.S. side.

Historically, decisions about the development of the Niagara Frontier have been based solely on economic factors, such as the creation of jobs and the production of cheaper materials. These decisions have proven to be the cause of environmental problems both in the Niagara River and the surrounding area.

More recently, environmental degradation and its impact on human health has become a prevailing consideration in decisions regarding use and management of the Niagara River. Over the last decade, high levels of bacteria, phenols, oil, iron, phosphorus, chloride, mercury, and color have been reduced significantly.

Currently, toxic substances and their effects on human health and the ecosystem are being focussed on. Major toxic waste disposal sites have been identified along the Niagara River corridor, and toxic substances have been measured in the effluents of industrial and municipal facilities discharging into the river.

With increased research, the link between the discharge of toxic substances into the Niagara River and the subsequent effects on the ecosystem has become more clear. In some cases, conditions in Lake Ontario can be attributed directly to substances from the Niagara River; the occurrence of mirex and dioxin in Lake Ontario fish is an example of such a direct relationship. Certain species of fish from specific areas of the lake are banned for commercial fishing as a result of mirex and PCB levels, attributable, in part, to Niagara River contaminants. In other cases, the linkage is less direct but nonetheless real; chemicals originating in the Niagara River combine with other sources to Lake Ontario to contaminate the water, sediment, and biota in the lake.

The presence of toxic chemicals in the Niagara River is not new; these substances have probably been in the river for years. The development of more sophisticated analytical equipment and methodology has led to greater detection capability, enabling scientists to find chemicals at very low concentrations. Unfortunately, the ability to detect these compounds has outstripped our ability to correlate their concentrations with direct adverse effects on human health and the environment.

Existing long term data show a decline in many contaminants, and, for the chemicals for which drinking water standards exist, monitoring shows that they are within current Canadian and United States limits. The development of drinking water standards is an on-going process, however, and there are chemical compounds presently being identified in the Niagara River for which no standards have as yet been established.

Many members of the public feel that there has been a lack of government concern and action in assessing and solving the problems in the Niagara River. In fact, pollution in the Niagara River has been a major concern of federal, state and provincial governments since the early 1950's.

Millions of dollars have been, and are continuing to be spent by government and industry in implementing clean-up programs, determining the effectiveness of river clean-up programs, and identifying additional contamination sources requiring action. Significant progress has already been made in alleviating the sources of many of the earlier problems, largely through the control of municipal and industrial waste discharges.

A continuing effort is now being directed at solving the more complex problems of toxic substance contamination in the Niagara River. In many cases, the scientific basis for understanding the environmental and human health significance of these chemical compounds, either individually or in combination, does not exist and will have to be developed. This is by no means an easy or inexpensive task, nor can it be accomplished in a short time frame. In the mean time, responsible Canadian and U.S. agencies have accepted the premise that they will have to make decisions regarding the control of toxic substances in the absence of all the evidence that might be scientifically desirable.

In summary, the occurrence of toxic chemicals in the Niagara River is a major public concern in both countries. While much has been accomplished, toxic substances remain a problem. The task is to assess what is there, identify the sources, implement additional appropriate abatement strategies, and monitor the effectiveness of these strategies.

1.2 The Niagara River Toxics Committee

The mutual concern of both Canadian and United States environmental agencies regarding the water quality of the Niagara River resulted in a decision to cooperate in a joint investigation of toxic chemicals entering the Niagara River. There had been previous investigations and reports on water quality in the river; however, no investigation had attempted a coordinated study on toxic substances pollution. In February, 1981, the Niagara River Toxics Committee (NRTC) was established to oversee and coordinate such a program. The committee consisted of representatives from:

- Environment Canada
- Ontario Ministry of the Environment
- United States Environmental Protection Agency
- New York State Department of Environmental Conservation

The Committee was co-chaired by representatives of Environment Canada and the New York State Department of Environmental Conservation. Funding for the investigation was provided by the four cooperating agencies.

River Toxics Committee. The Sub-committee findings and recommendations are contained in a report which has been published separately[1]. Data quality discussions are included in all appropriate chapters of this report.

1.3 The Niagara River - Background and Overview

1.3.1 General Description

The 58 kilometre (37 mile) Niagara River, with an average flow of 5,700 cubic metres per second (cms) or 200,000 cubic feet per second (cfs), connects Lake Erie to Lake Ontario. Divided into the upper and lower reaches by Niagara Falls, it provides 83 percent of the total tributary flow to Lake Ontario. The river drains an area of about 227,000 square kilometres (88,000 square miles). Between Lake Erie and Lake Ontario, the river drops about 100 metres (328 feet) with about one-half of the drop occurring at Niagara Falls.

For both Canada and the United States, the Niagara River provides municipal and industrial water supplies and a source of power generation, commerce, recreation, and tourism.

As a source of municipal drinking water, it serves a combined Canadian/United States population of more than 400,000 people. The City of Buffalo municipal water plant, which obtains water at the junction of Lake Erie and the Niagara River, services an additional 530,000 people. The river, in return, receives the treated waste from these same populations.

From Lake Erie to Strawberry Island (off the southern tip of Grand Island), a distance of about eight kilometres (5 miles), the Niagara River drops about two metres (6 feet). At Strawberry and Grand Islands, the river divides into two channels, the Chippawa Channel and the Tonawanda Channel, located west and east of Grand Island, respectively.

---

[1] Niagara River Toxics Committee, Data Quality Sub-committee, <u>Final Report to the Niagara River Toxics Committee</u>, March, 1984.

The Chippawa Channel is approximately 18 kilometres (11 miles) long and carries about 57 percent of the total river flow, while the Tonawanda Channel is about 24 kilometres (15 miles) long and carries the remaining portion of the river flow. During the navigation season (April/May through November/December), the New York State Barge Canal withdraws water from the Tonawanda Channel at Tonawanda, New York and discharges it into Lake Ontario at several points in the State of New York. Average diversions by the Barge Canal in recent years during the navigation period have been about 30 cms (1100 cfs).

At the north end of Grand Island, the Chippawa and the Tonawanda Channels unite to form the Chippawa-Grass Island Pool. The fall between Strawberry Island and the Pool is about one metre (3 feet).

In 1950, Canada and the United States signed the Niagara River Treaty to preserve the scenic spectacle of Niagara Falls, and to make more efficient use of the Niagara River for power generation purposes. To fulfill the objectives of the Niagara River Treaty, Ontario Hydro and the New York Power Authority constructed a control structure at the lower end of the Chippawa-Grass Island Pool. The structure consists of eighteen gates and extends from the Canadian shore part way across the river. It is operated by the two power entities under the direction of the International Joint Commission's International Niagara Board of Control.

The Niagara River Treaty requires that a minimum flow of 2830 cms (100,000 cfs) be maintained over the Falls during the daylight hours of the tourist season (April through October). At all other times, the minimum required flow over the Falls is 1410 cms (50,000 cfs). The control structure permits a relatively quick change over from daylight to night-time flow (and vice versa) during the tourist season. It also regulates the water level in the Chippawa-Grass Island Pool to facilitate power diversions within limits established by the Niagara Board. The present procedure requires that the water level in the Pool be maintained as nearly as may be practicable to its long-term average elevation of 170.99 metres (561 feet) . The operation of the control structure has a negligible effect on the outflows of Lake Erie.

The Canadian plants include the Canadian Niagara, Ontario Power, and Sir Adam Beck I and II Power Plants. Total Canadian diversion capability is about 2350 cms (84,000 cfs). The Robert Moses Niagara Plant is the only plant on the Niagara River in the United States and has a diversion capacity of about 3115 cms (110,000 cfs). Each of these power plants withdraws water from the upper Niagara River and discharges it downstream of Niagara Falls. During the tourist season, the additional water made available for power purposes during night-time hours is diverted and stored in the pump-storage reservoirs and released during the daylight hours when the power demand is high. This is also the case during the non-tourist season, when the additional water is available on a continuous basis. The excess water is stored during periods of lower energy demand, such as nights and week-ends, and released during periods of high energy demand. Thus, there is a persistent within-the-day variation in flow in the lower Niagara River between the Falls and Queenston, Ontario, due to discharge from these plants.

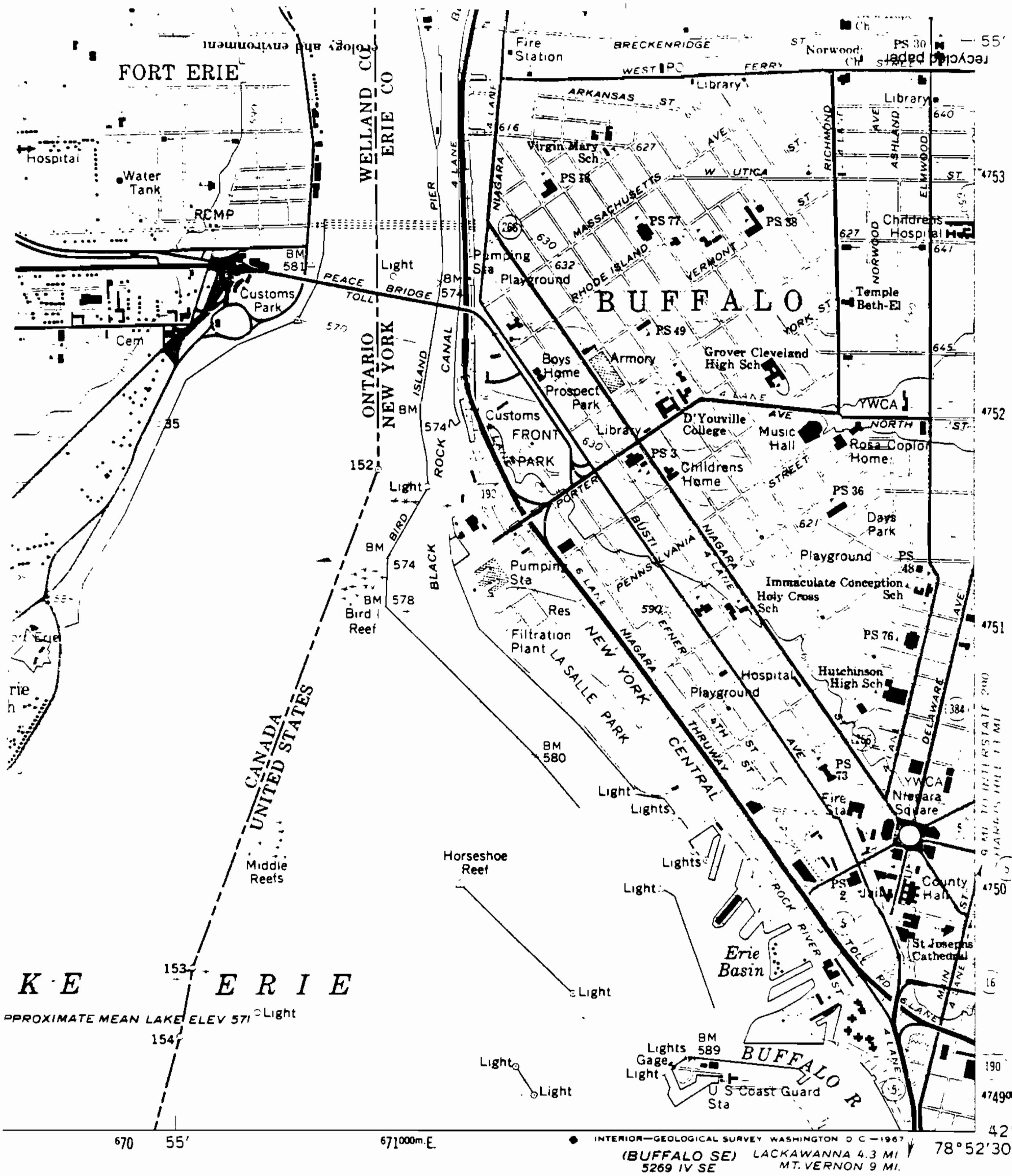
At Niagara Falls, water drops about 56 metres (182 feet) over the Falls into the Maid-of-the-Mist Pool. In the next five kilometres (3 miles), the river drops about 23 metres (75 feet) through the Whirlpool Rapids. The fall in the 11 kilometre (6 mile) reach from the foot of the Whirlpool Rapids to Lake Ontario is about 0.2 metres (0.6 feet).

1.3.2 Local Inflows and Outflows

1.3.2.1 Surface Water

The flow of the Niagara River between Buffalo and Queenston is increased by the local inflow from streams tributary to the upper river and by the water diverted into the Welland River from the Welland Canal. It is reduced by the diversion of the New York Barge Canal, which has an average flow of about 30 cms (1100 cfs) during the navigation season. Local

REFERENCE NO. 4



(BUFFALO SE)
5269 IV SE

1 MILE

7000 FEET

KILOMETER

8.6 FEET

ROAD CLASSIFICATION

Heavy-duty	▬	Light-duty	═
Medium-duty	▬	Unimproved dirt	=======

◯ Interstate Route ◯ State Route

QUADRANGLE LOCATION

STANDARDS
20242
ON REQUEST

BUFFALO NW, N.Y.–ONT.

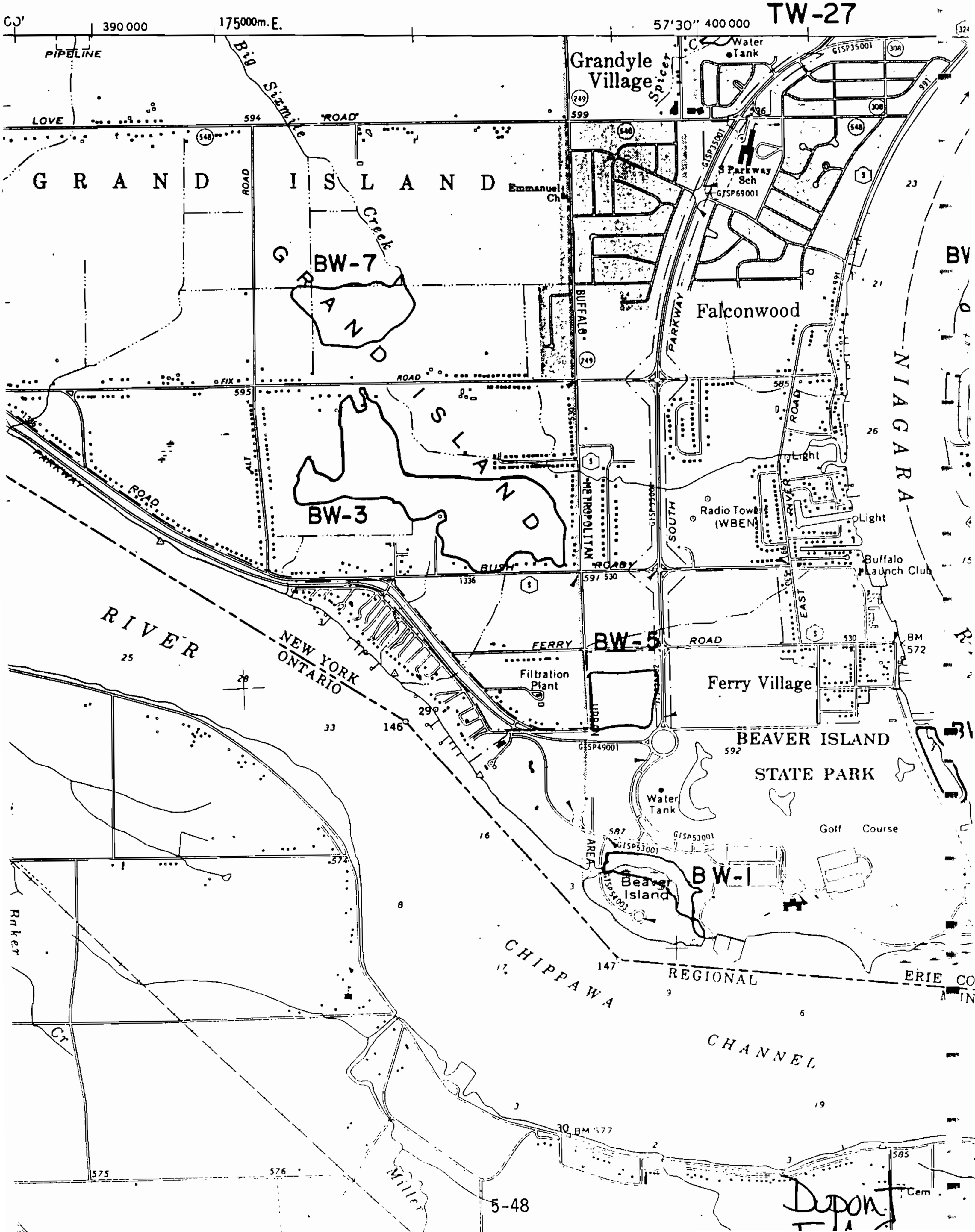
NW/4 BUFFALO 15′ QUADRANGLE
N4252.5—W7852.5/7.5

1965

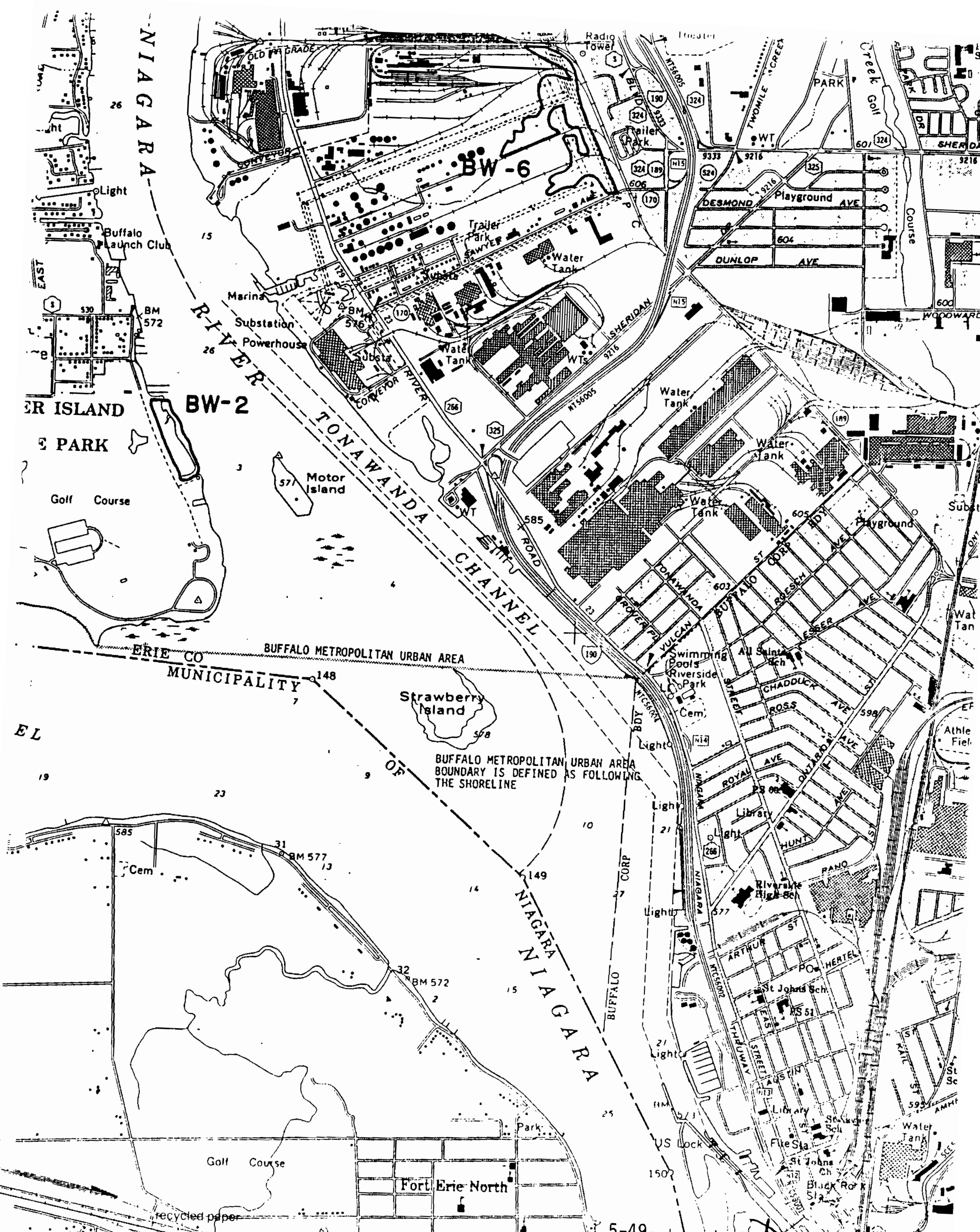
AMS 5269 IV NW–SERIES V821

REFERENCE NO. 5

TW-27


390 000
175000m. E.
57'30" 400 000
PIPELINE
Big Sixmile Creek
Grandyle Village
Spicer
Water Tank
GISP35001
LOVE ROAD
594
599
GRAND ISLAND
ROAD
Emmanuel Ch
S Parkway Sch
GISP69001
GISP35001
BW-7
GRAND ISLAND
BUFFALO
PARKWAY
Falconwood
NIAGARA RIVER
FIX ROAD
595
585
ROAD
ALT
METROPOLITAN
SOUTH
Radio Tower (WBEN)
Light
RIVER
BW-3
PARKWAY
ROAD
BUSH ROAD
1336
591 530
Buffalo Launch Club
EAST
RIVER
NEW YORK
ONTARIO
FERRY ROAD
BW-5
530
BM 572
Filtration Plant
Ferry Village
29
146
GISP49001
BEAVER ISLAND STATE PARK
592
Water Tank
Golf Course
587
GISP53001
AREA
Beaver Island
BW-1
572
Baker
Cr
CHIPPAWA CHANNEL
147
REGIONAL
ERIE CO
30 BM 577
585
575
576
Miller
Cem
Dupont

5-48


NIAGARA RIVER
TONAWANDA CHANNEL OF NIAGARA
NIAGARA
BW-6
BW-2
Radio Tower
OLD RR GRADE
CONVEYOR
Trailer Park
SAWYER AVE
Water Tank
Substa
Marina
Substation
Powerhouse
BM 576
RIVER ROAD
SHERIDAN
Water Tank
WTs
Light
Buffalo Launch Club
BM 572
ER ISLAND
E PARK
Golf Course
Motor Island
571
WT
585
TONAWANDA
ROVER PL
VULCAN
BUFFALO CORP BDY
ROESCH AVE
ESSER AVE
CHADDUCK AVE
ROSS AVE
ROYAL AVE
ONTARIO ST
HUNT
Playground
Swimming Pools
Riverside Park
All Saints Sch
Cem
Library
PS 60
Riverside High Sch
ARTHUR ST
HERTEL
PO
St Johns Sch
PS 51
EAST STREET
THRUWAY
AUSTIN
St Xaviers Sch
Fire Sta
St Johns Ch
Black Rock Sta
US Lock
Water Tank
Athletic Field
PARK
Twomile Creek
DESMOND
Playground AVE
DUNLOP AVE
WOODWARD
SHERIDAN
Golf Course
Creek
ERIE CO
MUNICIPALITY
BUFFALO METROPOLITAN URBAN AREA
148
149
150
Strawberry Island
578
BUFFALO METROPOLITAN URBAN AREA BOUNDARY IS DEFINED AS FOLLOWING THE SHORELINE
BUFFALO
585
Cem
BM 577
BM 572
Golf Course
Park
Fort Erie North
Light
Light
Light
Light

DuPont

Dupont, FMC

FRESHWATER WETLAND CLASSIFICATION

ructions: Circle numbers of applicable classification characteristics and place check next to appropriate class. Note
er of species to which characteristics 13, 14 or 15 apply shall be identified in parentheses with species considered a
rate Class II characteristic in determining item 7. Complete information on reverse side of form to substantiate your
lusions. A wetland with no Class I, II, or III characteristics is a Class IV wetland.

y,Town,~~Village~~) Tonawanda
ty Erie
. name Buffalo NW

Wetland name Sawyer Avenue Wetland
Wetland no. BW-6 DEC no. 115-26-0169
UTM Coord. 4766000m N. 180600m E.

Inspection Dates 11/29/79
No. of sheets attached 1
Preparer [illegible] Date [illegible]

CLASS I

Classic kettlehole bog
Res. hab., thr./endg. anim. sp.
Thr./endg. plant sp.
Unus. abund./div. anim. sp. in region or state
Significant flood protection for substantially developed area
Adj./contig. to reservoir or public water supply or hydraulically connected to public water supply aquifer
4 or more Class II characteristics

CLASS II X

[✓ 8.] Emgt. marsh: pur. loosestrife and/or phragmites max. 66% of covertype
9. 2 or more wetland structural groups
10. Contig. to tidal wetlands
11. Assoc. with ext. perm. open water
12. Adj./contig. C(t) or higher stream
13. ( ) mig. hab. thr./endg. anim. sp.
14. ( ) Res. hab. vuln. anim. sp.: state
15. ( ) Vuln. plant sp.: state
16. Unus. abund/dv. anim. sp.; county
17. Archeo./paleo. significance
18. Unusual geologic feature
19. Flood protection value: agr., light or planned development area
20. Hydraulically connected to aquifer
21. Tertiary treatment capacity for a sewage disposal system
[✓ 22.] Within urbanized area
[✓ 23.] 1 of 3 lgst. wetlands: city, town, NYC Borough
24. In publicly owned recreation area

CLASS III

25. Emgt. marsh, pur. loosestrife and/or phragmites min. 66% of covertype
26. Deciduous swamp
27. Shrub swamp
28. Floating and/or submergent veg.
29. Wetland open water
30. Contains island
31. Total alkalinity at least 50 PPM
32. Adj. to fert. upland; high base soils
33. Res./mig. hab. of vuln. anim. sp. Res. for region; mig. for region or state
34. Vuln. plant sp.; region
? [✓ 35.] Part of significantly polluted permanent open water system in which pollution reduction occurs
36. Visible and aesthetic/open space value
[✓ 37.] 1 of 3 lgst. wetlands of same covertype within a town
[✓ 38.] Wetland acreage max. 1% of total town acreage
39. Publicly owned land open to public use

PPLY? AREA STRUCTURAL GROUPS

X 85 % Herbaceous-emgt. marsh, wet meadow min. 25% of wetland.
15 % Woody - deciduous, coniferous, shrub swamp min. 25%.
___ % Water - submergent, floating veg., wetland open water min. 15%

PPLY?	AREA	COVERTYPE COVERTYPE (min. 50% of area)
✓	50 %	Wet Meadow
	35 %	Emergent marsh
	15 %	Deciduous swamp
	%	Coniferous swamp
	%	Shrub swamp
	%	Floating/submergent veg.
	%	Wetland open water

f no single covertype is of at least 50% of the wetland rea, add up all the separate covertype areas in each class nd assign the wetland to the class representing the largest roportion of the wetland's area.

Class II
___ % Emgt. marsh; pur. loosestrife and/or phragmite max. 66% of covertype
___ % TOTAL Class II
Class III
___ % Emgt. marsh; pur. loosestrife and/or phragmite min. 66% of covertype
___ % Deciduous swamp
___ % Shrub swamp
___ % Floating/submergent veg.
___ % Wetland open water
___ % TOTAL Class III
Class IV
___ % Wet meadow
___ % Coniferous swamp
___ % TOTAL Class IV

Wetland area is 30 acres. This and all other information is from Field Inspection Report.

The area around this wetland is heavily Industrial.

NYTM coordinates from Tentative Regulatory Map

915 - 26 - 0169
BW-6

WETLAND DATA

WETLAND NAME: Sawyer Ave. Wetland

LOCATION: (See attached map)

Quad: (USGS)(DOT) Buffalo NW

County: Erie

Town: Tonawanda

Miles 1/8 Dir. SW From Intersection of I 190 & I 290

INVESTIGATOR(S): J. R. Snider

DATE(S) OF FIELD INVESTIGATION:

Date(s)	Weather
11/29/79	Sunny, windy, 35°

TYPE OF ANALYSIS:

a. Reconnaissance ✓
b. Releve'
c. Continuum

VEGETATION COMMUNITY:

a. Size of Wetland 30 ✓

b. Covertypes (estimated percentage)

1.	Wet meadow	50 %
2.	Emergent Marsh	35 %
3.	Deciduous Swamp	15 %
4.	Coniferous Swamp	%
5.	Shrubs Swamp	%
6.	Submergent &/or floating	%
7.	Wetland open water	%

c. Remarks:

ECOLOGICAL ASSOCIATIONS

1. Covertype Groups

1. + 2. = 85 %
3 + 4 + 5 = 15 %
6 + 7 = %

2. Classic Kettlehole bog
4. Associated with open water
Water
5. Proximity to Mud Flats
6. Island present
7. Adjacent to Class C(T) or higher stream

SPECIAL FEATURES

~~Al~~ Wetland area is almost completely surrounded by heavy industry & oil storage facilities.

HYDROLOGICAL + POLLUTION CONTROL FEATURES

(Reference information sources where appropriate)

Serves as a settling area for sediments and other runoff materials from surrounding industries,

OTHER NOTABLE FEATURES

(Reference Information Sources where appropriate)

1. Soils

Lakemont silty clay loam and silt loam. - deep, poorly drained soils.

Odessa silt loam - deep, somewhat poorly drained soils

2. Human influence-degradation

Area is heavily influenced by access roads, railroad tracks and transmission lines which occur in the area. It appears that runoff from industries nearby have affected the wetland in an adverse manner.

OTHER NOTABLE FEATURES (Cont.)

3. Description of Faunal Community

observations made at the time of the field inspection:

Robin - *Turdus migratorius*
Muskrat - *Ondatra zibethica*
Ring-necked pheasant - (*Phasianus colchicus torquatus*
Starlings - *Sturnus vulgaris vulgaris*

Numerous other amphibians, reptiles, birds & mammals would be expected to use this wetland

4. Others

Vegetation -
See attached list

NOTE: Attach all supporting documents - Floristic & Faunal Lists, Engineer's reports, etc.

FLORISTIC CHECKLIST FOR WETLANDS DETERMINATION

Indicated species were found to be present in this wetland

A. WETLAND TREES	Cover-type*	Abundance**
Ash, Red &/or Green (Fraxinus pennsylvanica &/or var. subintegerrima)	3	5
Elm, American (Ulmus americana)	3	+
Maple, Red (Acer rubrum)		
Maple, Silver (Acer saccharinum)		
Oak, Sw. Wh. (Quercus bicolor)		
Willow, Black (Salix nigra)		
Oak, Pin (Quercus palustris)	3	+

B. WETLAND SHRUBS	Cover-type*	Abundance**
Alder, Tag (Alnus rugosa)		
Buttonbush (Cephalanthus occidentalis)		
Chokeberry, Black (Pyrus melanocarpa)		
Dogwood, Red Osier (Cornus stolonifera)	1M5	1
Dogwood, Silky (Cornus amomum)	1n5	1
Rose, Swamp (Rosa palustris)		
Spireas (Spirea sp.)	1	+
Viburnum, Arrowwood (Viburnum recognitum)		
Viburnum, Wildraisin (Viburnum cassinoides)		
Willows (Salix spp.)		
Winterberry Holly, com. (Ilex verticillata)		

C. EMERGENTS	Cover-type*	Abundance**
Arrowhead (Sagittaria spp.)		
Arrow arum (Peltandra virginica)		
Beggar Tick (Bidens spp.)		
Bulb-bearing Water Hemlock (Cicuta bulbifera)		
Bulrushes (Scirpus spp.)	2	1
Bur-reed (Sparganium spp.)		
Cattail (Typha latifolia &/or T. angustifolia)	2	3
Fern, Marsh (Thelypteris palustris)		
Forget-me-not (Myosotis scorpoides)		
Iris, Yellow (Iris pseudacorus)		
Loosestrife, Purple (Lythrum salicaria)	1n2	+

C. EMERGENTS (Cont.)	Cover-type*	Abundance**
Loosestrife, Yellow (Lysmachia sp.)		
Pickerelweed (Pontederia cordata)		
Purslane, Water (Ludwigia palustris)		
Reed (Phragmites australis)	2	2
Sedges (Carex spp.)	1a2	1
Smartweed, (Polygonum sp)	1	1
Swamp milkweed (Asclepias incarnata)	142	+
Water plantain (Alisma spp.)		
Water-horehound (Bugleweed)(Lycopsis spp.)		
Willow-herb (Epilobium spp.)		
Woolgrass (Scirpus spp.)		

D. ROOTED, FLOATING LEAVES	Cover-type*	Abundance**
Frogbit (Limnobium spongia)		
White Water Lilly (Nymphaea odorata)		
Yellow Pond-lily (Nuphar spp.)		

E. FREE FLOATING	Cover-type*	Abundance**
Duckweed, Lesser (Lemna minor)		

F. WET MEADOW AND/OR UNDERSTORY	Cover-type*	Abundance**
Arrowleaved Tearthumb (Polygonum sagittatum)		
Aster, Purple Stem (Aster puniceus)	1	1
Boneset (Eupatorium perfoliatum)		
Bulrush (Scirpus spp.)		
Fern, Cinnamon (Onoclea cinnamomea)		
Fern, Sensitive (Onoclea sensibilis)		
Iris, Larger Blueflag (Iris versicolor)		

FLORISTIC CHECKLIST PAGE 2

	Cover-type*	Abundance**
F. WET MEADOW AND/OR UNDERSTORY (Cont.)		
Joe-pye-weed (Eupatorium fistulosum or F. maculatum)		
Manna Grass (Glyceria sp.)		
Marsh Marigold (Caltha palustris)		
Meadowrue, Tall (Thalictrum polygamum)		
Moneywort (Lysmachia nummularia)		
Moss, Sphagnum (Sphagnum sp.)		
Rattlesnake Grass (Glyceria canadensis)		
Reed-Meadow Grass (Glyceria grandis)		
Reed Canarygrass (Phalaris arundinacea)	1	2
Rice Cut-grass (Leersia oryzoides)		
Rush (Juncus sp. spp.)	1	3
Rush, Soft (Juncus effusus)	1	1
Sedges (Carex spp.)	1	3
Skunk Cabbage (Symplocarpus foetidus)		
Spikerush (Eleocharis spp.)		
Touch-me-not (Impatiens pallida or I. capensis)		
G. BOG MAT (Use only if mat is present)		
Labrador Tea (Ledum groenlandicum)		
Leatherleaf (Chamaedaphne calculata)		
Sphagnum Moss (Sphagnum sp. (spp.)		
H. SUBMERGENTS		
Coontail (Ceratophyllum demersum)		
Pondweeds (Potamogeton sp.)		
Water Milfoil (Myriophyllum sp. (spp.)		
Waterweed (Elodea sp.)		

recycled paper

	Cover-type*	Abund-ance**
I. ADAPTABLE SPECIES		
Aspen, Quaking (Populus tremuloides)		
Cottonwood, Eastern (Populus deltoides)	3	+
Elder, American (Sambucus canadensis)		
Hemlock, Eastern (Tsuga canadensis)		
Nightshade, Purple (Solanum dulcamara)	3	+
Pine, White (Pinus strobus)		
Poison Ivy (Rhus radicans)		

*COVERTYPE SYMBOL

1. Wet meadow
2. Emergent marsh
3. Deciduous swamp
4. Coniferous swamp
5. Shrub swamp
6. Submergent and/or Floating plants

**ABUNDANCE SYMBOL

5.	75% - 100% of cover
4.	50% - 75% of cover
3.	25% - 50% of cover
2.	5% - 25% of cover
1.	5% of cover
+	Forming clumps, patches or colonies.
r	Rare or solitary.

(ex. 1+ is a species contributing less than 5% to a covertype and occurring in clumps)

NOTE NOTE

Dpont
FMC

*********NOTICE*********

This wetland, FW No. BW-2, is also classified as a significant coastal fish and wildlife habitat. SEE STAWBERRY ISLAND - MOTOR ISLAND SHALLOWS file, under SIGNIFICANT COASTAL FISH AND WILDLIFE HABITATS, and habitat boundaries on coastal area maps.

NOTE NOTE

BW-2

Name East River wetland
Miles 2 dir NW Buffalo
Topo quad Buffalo
County Erie
Town Grand Island
Region 9 ☒ Natural ☐ Artificial
Interspersion 6
6-24" depth 10

11. Robust emergents 50 %
12. Tall meadow emergents 30 %
13. Short meadow emergents 10 %
15. Submergents

Terry Moore
Jim Snider
East River Wetland Determination, Beaver Island State Park
Grand Island, Erie County D.E.C. # 915-17-0224
April 18, 1977

This wetland determination was made as a result of a formal request by the Niagara Frontier State Park and Recreation Commission. I observed a nine-acre freshwater wetland which has one of the highest wildlife values for habitat along the Niagara River. Although this wetland does not qualify as a protected wetland under the 12.4 acre size criteria, I recommend that this area be classified as a protected freshwater wetland due to its local significance. It provides outstanding wildlife habitat for breeding, nesting, feeding and cover, has some value for fish spawning, provides an excellent recreation area for hiking, bird watching and photography, serves as an open space area and is a source of nutrients for many varied food cycles.

The Niagara Frontier Park and Recreation Commission has inquired as to whether a wetlands permit will be required for repair of the East River Marina. Since the marina is more than 100 feet from this wetland, there will be no need for a freshwater wetlands permit.

JRS:egb
Att.
cc: S. Doleski
J. Snider

James R. Snider
James R. Snider
Senior Wildlife Biologist

Wetland Area-
9 acres in size

Wetland Soils-
Erie County S.C.S. office lists this soil as associated with a freshwater wetland. This soil is very high in organic matter

fluctuations in water level of up to 1 foot

Purple loosestrife: ☐ None ☐ Ind. plants
☐ Clumps <1m. diam. ☐ Clumps >1m. diam.
☐ Adjoining clumps through
☐ Solid, most of wetland

Green timber impoundment potential
☐ Mature or overmature trees ☐ Trees 80-100'
☐ 80% crown closure ☐ About 20% muck
☐ Red, Swamp Wh. Oak, Red Ash
☐ Understory: Sensitive

alkalinity (1) (2) (3)

AREA STRUCTURAL GROUPS

____% Herbaceous-emgt. marsh, wet meadow min. 25% of wetland.
____% Woody - deciduous, coniferous, shrub swamp min. 25%.
____% Water - submergent, floating veg., wetland open water min. 15%

COVERTYPE

AREA COVERTYPE (min. 50% of area)
____% Wet Meadow
____% Emergent marsh
____% Deciduous swamp
____% Coniferous swamp
____% Shrub swamp
____% Floating/submergent veg.
____% Wetland open water

o single covertype is of at least 50% of the wetland
, add up all the separate covertype areas in each class
essign the wetland to the class representing the largest
ortion of the wetland's area.

Class II
____% Emgt. marsh; pur. loosestrife and/or phragmite max. 66% of covertype
____% TOTAL Class II

Class III
____% Emgt. marsh; pur. loosestrife and/or phragmite min. 66% of covertype
____% Deciduous swamp
____% Shrub swamp
____% Floating/submergent veg.
____% Wetland open water
____% TOTAL Class III

Class IV
____% Wet meadow
____% Coniferous swamp
____% TOTAL Class IV

Wetland [illegible] 9[illegible] [illegible]

Cover type information is [illegible] field inspection report [illegible] in this file.

It has been recommended that this wetland be protected because of its local significance to wildlife.

This wetland is associated with the Niagara River as an external permanent open water body.

This wetland is within Beaver Island State Park.

The Niagara River is an "A" Class water body. 6NYCRR 837.4 item 1 page 1605.

Bureau of Wildlife wetland inventory map shows approximately 90% of this wetland. Portion of B of W map enclosed in file.

FRESHWATER WETLAND CLASSIFICATION

ions: Circle numbers of applicable classification characteristics and place check next to appropriate class. Note f species to which characteristics 13, 14 or 15 apply shall be identified in parentheses with species considered a Class II characteristic in determining item 7. Complete information on reverse side of form to substantiate your ons. A wetland with no Class I, II, or III characteristics is a Class IV wetland.

wn, ~~Village~~) Grand Island
Erie
me Buffalo N. W.

Wetland name EAST RIVER WETLAND
Wetland no. BW-2 DEC no. 915-17-6224
UTM Coord. 4764500m N. 178500m E.

Inspection Dates 4/13/77
No. of sheets attached 1
Preparer [illegible] Date [illegible]

CLASS I X

sic kettlehole bog
. hab., thr./endg. anim. sp.
./endg. plant sp.
s. abund./div. anim. sp. in
ion or state
nificant flood protection for
stantially developed area
./contig. to reservoir or public
er supply or hydraulically
nected to public water supply
ifer.
r more Class II characteristics

CLASS II ✓

[✓ 8.] Emgt. marsh: pur. loosestrife and/or phragmites max. 66% of covertype
9. 2 or more wetland structural groups
10. Contig. to tidal wetlands
[✓ 11.] Assoc. with ext. perm. open water
[✓ 12.] Adj./contig. C(t) or higher stream
13. ( ) mig. hab. thr./endg. anim. sp.
14. ( ) Res. hab. vuln. anim. sp.: state
15. ( ) Vuln. plant sp.: state
16. Unus. abund/dv. anim. sp.; county
[✓ 17.] Archeo./paleo. significance
18. Unusual geologic feature
19. Flood protection value: agr., light or planned develonment area
20. Hydraulically connected to aquifer
21. Tertiary treatment capacity for a sewage disposal system
[✓ 22.] Within urbanized area
23. 1 of 3 lgst. wetlands: city, town, NYC Borough
[✓ 24.] In publicly owned recreation area

CLASS III ____

[✓ 25.] Emgt. marsh: pur. loosestrife and/ or phragmites min. 66% of covertype
26. Deciduous swamp
27. Shrub swamp
28. Floating and/or submergent veg.
29. Wetland open water
30. Contains island
31. Total alkalinity at least 50 PPM
32. Adj. to fert. upland; high base soils
33. Res./mig. hab. of vuln. anim. sp. Res. for region: mig. for region or state
34. Vuln. plant sp.; region
35. Part of significantly polluted permanent open water system in which pollution reduction occurs
36. Visible and aesthetic/open space value
[✓ 37.] 1 of 3 lgst. wetlands of same covertype within a town
38. Wetland acreage max. 1% of total town acreage
39. Publicly owned land open to public use

WETLAND INVENTORY FIELD DATA SHEET
ADDITIONAL COMMENTS

ional Comments:

This wetland is one of very few cattail-emergent wetlands which are directly connected to the Niagara River. Because it is a very valuable wetland for wildlife and to some extent for fisheries, it should be protected. Since it is already owned by the Beaver Island State Park, it should be left in its existing state and preserved from any future alteration or development.

ırce: J. Snider

restigator: James R. Snider

le: Senior Wildlife Biologist Date: April 15, 1977

WETLAND INVENTORY FIELD DATA SHEET
VEGETATION, FISH, WILDLIFE

Known Vegetation

Species / Genus	occ	com	dom
Softstem bulrush-Scirpus validus	☐	☒	☐
	☐	☐	☐
Broadleaf cattail-Typha	☐	☐	☒
latifolia	☐	☐	☐
Smartweed-Polygonum	☐	☒	☐
Sedge-Carex. spp.	☐	☒	☐
Bulrush-Scirpus spp.	☐	☒	☐
Duckweed-Lemna spp.	☐	☒	☐
Willow-Salix spp.	☐	☒	☐
Speckled Alder-Alnus rugosa	☒	☐	☐
Red-osier dogwood-Cornus	☐	☒	☐
stolonifera	☐	☐	☐
Elderberry-Sambucus canadensis	☒	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐

Known Fish and Wildlife (p= prod., u= use)

Species / Genus	rare	com	abun
Mallard-Anas platyrhynchos	☐	☐	☒
Black Duck-Anas rubripes(p)	☐	☒	☐
Blue-winged teal-Anas	☐	☒	☐
discors (p)	☐	☐	☐
Greater Scaup-Aythya marila	☐	☐	☒
neartica (u)	☐	☐	☐
Canvasback-Aythya valisineria	☐	☐	☒
(u)	☐	☐	☐
Goldeneye-Glaucionetta	☐	☒	☐
clangula americana (u)	☐	☐	☐
Woodcock-Philohela minor (u)	☐	☒	☐
Belted Kingfisher-Megaceryle	☐	☒	☐
alcyon (u)	☐	☐	☐
Assorted shorebird &	☐	☐	☐
wading birds	☐	☐	☐
Muskrat-Ondatra zibethica(p)	☐	☐	☒
Raccoon-Procyon lotor (u)	☐	☒	☐
Snapping turtle-(p) Chelydra	☐	☒	☐
serpentina	☐	☐	☐
Midland painted turtle-	☐	☒	☐
Chrysemys picta marginata (p)	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐

Place an asterisk by unique vegetation, fish, wildlife

Reproduce this page to add more species

UTM ___ ___ ___ ___ ___ ___ ___ ___

WETLAND INVENTORY FIELD DATA SHEET
INFLUENCES AND VALUES

Man influence	Min.	Mod.	Maj.
Beaver Island State Park-	☒	☐	☐
Golf Course	☐	☐	☐
Beaver Island State Park-	☒	☐	☐
East River Marina	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐

Prod. loss to degradation ? % perhaps 5%

Source: J. Snider

Vulnerability to destruction

----low------------medium------------high----

☐ 0 ☐ 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5

Reason for vulnerability classification

There exists a potential demand on this area for additional park facilities in the future i.e. Larger marina, etc.

Source: J. Snider

Enhancement possibility

☒ low ☐ medium ☐ high

Work needed:

Expected gain

Source:

Known ownership ☐ Federal ☒ State ☐ Local

☐ Conservation Organ. ☐ Sport ☐ Private

MISCELLANEOUS VALUES (use boxes to describe)

Unique Geology

Source:

Unique in Environs

This wetland is one of the few cattail-emergent vegetation wetlands which border on the Niagara River.

Source: J. Snider

Flood Control

Source:

Sediment Filtering

Small stream from the Beaver Island State Park golf course empties into the wetland.

Source: J. Snider

Potential Use

Source:

Aesthetic/Open Space

Old road adjacent to this wetland serves as a valuable access trail for bird watching, etc.

Source: J. Snider

Historical Value

Source:

Migration Distribution flight lane

Wetland borders on Niagara River which is a migratory spot for some puddle ducks and wintering area for thousands of diving ducks. Also excellent habitat for /shore birds.

Source: J. Snider

Fish Spawning Area

Open winter areas have some potential for spawning area for bass, w. pike, bullheads, etc.

Source: J. Snider

WETLAND# BW-2 915-17-0224

UTM ___ ___ ___ ___ ___ ___ ___ ___

WETLAND INVENTORY FIELD DATA SHEET

CLASSIFICATION

East River Wetland

Miles 2 dir NW from Buffalo

Topo. quad Buffalo NW

County Erie

Town Grand Island

Region 9 ☒ Natural ☐ Artificial

Interspersion 6 Vegetative Cover 90 %

6-24" depth 10 %

WETLAND TYPES

Inland Fresh

1. Seasonally flooded basins/flats ___ %
2. Fresh meadows ___ %
3. Shallow fresh marshes 85 %
4. Deep fresh marshes 10 %
5. Open fresh marshes 5 %
6. Shrub swamps ___ %
7. Wooded swamps ___ %
8. Bogs ___ %

Coastal Fresh

12. Shallow fresh marshes ___ %
13. Deep fresh marshes ___ %
14. Open fresh water ___ %

Coastal Saline

15. Salt flats ___ %
16. Salt meadows ___ %
18. Regularly flooded salt marshes ___ %
19. Sounds and bays ___ %

VEGETATIVE CLASSES

Trees

1. Live deciduous trees ___ %
2. Live evergreen trees ___ %
3. Dead trees ___ %

Shrubs

4. Tall slender shrubs 5 %
5. Bushy shrubs ___ %
6. Low compact shrubs ___ %
7. Low sparse shrubs ___ %

8. Aquatic shrubs ___ %
9. Dead shrubs ___ %

Emergents

10. Sub-shrubs ___ %
11. Robust emergents 50 %
12. Tall meadow emergents 30 %
13. Short meadow emergents 10 %
14. Narrow-leaved marsh emergents ___ %
15. Broad-leaved marsh emergents ___ %

Surface Vegetation

16. Floating-leaved vegetation ___ %
17. Floating vegetation ___ %

Submergents

18. Submergents 5 %

* * * * * * * * * * * * * * * * * * * *

If open water, proportion of submergents:

☒ 0-1/3 ☐ 1/3-2/3 ☐ 2/3-1

☐ Meadow portion grazed

Purple loosestrife: ☐ None ☐ Ind. plants

☐ Clumps < ½m. diam. ☐ Clumps > ½m. diam.

☐ Adjoining clumps through an area

☐ Solid, most of wetland

Green timber impoundment potential

☐ Mature or overmature trees ☐ Trees 80-100'

☐ 80% crown closure ☐ About 30"+ muck

☐ Red, Swamp Wh. Oak, Red Ash

☐ Understory: Sensitive Fern/Arrow Arum

Additional Comments

Wetland Area-
9 acres in size

Wetland Soils-
Erie County S.C.S. office lists this soil as associated with a freshwater wetland. This soil is very high in organic matter and very poorly drained.

Water Regime-
This wetland's water level is directly influenced by the volum of water flowing in the Niagara River. This could result in fluctuations in water level of up to 1 foot at various times of the year.

Water

Total alkalinity (1)___ (2)___ (3)___

(4)___ (5)___ (6)___ (7)___

(8)___ (9)___ (10)___ mean:___

Water temp. (1)___ (2)___ (3)___

(4)___ (5)___ (6)___ (7)___

(8)___ (9)___ (10)___

☐ Not enough water to sample

Investigator: James Snider

Title: Senior Wildlife Biologist

Date: April 13, 1977 Time: 1 p.m.

File ✓

4/11/85
doc#1198P

DRAFT

STATE ID # 915025
STATE CLASS. ______
DOH RANKING ______
DEC RANKING ______
HRS SCORE ______

BUREAU OF TOXIC SUBSTANCE ASSESSMENT
HAZARDOUS WASTE SITE INSPECTION REPORT

Identifying Information

SITE NAME: FMC Corp - Chemical Div.

ADDRESS: 34 Sawyer Ave, Tonawanda N.Y 14150

OWNER: FMC Corporation

ADDRESS & PHONE NO.: 34 Sawyer Ave. ( )

LOCAL CONTACT: John W. Goykendalle - Resident manage

ADDRESS & PHONE NO.: P.O. Box 845, Buffalo NY 14240

DEC REGION: 9 DOH REGION: Buffalo COUNTY: ERIE TOWN: TONAWANDA

QUADRANGLE MAP: Buffalo NW

INSPECTORS & DATE: Y. Khaikin, K. MANN 7/31/85

Site Data

SIZE (acres): ______ TERRAIN: Hilly ______ Flat ✓

SUBURBAN: ______ URBAN: ✓ RURAL: ______

INDUSTRIAL: ✓ MUNICIPAL: ______ OTHER: ______

ACTIVE: ______ INACTIVE: ✓

KNOWN AND SUSPECTED USERS: Disposal pits used by FM Corp from 1964-1976.

CONTAMINANTS OF CONCERN:

Soil Vapor ______

Soil Contact ______

Groundwater ______

KNOWN CONTAMINATION:

	On Site	Off Site
Air		
Groundwater		
Surface Water		
Drinking Water		
Surface Soil		
Sub Surface Soil		

Site Status

Inspection: ✓

Investigation: ____

Negotiation: ____

Litigation: ____

Remediation: ____

Agencies Involved:

DOH ✓

DEC ✓

DOL ____

EPA ____

County ✓

Comments

For period of 12 years, from 1964 to 1976 FMC Corp used disposal pits. Size of each pit was estimated to be 20'x20'x100" The pits contained approximately 100 TONNS of chemical wastes, including persulfates, perborates, hydrogen peroxide, calcium and zinc peroxide, magnesium, urea, pyrophosphate and diplecolinic acid. In 1976 the pits have been covered and graded.

Site Name FMC Corp. Chemical Div. Site No. 915025

2. Toxicity - Contaminants of Concern

Table 2-2. Waste Compounds: Quantities and Toxicity

Waste	Quantity (Tons)	Individual Compounds	CAS Number	Quantity (Tons)	Toxicity Rating
		Borax	1303-96-4		3-2
		(Sodium borate decahydrate)			
		Hydrogen peroxide	7722-84-1		3
		Sodium carbonate	497-19-8		3-2
		Sodium persulfate	7775-27-1		3
		($Na_2S_2O_8$)			
		Ammonium bicarbonate	1066-33-7		3
		Ammonium carbonate	506-87-6		3
		Ammonium hydroxide	1336-21-6		3
		Ammonium sulfate	7783-20-2		2
Foundry Sand		Sodium silicate	6834-92-0		3
		Phenol	108-95-2		3
Cutting oil		Benzo(a)pyrene	50-32-8		4

Table 2-3. Chemical/Physical Properties

Most Toxic Compounds	Persistence Value P	Solubility ppm @ 20 C	Vap. Press. (mm Hg) @ 25 C	Soil Partit. Coefficient
Benzo(a)pyrene		0.0038	5.0×10^{-7}	
Phenol		93000	0.35	
Sodium silicate		Soluble	—	
Sodium persulfate		Soluble	—	
Hydrogen peroxide		∞	1 15.3°	
Ammonium hydroxide		Soluble	—	

FMC Corp. Chemical Div 915025

Table 2-4. Use data from CHEMDATA tables.

Compound	Leaching Index	Evaporation Potential	Soil Retention Index
Benzo(a)pyrene	+	+	+++
Phenol	+++	++	+
Sodium silicate	+++	+	+
Sodium persulfate	+++	+	+
Hydrogen peroxide	+++	+++	
Ammonium Hydroxide	+++	+++	+

e 2-5. Contaminants of Concern

pound of ern	Soil Vapor (High LI)	Soil Contact (High SRI)	Groundwater (High LP,Med V)
nzo(a)pyrene		✓	
henol	✓		✓
Sodium silicate			✓
odium persulfate			✓
ydrogen peroxide	✓		✓
mmonium Hydroxide	✓		✓

Adjacent Population

Estimate the population within 1 mile of the site. Assign appropriate score 0, 1, 2 or 3 from Table 3-4, below.

Population estimate: < 1000 Score 1

3.3 Exposure Estimate: Onsite Record the highest surface soil concentration measured of the contaminant of concern (soil-contact)

______________ ug/g

Onsite Contact - Comments - Provide additional comments specific to onsite contact.

4. Groundwater and Gas Migration

Identify the aquifers beneath the site fron hydo-geological data or well depths in the area.

Aquifer Design.	Depth (ft)	Groundwater wells			
		Dist.	Direction	Depth	Contaminated ?
unconsolidated deposits (silt and clay till)	<32'				
Bedrock millus shale)	> 32'				

4.1 Target Populations

Identify target groups by common use (or exposure) and/or common location with respect to the site, (drinking water wells, wet basements, watering crops springs or seepage, gas in basement). In addition identify populations with those groupings with documented contamination. Locate groups on land use maps.

Group	Common Use or Exposure	Direction from site (N,NNE,SW)	Distance from site (meters)	Number of people affected			
				Potential		Actual	
				Res.	Non-Res.	Res.	Non-Res.
		none					

4.2 Probability of Transport (Release)

4.2.1 Observed Release

If a groundwater release has been measured, score 1, and skip to 4.3
If none, score 0: 0

4.2.2 No Observed Release

Do area wells exhibit taste and odor? Yes or No: unknown

1) Aquifer proximity

The vertical distance from the lowest point of the hazardous substances to the highest seasonal level of the saturated zone of the aquifer of concern is 360' feet.

Assign score 0, 1, 2, 3 according to Table 4-2, 2

47-15-11(2/80)

HAZARDOUS WASTE DISPOSAL SITES REPORT
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Code: D E
Site Code: 915025
Name of Site: FMC Corp.-Chemical Division
Region: 9
County: Erie
Town/City Tonawanda
Street Address: 34 Sawyer Ave.

Status of Site Narrative:

Waste disposal pits have been properly closed.

Type of Site: Open Dump	☐	Treatment Pond(s)	☐	Number of Ponds	
Landfill	☐	Lagoon(s)	☐	Number of Lagoons	
Structure	☐	Pits	☒	Number of pits	4

Estimated Size ______ Acres

Hazardous Wastes Disposed? Confirmed ☐ Suspected ☒

*Type and Quantity of Hazardous Wastes:

TYPE	QUANTITY (Pounds, drums, tons, gallons)
Persulfates, perborates	
sodium carbonate peroxide	100 tons total
hydrogen peroxide, peracetic acid,	
calcium & zinc peroxide, magnesium,	
urea, pyrophosphate, diplcolinic acid	

*Use additional sheets if more space is needed.

Name of Current Owner of Site: FMC Corp.
Address of Current Owner of Site:

Time Period Site Was Used for Hazardous Waste Disposal:
, 19 64 To , 19 76

Is site Active ☐ Inactive ☒
(Site is inactive if hazardous wastes were disposed of at this site and site was closed prior to August 25, 1979)

Types of Samples: Air ☐ Groundwater ☐ None ☒
Surface Water ☐ Soil ☐

Remedial Action: Proposed ☐ Under Design ☐
In Progress ☐ Completed ☒
Nature of Action: Capping

Status of Legal Action: State ☐ Federal ☐

Permits Issued: Federal ☐ Local Government ☐ SPDES ☐
Solid Waste ☐ Mined Land ☐ Wetlands ☐ Other ☐

Assessment of Environmental Problems:

Continued monitoring required to confirm effective closure.

Assessment of Health Problems:

Unknown.

Persons Completing this Form:

G. D. Knowles	Ronald Tramontano
New York State Department of Environmental Conservation	New York State Department of Health
Date April 15, 1980	Date April 15, 1980

1/18/80
DK:cl

ently used or abandoned landfills, dumps, or lagoons)

etailed design and operational plans for the site? ☐ Yes ☑ No

sketch of land disposal area showing location and distance to surface water, classification, direction of groundwater flow, location of monitoring wells, other pertinent information.

CONFIDENTIAL

es disposal site have a liner? ☐ Yes ☑ No

b. Type of liner __________

c. Thickness __________

3. a. Leachate collection? ☐ Yes ☑ No

b. Leachate treatment? ☐ Yes ☐ No

c. Type of treatment __________

4. a. Shortest depth to groundwater ______ ft.

b. Classes of soils underlying site (correlate with sketch) __________

5. a. Groundwater monitoring wells? ☐ Yes ☑ No

b. Number of wells ______ c. Well down gradient? ☐ Yes ☐ No

6. Non-industrial wastes disposed of at site? ☑ Yes ☐ No

7. Are different waste(s) disposed in specially segregated areas of the site? ☐ Yes ☐ No

8. Is there security at disposal area (i.e. fences, signs)? ☑ Yes ☐ No

9. Are there contingency plans and equipment to handle possible emergency situations at the facility? ☐ Yes ☐ No Attach if available.

0. Industrial wastes disposed of at site:

Waste Stream Number	Waste	Volume/Year (please specify tons, gallons, cubic yards)
	ammonium persulfate & potassium persulfate at approx 1 drum/month plus sweepings are disposed of on site.	660 gal/yr.

~ 20' x 20' x 5' deep open pit

INTERAGENCY TASK FORCE ON HAZARDOUS WASTES
M.P.O. Box 561
Niagara Falls, New York 14302
(716) 285-3057

I. General Information

1. Company Name FMC Corporation

Mailing Address P.O.Box 845, Buffalo, N.Y. 14240 Station "B", Bflo.NY
Street City State Zip

Present Plant Location ☐ Same as Above

Sawyer Avenue, Town of Tonawanda, N.Y. 14150
Street City State Zip

2. If Subsidiary or Division, Name of Parent Company FMC Corporation

3. Person Responsible for Present Plant Operations J. Wilding
Name

Resident Manager (716) 876-8300
Title Telephone

4. Person Answering this Questionnaire J. Wilding
Name

Resident Manager (716) 876-8300
Title Telephone

II. Company History

1. Date Company Founded Predecessor Company - Buffalo Electro-Chemical Co.- 1925

Date and State of Incorporation FMC Corporation - State of Delaware - 1928

Date Company Began Operations in Erie or Niagara County 1925 as Buffalo Electro-Chemical Company

2. Other Company Names since 1930 (specify time periods)
Food Machinery and Chemical Corporation - 1952
FMC Corporation (name shortened) - 1961

3. Other Plant Locations in Erie or Niagara County since 1930 (specify locations and time periods) The FMC Plant at Middleport, N.Y. is making a separate reply to this questionnaire.

4. Names of Companies Acquired which have Operated Plants in Erie or Niagara County since 1930 (specify name of company, date of acquisition, location of plant, and periods of operation). Ditto - 3 above

Company Personnel

1. Identify all plant managers from 1930 to present. Indicate years of service in that position, last known address and telephone number. (see attach i)
2. Identify all plant purchasing agents from 1930 to present. Indicate years of service in that position, last known address and telephone number. (see attached)
3. Identify all plant personnel with supervisory responsibility for treatment or disposal of industrial wastes from 1930 to present. Indicate years of service, last known address and telephone number. (see attached)

IV. Industrial Waste Production, Treatment and Disposal

1. Processes Used at Plant (1930-1975)	Dates
a. Processes appropriate to the	a.
b. products manufactured.	b.
c. See page 5	c.
d.	d.
e.	e.

2. Products (1930-1975)

a. See page 5	a.
b.	b.
c.	c.
d.	d.
e.	e.

3. On Site Waste Treatment (1930-1975)

a. See page 5, 6	a.
b.	b.
c.	c.
d.	d.
e.	e.

4. List all Waste Haulers since 1930 Including Your Company

Name FMC Corp., Buffalo Plant (formerly Buffalo Electro-Chemical Co.)
Address P. O. Box 845, Buffalo, NY 14240 Station "B", Buffalo, N.Y.
Street City State
Telephone (716) 876-8300

Name Downing Container Service, Inc.
Address 191 Ganson Street, Buffalo, N.Y.
Street City State
Telephone (716) 853-6117

Name - Buffalo Waste Oil Service
76 Robinson Street
No. Tonawanda, N.Y.
(716) 693-0861

Name - Chem-Trol Pollution Service, Inc.
P. O. Box 200
Model City, New York 14107

REFERENCE NO. 6

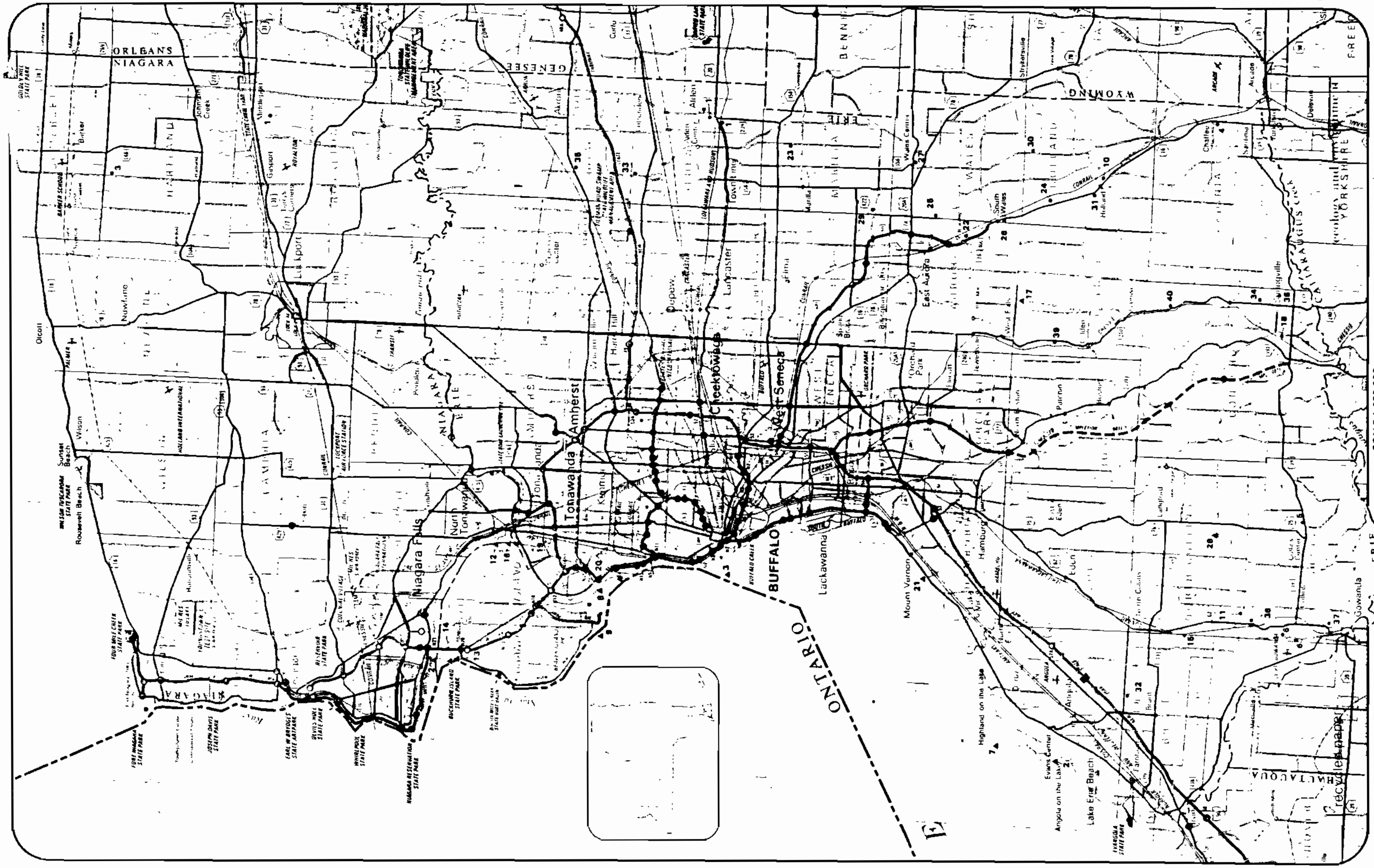
New York State Atlas of
Community Water System Sources
1982

NEW YORK STATE DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL PROTECTION
BUREAU OF PUBLIC WATER SUPPLY PROTECTION

LOCATION OF COMMUNITY WATER SYSTEM SOURCES-1982

NEW YORK STATE DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL PROTECTION
BUREAU OF PUBLIC WATER SUPPLY PROTECTION

ERIE and NIAGARA COUNTIES



ADAPTED FROM THE FOUR SHEET 1:250 000 SCALE NEW YORK STATE MAP © 1980 BY THE NEW YORK STATE DEPARTMENT OF TRANSPORTATION

ERIE COUNTY

ID NO	COMMUNITY WATER SYSTEM	POPULATION	SOURCE
Municipal Community			
	Akron Village (See No 1 Wyoming Co, Page 10)	3640	
1	Alden Village	3460	Wells
2	Angola Village	8500	Lake Erie
3	Buffalo City Division of Water	357870	Lake Erie
4	Caffee Water Company	210	Wells
5	Collins Water District #3	704	Wells
6	Collins Water Districts #1 and #2	1384	Wells
7	Erie County Water Authority (Sturgeon Point Intake)	375000	Lake Erie
8	Erie County Water Authority (Van DeWater Intake)	NA	Niagara River - East Branch
9	Grand Island Water District #2	9390	Niagara River
10	Holland Water District	1670	Wells
11	Lawtons Water Company	138	Wells
12	Lockport City (Niagara Co)		Niagara River - East Branch
13	Niagara County Water District (Niagara Co)		Niagara River - West Branch
14	Niagara Falls City (Niagara Co)		Niagara River - West Branch
15	North Collins Village	1500	Wells
16	North Tonawanda City (Niagara Co)		Niagara River - West Branch
17	Orchard Park Village	3671	Pipe Creek Reservoir
18	Springville Village	4169	Wells
19	Tonawanda City	18538	Niagara River - East Branch
20	Tonawanda Water District #1	91269	Niagara River
21	Wanakah Water Company	10750	Lake Erie
Non-Municipal Community			
22	Aurora Mobile Park	125	Wells
23	Bush Gardens Mobile Home Park	270	Wells
24	Circle B Trailer Court	50	Wells
25	Circle Court Mobile Park	125	Wells
26	Creekside Mobile Home Park	120	Wells
27	Donnelly's Mobile Home Court	99	Wells
28	Gowanda State Hospital	NA	Clear Lake
29	Hillside Estates	160	Wells
30	Hunters Creek Mobile Home Park	150	Wells
31	Knox Apartments	NA	Wells
32	Maple Grove Trailer Court	72	Wells
33	Millgrove Mobile Park	100	Wells
34	Perkins Trailer Park	75	Wells
35	Quarry Hill Estates	400	Wells
36	Springville Mobile Park	114	Wells
37	Springwood Mobile Village	132	Wells
38	Taylors Grove Trailer Park	39	Wells
39	Valley View Mobile Court	42	Wells
40	Villager Apartments	NA	Wells

NIAGARA COUNTY

ID NO	COMMUNITY WATER SYSTEM	POPULATION	SOURCE
Municipal Community			
	Lockport City (See No 12, Erie Co)	25000	
1	Middleport Village	2000	Wells (Springs)
	Niagara County Water District (See No 13, Erie Co)	48	
2	Niagara Falls City (See also No 14 Erie Co)	77384	Niagara River - East Branch
	North Tonawanda City (See No 16 Erie Co)	36000	
Non Municipal Community			
3	Country Estates Mobile Village	28	Wells

REFERENCE NO. 7

CONTACT REPORT

TO:	Fred McKosky
CONTACT:	Robert Wruck- Pump Operator, Van Dewater Station
AGENCY:	Erie County Water Authority Ellicott Square Building
TELEPHONE:	716-873-8884
DATE:	September 23, 1987
RE:	Niagara River Water Intake NYSDEC Phase 1, FMC, DuPont Sites
CONTACT PERSON:	A. Mark Sienkiewicz

Mr. Robert Wruck was contacted concerning the location of the Water intake for the Van DeWater station and the population served.

The water intake is located near Motór Island in the East Branch of the Niagara River. The water is pumped ~~into the Ball Tanks located at the U.B. Campus. The water is then pumped into the regular distribution lines.~~ TO THE VAN DE WATER WATER TREATMENT PLANT, AFTER TREATMENT TO THE FALL PUMPING STATION FOR DISTRIBUTION.

~~He is not sure how many people are served by the system.~~ APPROXIMATELY 150,000 PEOPLE ARE SERVED BY THIS FACILITY.

Signature

4/4/89

Date

djr

ERIE COUNTY WATER AUTHORITY
3030 UNION ROAD CHEEKTOWAGA, N.Y. 14227

ROBERT A. NIEDERPRUEM JR.
PRODUCTION ENGINEER 684-1510

REFERENCE NO. 8

CONTACT REPORT

TO: Fred McKosky

CONTACT: Mr. Peter Rescka

AGENCY: Erie County Water Authority
Ellicott Square Building

TELEPHONE: 716-849-8484

DATE: September 23, 1987

RE: NYSDEC Phase 1
FMC & DuPont Sites

CONTACT PERSON: A. Mark Sienkiewicz

Mr. Peter Rescka was contacted regarding the number of people serviced by the Erie County Water Authority. Mr. Rescka was not able to produce an estimate, however, he stated that as of August 31, 1987, the Water Authority had 104,777 connections. 103,927 connections were billed quarterly which indicates they have fairly small usages. 850 connections are billed monthly. These connections are large use customers, including townships, manufacturing plants, and apartment buildings.

The entire system is supplied from both the Van DeWater intakes and Sturgeon Point intake. The water is tested by inhouse chemists.

Signature

11/30/88
Date

djr

REFERENCE NO. 9

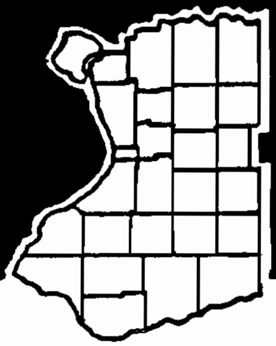
L. Clare

ENVIRONMENTAL CONTROL SERIES

HAZARDOUS WASTE INACTIVE SITE SURVEY PHASE II - REPORT

DECEMBER, 1982

DIVISION OF ENVIRONMENTAL CONTROL
SOLID WASTE SECTION



County of Erie
DEPARTMENT OF ENVIRONMENT AND PLANNING

5-84

HAZARDOUS WASTE SITE PROFILE

F.M.C. CORPORATION
SAWYER AVENUE
TOWN OF TONAWANDA

SITE #915025

Prepared by
Erie County Department of
Environment and Planning
February 1982

INACTIVE SITE PROFILE

FMC CORPORATION

34 Sawyer Avenue
Tonawanda, New York

DEC SITE #915025

GENERAL INFORMATION

The firm utilized two (2) and possibly four (4) waste disposal pits during a twelve (12) year period from 1964 to 1976. These pits were reported to be twenty (20) feet by twenty (20) by ten (10) feet deep. Paper, floor sweepings, scrap product, borax, persulfates and ammonia compounds were placed into these pits, as confirmed by company records. The pits have been covered and graded and cannot be distinguished from the surroundings. One (1), or possibly two (2), of the inactive pits are on lands transferred to the Niagara Mohawk Power Corporation and may now be buried under a railroad roadbed. Soil borings on plant grounds in the vicinity of the pits revealed a silty clay subsoil to a depth of twenty-five (25) feet. No water was encountered in any borings to this depth. The company reported that any scrap product deposited into the pits would decompose with time and form salts. These salts would pose no toxic hazard. The site is located in an industrial strip along the River Road. An estimated population of less than 3,000 reside within a one mile radius of the site. The bulk of the residential population is located in a development bounded by Sawyer Avenue, River Road, Adam Street and James Street.

BEDROCK, SOILS, GROUNDWATER, SURFACE WATER

Plant borings did not encounter bedrock to a depth of sixty (60) feet. Well data at the Dunlop and DuPont plants to the south indicate a Camillus Shale bedrock located sixty (60) to seventy (70) feet deep. Approximate location of these wells is shown in Exhibit G. The soil borings show a thick layer of silty clay soil in the area. Ernest H. Muller described the soils as lake site, sand and clay in his Quaternary Geology of New York (Published 1977).

Groundwater was not encountered in the FMC borings to a depth of sixty (60) feet. Data from the Dunlop Tire and Rubber and DuPont Corporation wells indicate an aquifer located at a depth of 35 to 54 feet. These wells are located approximately ¼ to ½ mile south of the FMC pits. There are no wells on the FMC site.

The Niagara River, a source of drinking water, is located approximately ¼ mile to the west. This is the only surface water within one (1) mile of the site. Several small New York State DEC designated wetlands exist within a one (1) mile radius of the site.

FIRE AND EXPLOSION

There are no fire or explosion hazards anticipated with the disposal site.

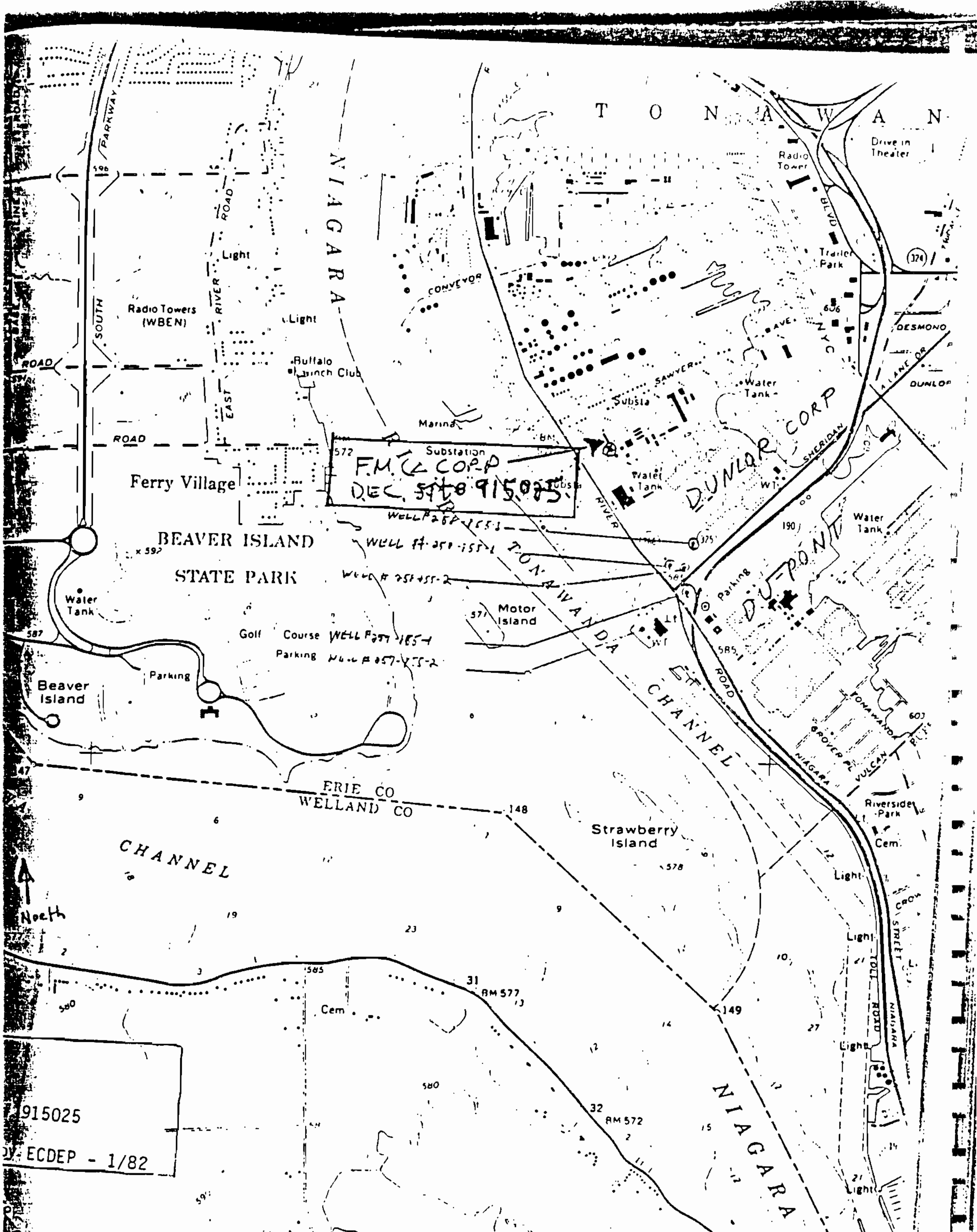
DIRECT CONTACT

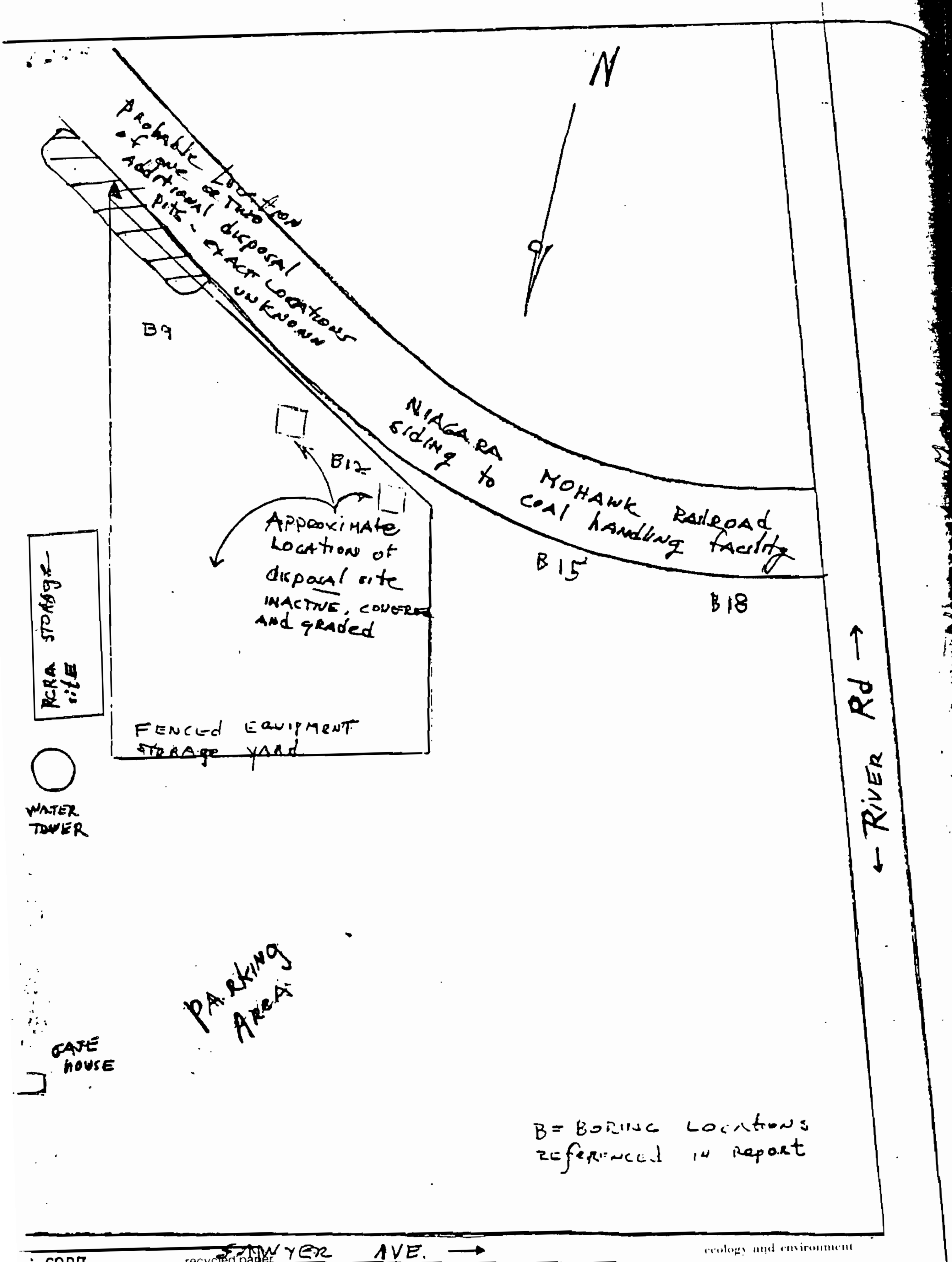
The site is secured within a fenced area and access is limited by plant security. Even if access to the site was unrestricted, no contact hazard would be expected.

CONCLUSION AND RECOMMENDATION

These pits were located in an area of thick silty clay deposits which would restrict the migration of leachable pollutants. The groundwater is not used as a drinking water source. The disposal pit have been adequately closed and covered. Waste chemicals placed into the disposal pits have or can be expected to decompose into harmless salts. The site does not appear to pose any hazard, given the inform tion available, in its present condition. Monitoring, excavating or providing additional cover to the area is not justified. We would recommend, given the above conclusions, that the site be kept undisturbed and removed from consideration as a hazardous disposal are

Erie County Department of Environment and Planning
March 1, 1982


T O N A W A N
Drive in Theater
Radio Tower
BLVD
Trailer Park
374
606
DESMOND
NYC
AVE
SAWYER
Water Tank
Substa
DUNLOP CORP
DUNLOP
LANE DR
SHERIDAN
WT
Water Tank
190
Water Tank
DU PONT
Parking
375
585
ROAD
TONAWANDA
GROVER PL
VULCAN
Riverside Park
Cem
Light
CROW STREET
TOLL ROAD
NIAGARA
Light
Light
Light
BM 573
27
NIAGARA
RIVER
CONVEYOR
Marina
BM
Substation
572
F.M.C. CORP
DEC. Site 915025
Substa
WELL #257-155-3
WELL #-257-155-1
WELL # 257-155-2
TONAWANDA CHANNEL
RIVER
Motor Island
571
PARKWAY
SOUTH
596
ROAD
RIVER
EAST
ROAD
Light
Radio Towers (WBEN)
Light
Buffalo Launch Club
ROAD
ROAD
Ferry Village
BEAVER ISLAND
STATE PARK
x 592
Water Tank
587
Golf Course WELL #257-155-4
Parking WELL #257-155-2
Parking
Beaver Island
ERIE CO
WELLAND CO
148
Strawberry Island
578
CHANNEL
North
9
6
18
19
23
9
2
3
585
31
BM 577
580
Cem
149
580
32
BM 572
NIAGARA
915025
by: ECDEP - 1/82


N
Probable Location of one or two Additional disposal pits - exact locations unknown
B9
NIAGARA MOHAWK Railroad siding to coal handling facility
B12
Approximate Location of disposal site INACTIVE, COVERED AND graded
B15
B18
RCRA storage site
FENCED EQUIPMENT STORAGE YARD
WATER TOWER
PARKING AREA
GATE HOUSE
← RIVER Rd →
B = BORING LOCATIONS REFERENCED IN REPORT
SAWYER AVE. →

REFERENCE NO. 10

ATTACHMENT IV

INTERAGENCY TASK FORCE ON HAZARDOUS WASTES

DRAFT REPORT
ON
HAZARDOUS WASTE DISPOSAL
IN
ERIE AND NIAGARA COUNTIES, NEW YORK

March 1979

ATTACHMENT IV

FMC CORPORATION
Industrial Chemical Division
34 Sawyer Avenue
Tonawanda

FMC Corporation was established in 1925 as the Buffalo Electro-Chemical Company. The company later became known as Foo Machinery and Chemical Corporation. In 1961, the name was shortened to FMC.

The company manufactures a variety of products including ammonium persulfate (since 1951), potassium persulfate (since 1927), sodium persulfate (since 1961), hydrogen peroxide (1927 t 1970), peracetic acid (since 1927), zinc and calcium peroxides (1958 to 1968) and dipicolinic acid (since 1958).

The company generates floor sweepings, scrap products, borax, potassium perdiphosphate, potassium phosphate, potassium flouride, manganese oxide, filter backwashes containing ammonium persulfate, ammonium sulfate, metal oxide, scrap perburate and miscellaneous garbage as wastes.

Four pits on site, each 4,000 cubic feet in size, were used for disposal of floor sweepings (660 gallons/year), scrap products and borax from 1964 to 1976. Since 1974, Chem-Trol Pollution Service, Inc. has been used for the removal and disposal of floo sweepings, scrap products including persulphates, perberates, sodium carbonate peroxide, hydrogen peroxide, paracetic acid, calcium and zinc peroxide, magnesium, urea, pyrophosphate and dipicolinic acid.

Since 1962, Seaway Industrial Park in Tonawanda has been used for disposal of yard trash, floor sweepings, scrap perborat and miscellaneous garbage. The company has no records of waste disposal activities prior to 1962.

~~FORD MOTOR COMPANY~~
~~Ford Stamping Plant~~
~~3660 Lake Shore Road~~
~~Buffalo~~

~~The Ford Motor Company has operated two manufacturing facilities in Buffalo, an assembly plant which operated from 1924 to 1957 in a building now occupied by the Niagara Frontier Port Authority, and the Stamping Plant at Lake Shore Road which has been operating since 1950.~~

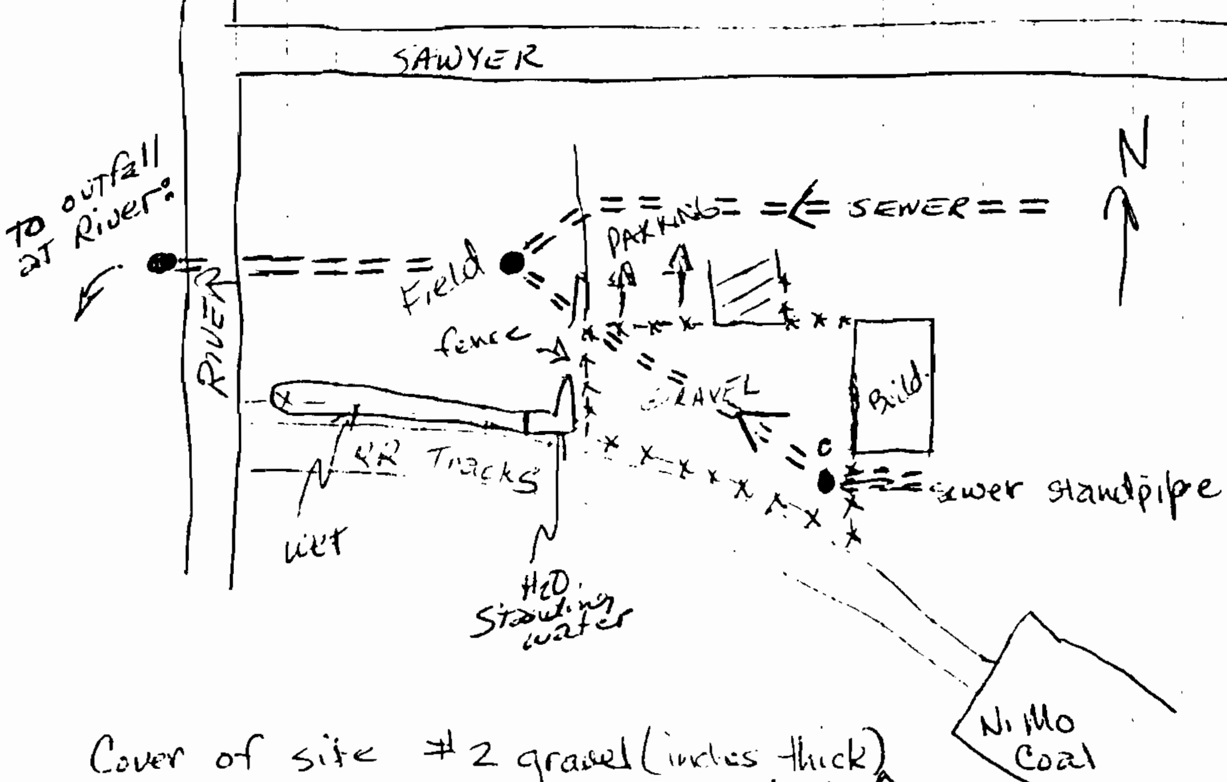
REFERENCE NO. 11

TITLE ______ **Project No.** ______

Book No. ______

From Page No. ___ FMC Corporation Cont 9-24-87

1055 HNU Calibration Checked - 63ppm 9.8 span
1100 Inspect site - Bruce Warner accompanying R. Wise.



Cover of site #2 gravel (inches thick)
Weather - partly cloudy, 65°F, wind from E
photo 1 - site from NW
no leachate at water visible
photo 2 - standing water at west end
plastic liner under gravel for weed control
photo 3,4 Site from SE corner, with sewer on #4
- herbicides used to control grass.

outfall discharge of sewer ~~to~~ tested prior to leaving site
1130 Obtained sewer information
1135 off site.

9-24-87

FMC Corporation
Peroxygen Chemicals Division
Box 845
Buffalo New York 14240
716 879 0405

Richard K Wise
Supervisor
Environmental
Engineering

FMC

Witnessed & Understood by me,	Date	Invented by

Project No.________

Book No.________ **TITLE** ____

Page No.__

FMC CorporATion 9·23·87
A.M. Sienkiewicz Gene Florentino

00 Met with Richard Wise - discussed Phase I investigation outline.

SPDES permit # ~~40337~~ AMS #0000337
USGS 82-83
correction on pg 2 of Draft Task Force Report
pit depth 10'

Land purchase by Niagra Mohawk 1977, at edge of pit

SPDES #0000337 Date Isssue 8/1/86 8/1/91 expiration
SPCC # unknown
Sanitary Sewer PermiT

Plant Manager: Paul R. Yochum

RCRA Generator - FMC
Lewiston Trucking - Transporter
Tonnawanda Tank - transportor } local (major)

No work on site by FMC - no monitoring by FMC.
Mr. Wise Provided file information on site.
No monitoring wells on site.
Regarding PCB drums - identified drum was burned at EANSCO as well as westinghouse site which was AMS non-PCB oil.
Pittsburg testing Conducted off-site boring in FMC location. Provided to E+E.

045 Meeting concluded - site inspection

A. M. Sienkiewicz

To Page No.____

essed & Understood by me, | Date | Invented by | Date

REFERENCE NO. 12

FMC Corporation

Peroxygen Chemicals Division
Box 815
Buffalo New York 14210
716 876 8300

FMC

September 24, 1987

Mr. Mark Sienkiewicz
Ecology and Environment
P. O. Box D
195 Holtz Road
Buffalo, New York 14225

Re: Inactive Waste Disposal Site (ID 915025) at
FMC Corporation, Tonawanda/Erie County

Dear Mr. Sienkiewicz:

Mr. Charles Goddard's letter of May 1, 1987 states that a "preliminary field investigation" will be done at our inactive waste disposal site. Phase I of the program is to collect available information on the site and prepare a work plan to collect additional data. Information about the site includes the following:

a) All generators of wastes deposited at the site. FMC is the sole depositor.

b) Types and quantities of such wastes. Persulfates, perborates, sodium carbonate peroxide, hydrogen peroxide, peracetic acid, calcium and zinc peroxide, dipicolinic acid. 100 tons total (estimate).

c) Period of time site was operated. 1964-1976.

d) Description of site operational practices. Wastes were deposited in pits. Pits were covered with clay when they were full.

e) Description of testing, monitoring or remedial action undertaken or planned.

Testing - See Attachment I - FMC soil bore data
Attachment II - USGS testing

Monitoring - See Attachment III - Erie County Report
No monitoring/remedial action is planned.

f) Description of any known health or environmental problems at the site.

No problems are known or suspected.

g) Other information which may assist in site evaluation.

See Attachment IV - Interagency Task Force Report
Attachment V - Inactive Hazardous Waste Disposal Sites in NYS - Volume 9
Attachment VI - "Executive Order 33" submittal (non-pertinent data "x"ed out).

The recently completed Niagara River toxics study examined sixty disposal sites in the Tonawanda - North Tonawanda area, designating twenty sites as having a significant potential for containment migration. The FMC site was evaluated, but was not one of the significant sites.

We recommend, given the above information, that the site be kept undisturbed and removed from consideration as a hazardous disposal area.

Very truly yours,

Paul R. Yochum

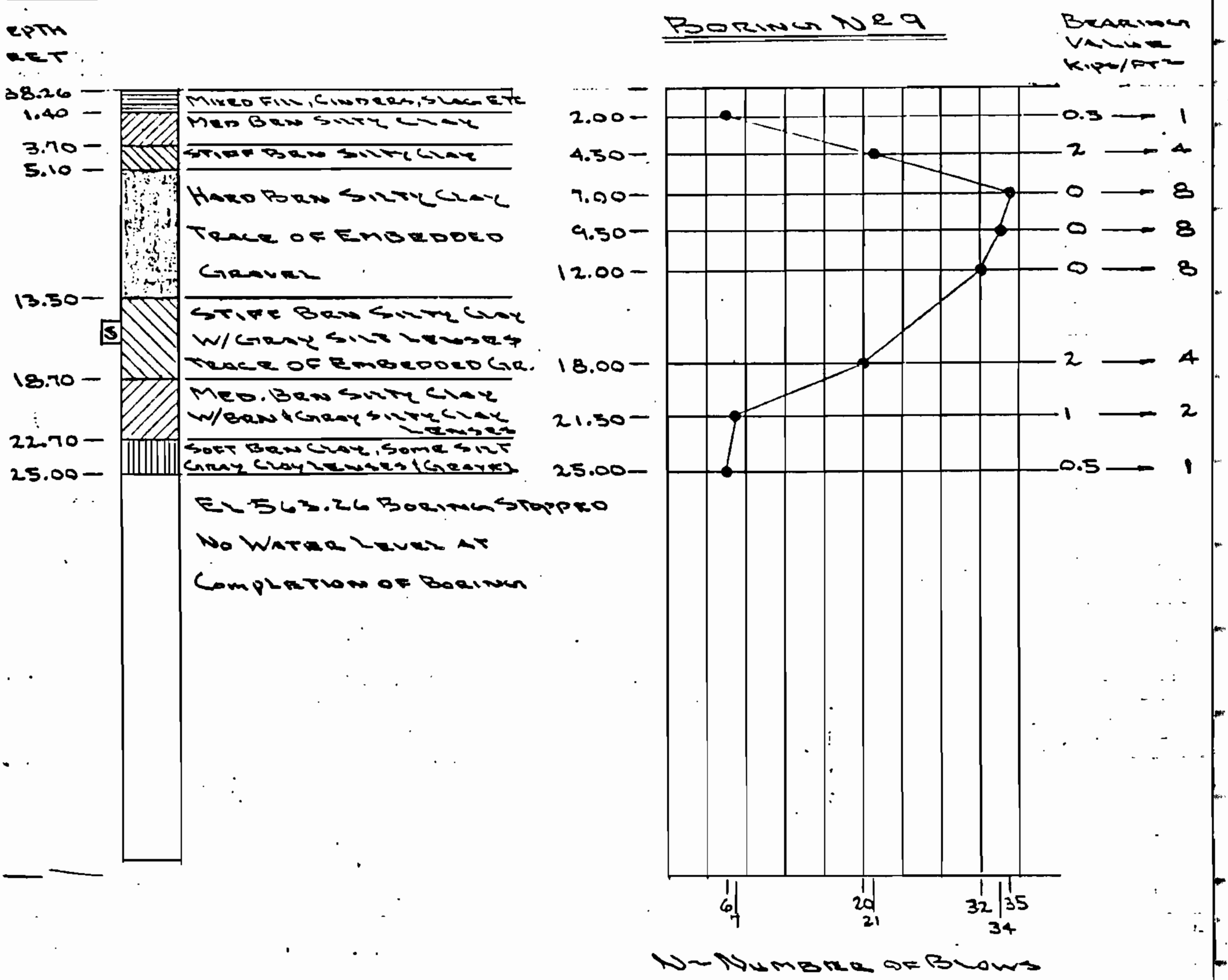
P. R. Yochum
Resident Manager

jmd
Attachments

ATTACHMENT I

FMC CORPORATION
BUFFALO PLANT
SOIL STUDY
WEST PARCEL OF LAND

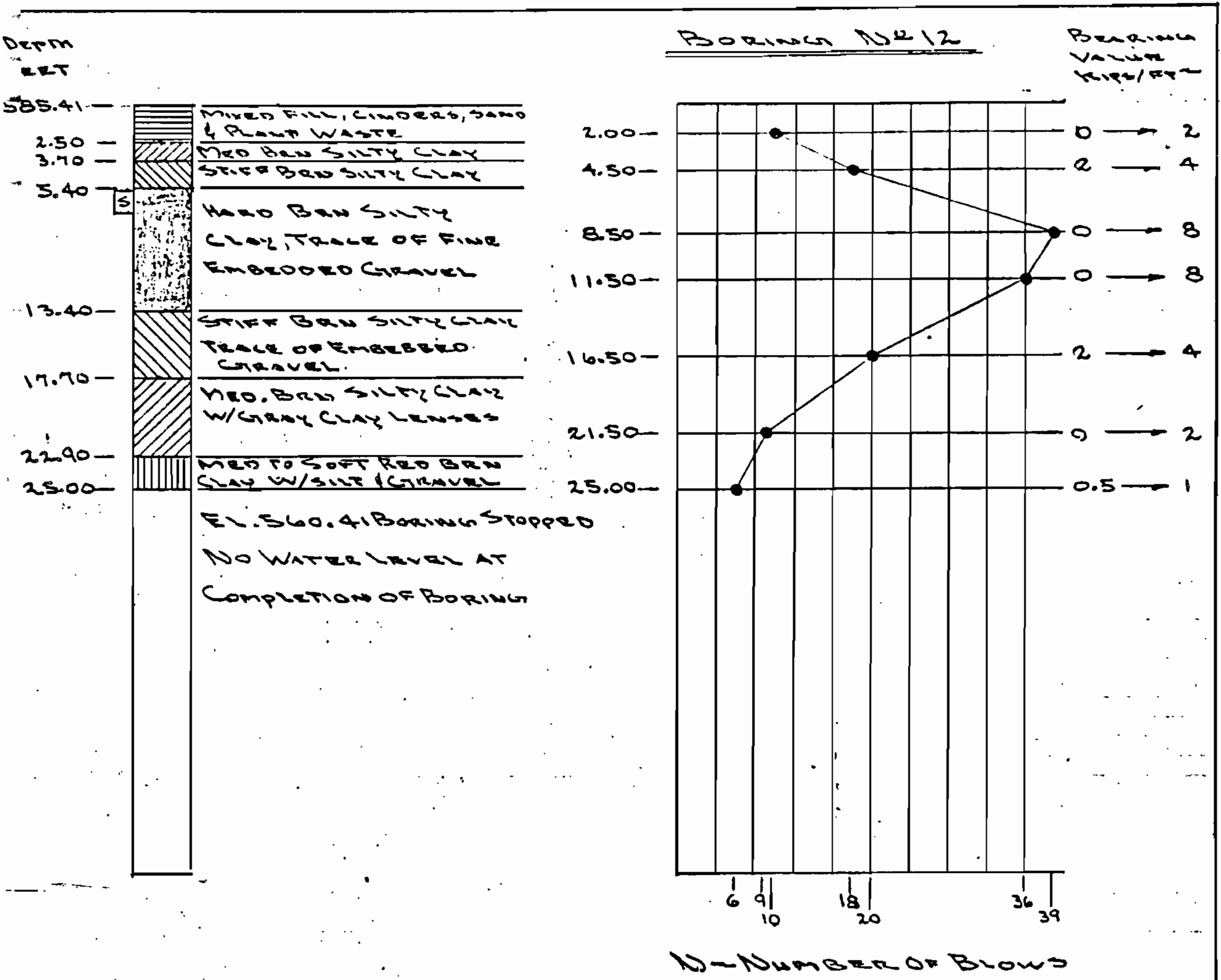
APRIL 2, 1969



S - 2½" SHELBY TUBE SAMPLE
TAKEN AT EL 573.26 - 571.76

SISTI 3/20/69

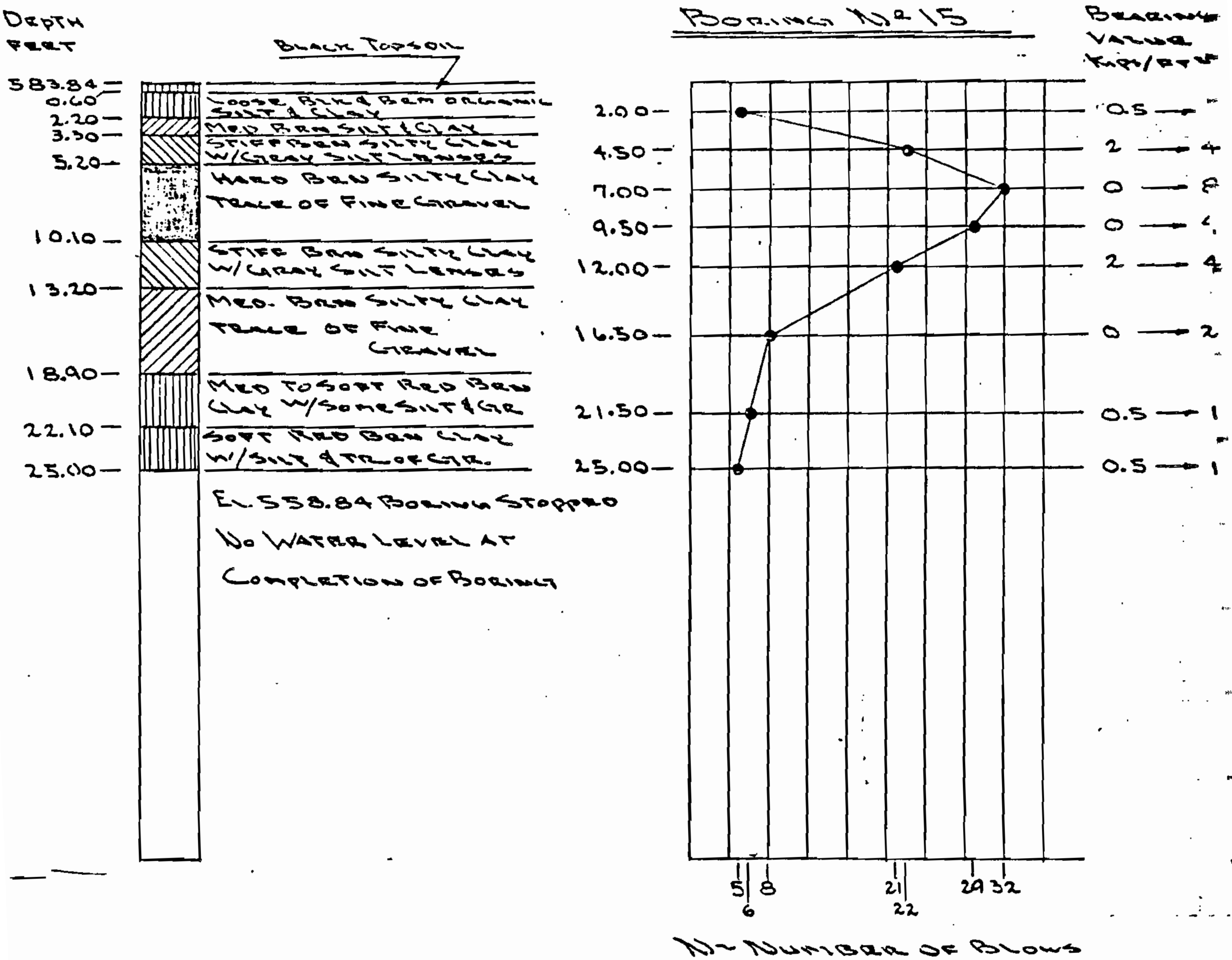
ATTACHMENT 1



S - 2½" Shelby Tube Sample Taken At El. 579.91-578.41

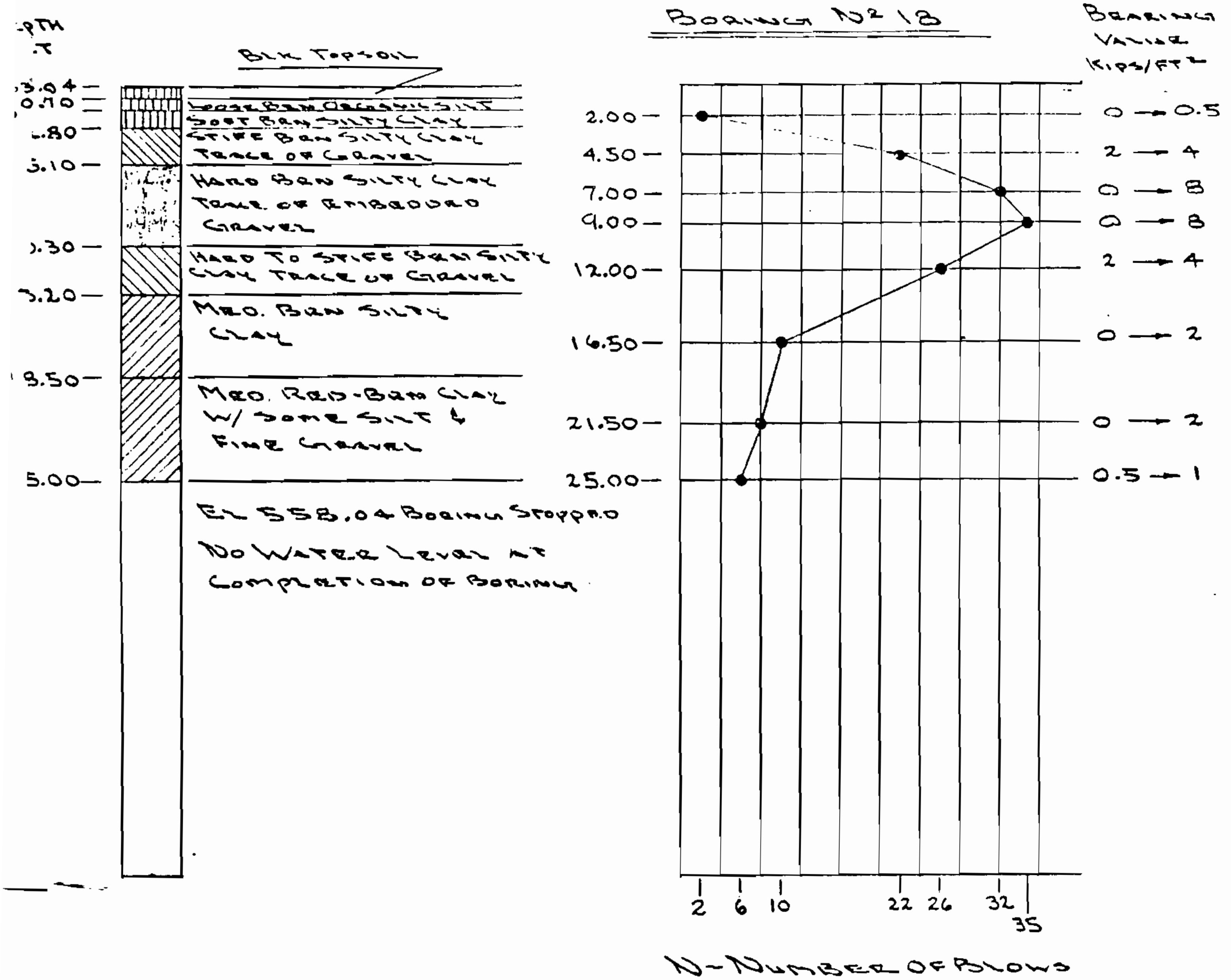
3/24/69

BORING Nº 15



Sisti 3/24/

BORING Nº 18



Sisti 3/24/69

ATTACHMENT II

New York State Department of Environmental Conservation
600 Delaware Avenue, Buffalo, New York 14202-1073

Henry G Williams
Commissioner

September 24, 1984

Mr. John W. Coykendall, Resident Manager
FMC Corporation
P.O. Box 845
Buffalo, New York 14240

Attn: Mr. Richard K. Wise

Dear Mr. Coykendall:

Re: FMC Corporation, Site No. 932014

During the Summer of 1982 and the Spring of 1983, the United States Geological Survey (USGS) undertook the sampling of a number of inactive hazardous waste disposal sites within roughly a three mile wide band along the Niagara River as part of an overall investigation of toxic contaminant entry to the Niagara River. Your site was one of those sampled by the USGS as part of this program.

For your information, find enclosed a copy of a site map delineating the USGS sampling locations, and a copy of the analytical results from the sampling program.

Questions concerning the enclosed material can be directed to this office at 716/847-4590.

Yours truly,

Peter J. Bucchi, P.E.
Associate Sanitary Engineer

PJB:cag

Enclosure

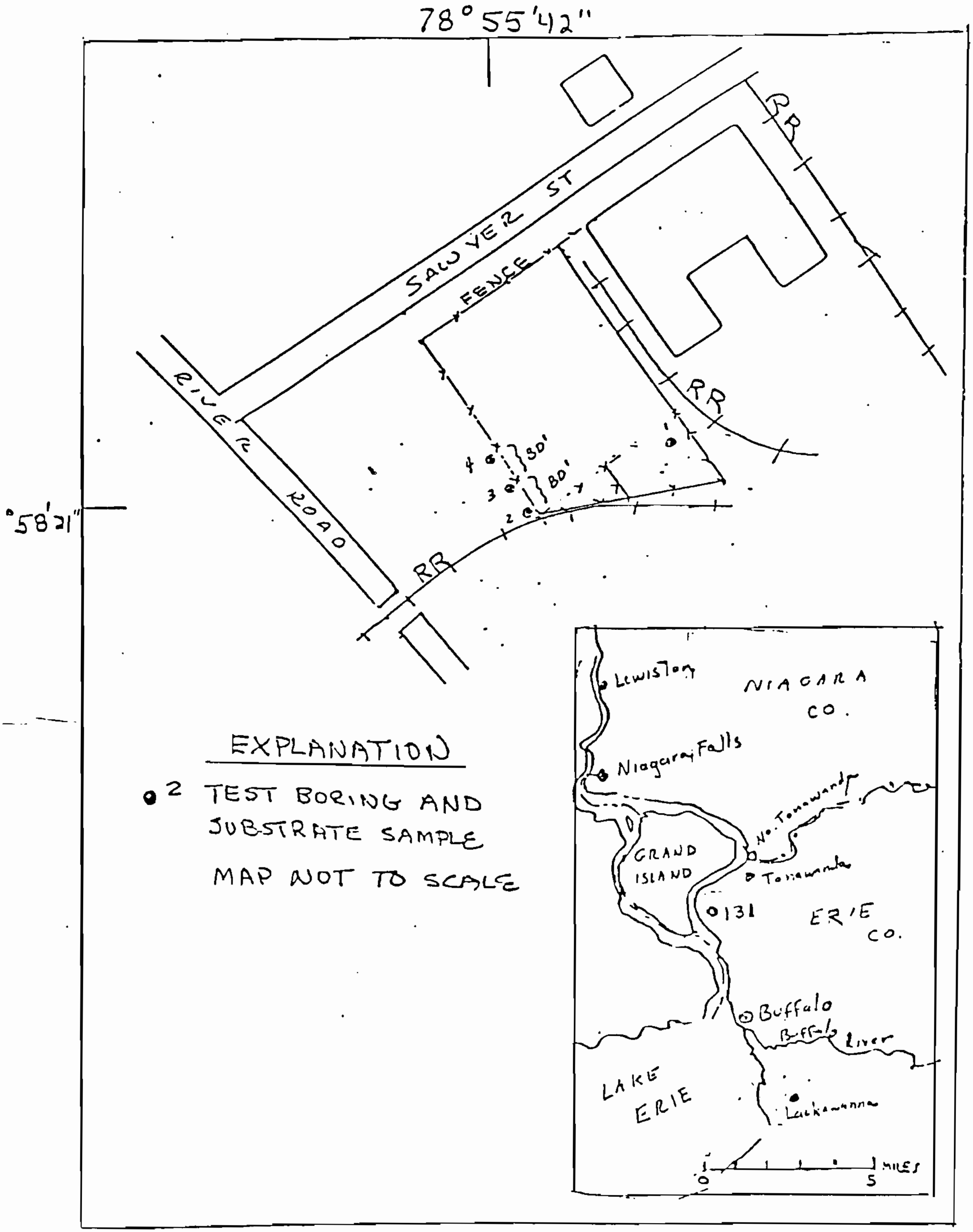
FMC COMMENT

Samples from 8/19/83 were held beyond the allowable holding time before analyses.

Analytical results were below the detection limit for the method.

RECEIVED
SEP 26 1984
FMC - BUFFALO
ENVIRONMENTAL

ATTACHMENT II



Base from field sketch by USGS, 1983

DRAFT

ATTACHMENT II

Table ~~66~~ 67.--Analyses of substrate samples from FMC, site 131, Sawyer Street, Tonawanda, N.Y. (Locations shown in fig. ~~57~~ 51. Concentrations are in µg/Kg; dashes indicate that constituent or compound was not found, LT indicates it was found but below the quantifiable detection limit.)

	Sample number and depth below land surface (ft)			
	1	2	3	4
First sampling (08-04-82)	0.5	2.5	2.5	2.5
Inorganic constituents				
Iron	160,000	470,000	410,000	370,000
Zinc	1,000	17,000	29,000	13,000

	Sample number			
Second sampling (08-19-83)	1A	2A	3A	4A
Inorganic constituents				
Molecular sulfur	--	10,000	--	--
Organic compounds				
Priority pollutants				
Acenaphthene	*	*	*	*
Fluoranthene	*	*	*	*
Naphthalene	*	*	*	--
Bis(2-ethylhexl)phthalate	*	--	--	*
Di-n-butylphthalate	--	*	--	--
Di-n-octylphthalate	--	--	--	*
Benzo(a)anthracene	*	*	*	*
Benzo(a)pyrene	*	*	*	*
Benzo(b)fluoranthene and benzo(k)fluoranthene	*	--	*	*
Chrysene	*	*	*	*
Acenaphthylene	*	--	--	--
Anthracene	*	*	*	--
Benzo(ghi)perylene	*	*	*	*
Fluorene	*	*	*	--
Phenanthrene	*	*	*	--
Dibenzo(a,h)anthracene	*	*	*	*
Indeno(1,2,3-cd)pyrene	*	*	*	*
Pyrene	*	*	*	*

---

[1] Tentative identification based on comparison with the National Bureau of Standards (NBS) library. No external standard was available. Concentration reported is semiquantitative and is based only on an internal standard. GC/MS spectra were examined and interpreted by GC/MS analysts.

* Compounds detected but not quantified--Holding time exceeded before GC/MS acid- and base-neutral extractable compounds were extracted.

DRAFT

ATTACHMENT II

Table ~~66~~ 67.--Analyses of substrate samples from FMC, site 131, Sawyer Street, Tonawanda, N.Y. (Locations shown in fig. ~~57~~ 51. Concentrations are in μg/Kg; dashes indicate that constituent or compound was not found, LT indicates it was found but below the quantifiable detection limit.)—continued

Second sampling (08-19-83)	Sample number			
	1A	2A	3A	4A
Organic compounds (continued)				
Nonpriority pollutants				
Dibenzofuran	*	*	*	*
2-Methylnaphthalene	*	*	*	--
Benzoic acid	--	*	*	--
1-Methylnaphthalene[1]	*	--	--	--
Dibenzothiophene[1]	*	--	--	--
Acridine[1]	*	--	--	--
Phenanthridine[1]	*	--	--	--
9H-carbazole[1]	*	--	*	--
9-Methylphenanthrene[1]	*	--	--	--
3-Methylphenanthrene[1]	*	--	--	--
4-Methylphenanthrene[1]	*	--	--	--
7-Methyl-9H-carbazole[1]	*	--	--	--
1-Phenylnaphthalene[1]	*	--	--	--
9,10-Anthracenedione[1]	*	--	--	--
9-Ethylphenanthrene[1]	*	--	--	--
2,5-Dimethylphenanthrene[1]	*	--	--	--
1-Methylpyrene[1]	*	*	*	--
7-Methylbenzo(a) anthracene[1]	*	--	*	--
4-Cyclopenta(def) phenanthrene[1]	*	--	--	--
Perylene	--	--	*	--
Hexadecanoic acid[1]	--	--	*	--
4-Hydroxy-3-methoxy-benzaldehyde[1]	--	--	*	--
4H-Cyclopenta(def) phenanthrene[1]	--	--	*	--
Unknown hydrocarbons[1]	*	*	*	--

ATTACHMENT V

DEC
PUBLICATION

RECEIVED
APR 22 1987
FMC - BUFFALO
ENVIRONMENTAL

Division of Solid and Hazardous Waste

Inactive Hazardous Waste Disposal Sites in New York State

Site List by Counties; Volume 9

- Allegeny
- Cattaraugus
- Chautauqua
- Erie
- Niagara
- Wyoming

December 1986

A Joint Report
of the New York State Department of Environmental Conservation and Health

New York State/Department of Environmental Conservatio

ATTACHMENT V

APPENDIX G

Volume 9

Included in this volume are the site report forms for all inactive hazardous waste disposal sites located in the Department of Environmental Conservation (DEC) Region 9.

Each of the site reports includes information currently known about the site. It also indicates the priority classification which has been assigned to the site, according to the following code:

1. Causing or presenting an imminent danger of causing irreversible or irreparable damage to the public health or environment - immediate action required;
2. Significant threat to the public health or environment - action required;

2a. Temporary classification assigned to sites that have inadequate and/or insufficient data for inclusion in any of the other classifications;

3. Does not present a significant threat to the public health or environment - action may be deferred;
4. Site properly closed - requires continued management;
5. Site properly closed, no evidence of present or potential adverse impact - no further action required.

This report contains thousands of individual items of information, taken from many different sources. It is probable that some individual facts given on the site report forms are in error. The Department of Environmental Conservation will make every effort to correct such errors in subsequent reports, and will appreciate any assistance in this effort.

Corrections or information on additional sites may be submitted to the appropriate DEC Regional Office, or the Chief of the Bureau of Hazardous Site Control, 50 Wolf Road, Room 207, Albany, New York 12233, (518) 457-0730.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID AND HAZARDOUS WASTE
INACTIVE HAZARDOUS WASTE DISPOSAL REPORT

CLASSIFICATION CODE: 2a REGION: 9 SITE CODE: 91502
EPA ID:

NAME OF SITE : FMC Corp - Chem. Div
STREET ADDRESS: 34 Sawyer Ave.
TOWN/CITY: Tonawanda
COUNTY: Erie
ZIP: 14150

SITE TYPE: Open Dump-X Structure- Lagoon- Landfill- Treatment Pond-
ESTIMATED SIZE: 1 § Acres

SITE OWNER/OPERATOR INFORMATION:
CURRENT OWNER NAME....: FMC Corporation
CURRENT OWNER ADDRESS.: 34 Sawyer Ave., Tonawanda, NY 14150
OWNER(S) DURING USE...: FMC Corporation
OPERATOR DURING USE...: FMC Corporation
OPERATOR ADDRESS......: 34 Sawyer Ave., Tonawanda, NY 14150
PERIOD ASSOCIATED WITH HAZARDOUS WASTE: From 1964 To 1976

SITE DESCRIPTION:
Two (2) and possibly four (4) waste disposal pits were utilized, by the firm, for a period of 12 years. The pits have been covered and graded. Possibly two (2) of the pits are on land transferred to the Niagara Mohawk Corporation and now may have been buried under a railroad roadbed. Size of each pit was estimated to be 20' x 20' x 10'. In July of 1982, U.S.G.S. collected 4 subsurface soil samples. Samples were analyzed for iron and zinc. Resampling of the site by U.S.G.S. took place in May, 1983. 18 of the organic priority pollutants were detected, four parameters were found at above 1000 PPB concentrations. DOH inspection of this site was conducted in May of 1985.

HAZARDOUS WASTE DISPOSED: Confirmed-X Suspected-

TYPE	QUANTITY (units)
Persulfates, perborates, sodium carbonate ammonia compounds, hydrogen perioxide, calcium peroxide, magnesium urea, pyrophosphate	100 tons total

ANALYTICAL DATA AVAILABLE:
Air- Surface Water- Groundwater- Soil-X Sediment- None-

CONTRAVENTION OF STANDARDS:
Groundwater- Drinking Water- Surface Water- Air-

LEGAL ACTION:

TYPE..: none State- Federal-
STATUS: Negotiation in Progress- Order Signed-

REMEDIAL ACTION:

Proposed- Under design- In Progress- Completed-
NATURE OF ACTION: none

GEOTECHNICAL INFORMATION:
SOIL TYPE: Silty clay
GROUNDWATER DEPTH: unknown

ASSESSMENT OF ENVIRONMENTAL PROBLEMS:

Waste disposal pits have been properly closed and the analysis of the soil samples collected by U.S.G.S. did not show significant concentrations of iron and zinc. However, organic data indicate that the site is contaminated and there is potential for contaminant migration from the site.

ASSESSMENT OF HEALTH PROBLEMS:

Medium	Contaminants Available	Migration Potential	Potentially Exposed Population	Need for Investigation
Air	Likely	Unlikely	Yes	Medium
Surface Soil	Likely	Unlikely	Yes	Medium
Groundwater	Likely	Unlikely	No	Low
Surface Water	Likely	Unlikely	Yes	Medium

Health Department Site Inspection Date : 7/85

MUNICIPAL WASTE ID:

ANALYTICAL DATA AVAILABLE:
Air- Surface Water- Groundwater- Soil-X Sediment- None-

CONTRAVENTION OF STANDARDS:
Groundwater- Drinking Water- Surface Water- Air-

LEGAL ACTION:

TYPE..: none State- Federal-
STATUS: Negotiation in Progress- Order Signed-

REMEDIAL ACTION:

Proposed- Under design- In Progress- Completed-
NATURE OF ACTION: none

GEOTECHNICAL INFORMATION:
SOIL TYPE: Silty clay
GROUNDWATER DEPTH: unknown

ASSESSMENT OF ENVIRONMENTAL PROBLEMS:

Waste disposal pits have been properly closed and the analysis of the soil samples collected by U.S.G.S. did not show significant concentrations of iron and zinc. However, organic data indicate that the site is contaminated and there is potential for contaminant migration from the site.

ASSESSMENT OF HEALTH PROBLEMS:

Medium	Contaminants Available	Migration Potential	Potentially Exposed Population	Need for Investigation
Air	Likely	Unlikely	Yes	Medium
Surface Soil	Likely	Unlikely	Yes	Medium
Groundwater	Likely	Unlikely	No	Low
Surface Water	Likely	Unlikely	Yes	Medium

Health Department Site Inspection Date : 7/85

MUNICIPAL WASTE ID:

ATTACHMENT XI

FMC Corporation

Specialty Chemicals Division
Box 845
Buffalo, New York 14240
(716) 876 8300

Certified Mail
RETURN RECEIPT REQUESTED

August 7, 1984

NYSDEC
RTK Processing Unit
Room 525
50 Wolf Road
Albany, New York 12233

Gentlemen:

The following information, required by Executive Order 33, is attached for the FMC Corporation "Buffalo" Plant, located in the Town of Tonawanda.

1. Completed "Generator" Questionnaire.
2. ~~Completed "Transporter" Questionnaire.~~
3. ~~Updated Industrial Chemical Survey.~~
4. ~~A separate envelope containing confidential information pertaining to Part III of the Industrial Chemical Survey.~~

Very truly yours,

P. R. Yochum
Resident Manager

hp
Attachments

ATTACHMENT VI

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID AND HAZARDOUS WASTE

GENERATOR FORM
PART - I

50 WOLF ROAD
ALBANY, NEW YORK 12233

HAZARDOUS WASTE DISPOSAL QUESTIONNAIRE

PLEASE COMPLETE AND RETURN TO THE ABOVE ADDRESS, ATTENTION: RTK PROCESSING UNIT, ROOM 525

ICS #: 9167091

ICS CODE
EPA ID NUMBER NYD074033101

FMC CORP.
RICHARD WISE
P.O. Box 845
Buffalo NY 14240

CITY
STATE
ZIP CODE

CONTACT NAME
TELEPHONE (716) 876-8300

ANT ADDRESS (if different)
REET 37 Sawver Avenue
CITY Tonawanda
STATE NY
ZIP CODE 14150

INCIPAL BUSINESS OF PLANT
Peroxygen Chemical Manufacture

PLEASE ANSWER THE FOLLOWING QUESTIONS:

CHECK ONE

1. SINCE JANUARY 1, 1952 THRU DECEMBER 31, 1981, HAVE YOU OR ANY PREVIOUS OWNERS/OPERATORS OF THIS FACILITY GENERATED ANY HAZARDOUS WASTE (SEE INSTRUCTIONS) AT YOUR PRESENT FACILITY, PLANT, PROPERTY, ETC?

☒ YES
☐ NO

IF THE ANSWER IS **YES** COMPLETE QUESTIONS 1, 2, 3, 4 AND **GENERATOR FORM PART - II**
IF THE ANSWER IS **NO** COMPLETE QUESTIONS 1 AND 4 AND RETURN THIS FORM

2. HAS THE FACILITY AT THIS LOCATION CHANGED ITS NAME OR IDENTIFICATION BECAUSE THERE WAS A CHANGE IN OWNERSHIP, CORPORATE NAME OR OPERATOR NAME, ETC. IF YES LIST THE NAMES BY WHICH THIS FACILITY HAS BEEN IDENTIFIED SINCE JANUARY 1, 1952 TO THE PRESENT.

☒ YES
☐ NO

NAME, ADDRESSES, AND TELEPHONE NUMBERS	DATES
Food Machinery and Chemical Corporation	1952-1961
FMC Corporation (name shortened)	1961-Present

3. DESCRIBE THE DOCUMENTS FROM WHICH DATA THAT IS INCLUDED ON PART-II WAS OBTAINED (SEE INSTRUCTIONS).

DOCUMENT DESCRIPTION	DATES
Summary to Interagency Task Force on Hazardous Waste	10/31/78
SCA Shipment Summary	8/8/80
FMC Manifests	5/6 to 12/29/81
Cercla Notification to EPA	6/8/81

4. I HEREBY CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT INFORMATION SUPPLIED IS TRUE AND COMPLETE. FALSE STATEMENTS SUBMITTED ON THIS DOCUMENT ARE PUNISHABLE PURSUANT TO SECTION 210.45 OF THE PENAL LAW.

P. R. Yochum — Resident Manager — 8/7/84
NAME OF OWNER/OPERATOR, PARTNER OFFICER OR AUTHORIZED REPRESENTATIVE — TITLE — DATE

Paul R Yochum

5-114 (716) 876-8300

…pora…n	NYD074033101		
ADDRESS P.O. Box 845			
CITY Buffalo,	STATE NY	ZIP 14240	

GENERATOR FORM

PART - II

G

DATE 8/7/84

Page 1 of 2

1. HAZARDOUS WASTE DISPOSAL SITE (SEE INSTRUCTIONS)	2. DESCRIPTION OF HAZARDOUS WASTES DEPOSITED AT THIS LOCATION (SEE INSTRUCTIONS)	3. EPA WASTE CODE	4. WASTE DISPOSED OF QUANTITY OF WASTE (TONS)	FORM LIQUID	FORM SOLID	FORM DRUMS	5. WASTE DISPOSAL DATES	6. TRANSPORTER OF HAZARDOUS WASTE (SEE INSTRUCTIONS)
SCA Chemical Services 1550 Balmer Road Model City, NY 14107 Niagara Co. Landfill	Persulfate Process Filtercake - filter aid with residual amounts of sulfates and persulfates	D001	228		X	X	1977-1980	SCA Chemical Service 11550 Balmer Road Model City, NY 14107
SCA Chemical Services 1550 Balmer Road Model City, NY 14107 Niagara Co. Landfill	Persulfate Process Filtercake - filter aid with residual amounts of sulfates and persulfates	D001	28		X	X	1981	Modern Disposal P.O. Box 109 Model City, NY 14107
CECOS International 56 St.+Pine Avenue Niagara Falls, NY 14304 Niagara Co. Landfill	Persulfate Process filtercake - filter aid with residual amounts of sulfates and persulfates	D001	81		X	X	1981	Niagara Sanitation 262 Pullman Kenmore, NY 14217
SCA Chemical Services 1550 Balmer Road Model City, NY 14107 Niagara Co. Landfill	Floor sweepings, etc from calcium and zinc peroxide process contains mixture of calcium &zinc oxides & peroxides with floor sweepings	D001	26		X	X	1979-1981	SCA Chemical Services 1550 Balmer Road Model City, NY 14107
SCA Chemical Services 1550 Balmer Road Model City, NY 14107 Niagara Co. Landfill	Residuals from experimental production of potassium perphosphate containing potassium phosphate, perphosphate and fluoride	D001	18	X	X	X	1974	SCA Chemical Services 1550 Balmer Road Model City, NY 14107
SCA Chemical Services 1550 Balmer Road Model City, NY 14107 Niagara Co. Landfill	Scrap persulfate products	D001	3		X	X	1981	SCA Chemical Services 1550 Balmer Road Model City, NY 14107
SCA Chemical Services 1550 Balmer Road Model City, NY 14107 Niagara Co. Landfill	Corrosive sludges from cleaning containment sumps	D002	1		X	X	1981	SCA Chemical Services 1550 Balmer Road Model City, NY 141…

recycled paper

NAME	ICS NUMBER - EPA ID NUMBER	
FMC Corporation	NYD074033101	
ADDRESS P.O. Box 845		
CITY Buffalo	STATE NY	ZIP 14240

GENERATOR FORM

PART - II

G

DATE 8/7/84

Page 2 of 2

HAZARDOUS WASTE DISPOSAL SITE (SEE INSTRUCTIONS)	2. DESCRIPTION OF HAZARDOUS WASTES DEPOSITED AT THIS LOCATION (SEE INSTRUCTIONS)	3. EPA WASTE CODE	4. WASTE DISPOSED OF QUANTITY OF WASTE (TONS)	FORM LIQUID	FORM SOLID	FORM DRUMS	5. WASTE DISPOSAL DATES	6. TRANSPORTER OF HAZARDOUS WASTE (SEE INSTRUCTIONS)
~~eaway Industrial Park 825 River Road onawanda, NY 14150 rie Co. Landfill~~	~~Floor sweepings and off-spec products (persulfates and peroxides)~~	~~D001~~	~~250 (Estimate)~~		~~X~~	~~X~~	~~1952-1979~~	~~FMC Corporation 37 Sawyer Avenue Tonawanda, NY 14150~~
~~own of Tonawanda 91 East Park onawanda, NY 14150 xie Co. Landfill & Incinerator~~	~~Floor sweepings and off-spec products (persulfates and peroxides)~~	~~D001~~	~~250 (Estimate)~~		~~X~~	~~X~~	~~1952-1979~~	~~FMC Corporation 37 Sawyer Avenue Tonawanda, NY 14150~~
~~ity of Buffalo quaw Island rie Co. Incinerator~~	~~Floor sweepings and off-spec products (persufates and peroxides)~~	~~D001~~	~~5 (Estimate)~~		~~X~~		~~1952-1979~~	~~FMC Corporation 37 Sawyer Avenue Tonawanda, NY 14150~~
MC Corporation 7 Sawyer Avenue onawanda, NY 14150 rie Co. Landfill	Floor sweepings, off-spec products (persulfates, peroxides, perborate)	D001	100 (Estimate)		X		1952-1978	On-Site Disposal
~~C Corporation iblin Road leans County, NY ndfill~~	~~Lab Chemicals~~	~~-~~	~~15 (Estimate)~~	~~X~~	~~X~~		~~1960~~	~~FMC Corporation 37 Sawyer Avenue Tonawanda, NY 14150~~

REFERENCE NO. 13

DRAFT

GRAPHICAL EXPOSURE MODELING SYSTEM

(GEMS)

USER'S GUIDE

VOLUME 1. CORE MANUAL

Prepared for:

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES AND TOXIC SUBSTANCES
EXPOSURE EVALUATION DIVISION
Task No. 3-2
Contract No. 68023970
Project Officer: Russell Kinerson
Task Manager: Loren Hall

Prepared by:

GENERAL SCIENCES CORPORATION
6100 Chevy Chase Drive, Suite 200
Laurel, Maryland 20707

Submitted: February, 1987

1. INTRODUCTION

The Graphical Exposure Modeling System (GEMS) is an interactive computer system developed by General Sciences Corporation under the auspices of the Modeling Section in the Exposure Evaluation Division (EED), Office of Toxic Substances (OTS) of the Environmental Protection Agency (EPA). It provides a simple interface to environmental modeling, physiochemical property estimation, statistical analysis, and graphic display capabilities, with data manipulation which supports all of these functions. An overview of the basic GEMS components is shown in Figure 1-1. The system is installed on the OTS VAX 11/780 computer in Research Triangle Park, North Carolina, and is accessible through dial-up lines.

GEMS is being developed to support integrated exposure analyses at OTS. Its purpose is to provide environmental researchers and analysts with a set of sophisticated tools to perform exposure assessments of toxic substances without requiring them to become familiar with most aspects of computer science or programming.

GEMS is designed under a unique concept which integrates the computerized tools of graphics, mapping, statistics, file management, and special functions such as modeling and physiochemical property estimation, under a user-oriented and simple-to-learn interface. GEMS prompts the user or provides a menu for each action to be performed. The following features provide users with great flexibility during the GEMS execution:

- o HELP commands - When you are using the GEMS system, you may not always have a user's manual readily available and/or you may need to see the format and type of a command or an answer before you enter it. Various HELP commands are available in GEMS which provide such information.

- o Recovering from errors - If you enter a command or a response incorrectly, the system issues an error message and reprompts you for the correct information.

- o Built-in defaults for model execution - GEMS is designed to guide inexperienced users through the execution of selected models. Default responses are usually available when you cannot specify a choice or supply an input to a prompt during model execution.

- o Data management of modeling results - Data generated from execution of the SESOIL, ISC, SWIP, or AT123D models may be stored automatically in GEMS. These data may be accessed or analyzed via GEMS' file management, graphics, and statistics operations.

The purpose of this document is to describe GEMS from the user's point of view. It is intended as a comprehensive guide to the use of GEMS for personnel who have no specialized knowledge of computer programming. However, a working knowledge of environmental modeling is necessary for complete and accurate use of the system.

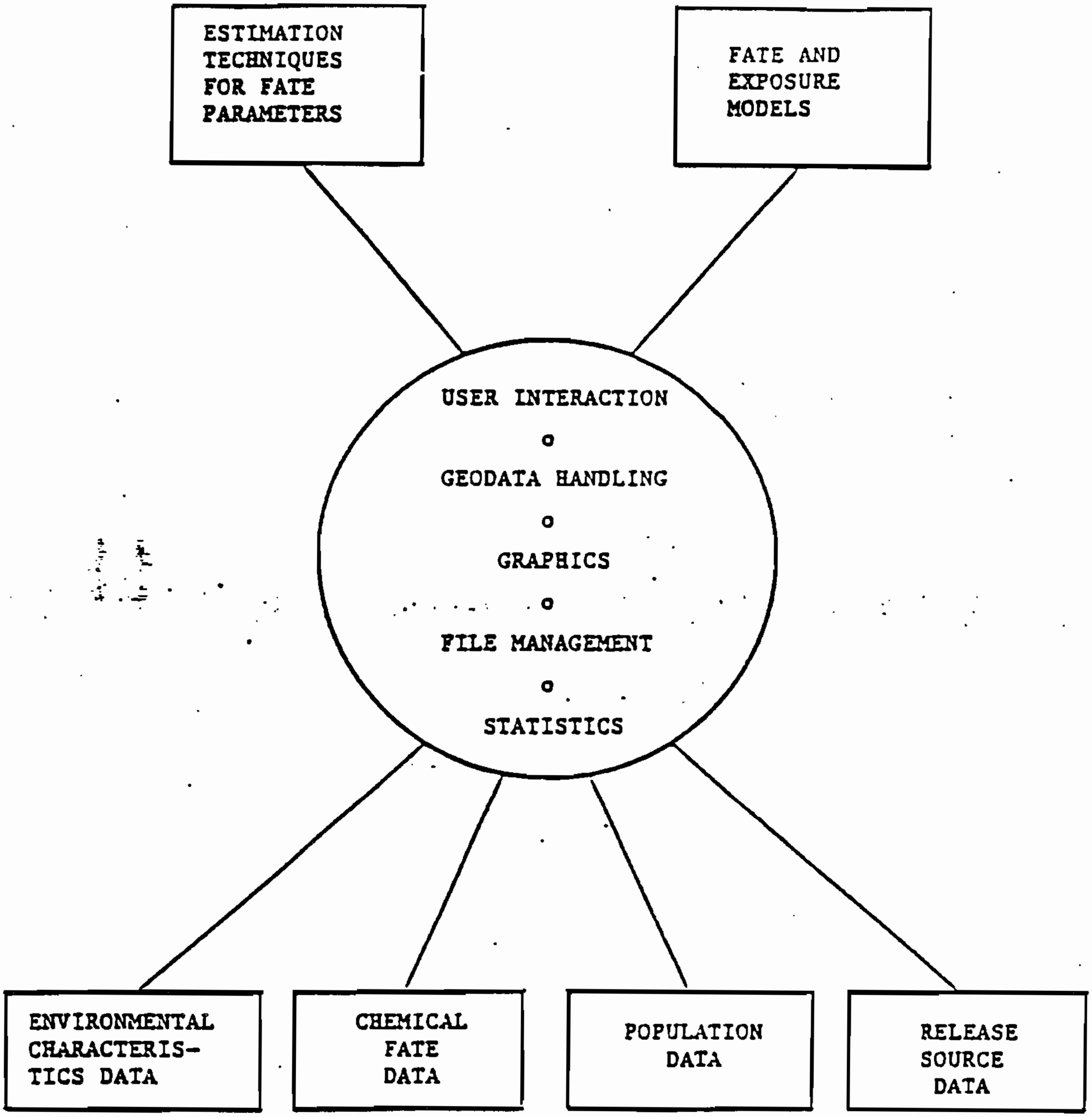


FIGURE 1-1. Components of the Graphical Exposure Modeling System (GEMS)

Since the last draft of the GEMS User's Guide, completed in June, 1984, the GEMS system has gone through a number of modifications and enhancements. It is no longer feasible to hold all sections in one single volume. This revised user's guide is designed in a modular fashion of six separate volumes described briefly below. In addition, GEMS has been adapted to function on an IBM PC/XT or AT. This prototype called PCGEMS has many of the same capabilities of the mainframe GEMS. These include environmental modeling procedures such as ENPART and AT123D as well as property estimation procedures such as CLOGP and AUTOCHEM. The prototype PCGEMS works in large part through interface with the OTS VAX 11/780 on which GEMS resides, a user's guide for PCGEMS will be available in the near future.

Volume 1: Core-Manual

This volume is a reference manual and introduction for first-time users. In addition to Section 1 - Introduction, a functional description of GEMS is presented in Section 2, a detailed guide to the use of the system is presented in Section 3, and summaries of the VAX operating environment and system and frequently used utilities are presented in Section 4. Two sample runs are given in the attachment to provide users with information in order to interact with the GEMS system, to generate a dataset, and subsequently, produce a map from the dataset.

Volume 2: Modeling

This volume consists of all GSC prepared user's manuals to GEMS models, grouped according to media. User's manuals are available for the following models: SESOIL, AT123D, SWIP, ENPART, TOX-SCREEN, INPUFF, and ISC/GAMS. A user's manual for EXAMS II model will be available later this year. Refer to Section 2.2 for further information.

Volume 3: Graphics and Geodata Handling

This volume contains two GEMS operations, Graphics and Geodata Handling. The Graphics operation contains a variety of graphics procedures which may be used to display results from modeling runs or from datasets. The Geodata Handling operation contains procedures that perform geographic data manipulation and generate maps of U.S. states or counties. Refer to Section 2.3 for further information.

Volume 4: Data Manipulation

This volume contains descriptions of GEMS system-installed datasets and two GEMS operations - File Management, and Utilities. Refer to Section 2.4 for further information.

Volume 5: Estimation

This volume consists of user's manuals for SFILES, FAP, CLOGP, and AUTOCHEM. These estimation programs may be used to provide estimated physiochemical properties for model input or for other environmental fate analyses. Refer to Section 2.5 for further information.

Volume 6: Statistics

This volume contains information on the GEMS Statistics operation which includes the Descriptive Statistics procedure and procedures to produce simple or multiple regression and contingency tables. Refer to Section 2.6 for further information.

REFERENCE NO. 14

Dangerous Properties of Industrial Materials

Fifth Edition

N. IRVING SAX

Assisted by:

Marilyn C. Bracken/Robert D. Bruce/William F. Durham/Benjamin Feiner/
Edward G. Fitzgerald/Joseph J. Fitzgerald/Barbara J. Goldsmith/John H. Harley/
Robert Herrick/Richard J. Lewis/James R. Mahoney/John F. Schmutz/
E. June Thompson/Elizabeth K. Weisburger/David Gordon Wilson

VNR VAN NOSTRAND REINHOLD COMPANY
NEW YORK CINCINNATI ATLANTA DALLAS SAN FRANCISCO
LONDON TORONTO MELBOURNE

AMMONIUM-*m*-ARSENITE. White powder. NH_4AsO_2, mw: 125.
THR = HIGH; see arsenic compounds.

AMMONIUM AZIDE. Colorless plates. NH_4N_3, mw: 60.1. mp: 160°, bp: explodes, d: 1.346, vap. press: 1 mm @ 59.2° (sublimes).
THR = HIGH via oral and inhal routes.
Fire Hazard: Mod.
Explosion Hazard: Mod when heated.

AMMONIUM BENZENE SULFONATE. Crystals. $NH_4C_6H_5SO_3$, mw: 175.2, mp: 271–275° (decomp), d: 1.342.
THR = U. Probably toxic.
Disaster Hazard: Dangerous; see sulfonates.

AMMONIUM BIBORATE. Syn: *ammonium tetraborate*. Colorless, tetragonal crystals. $(NH_4)_2B_4O_7 \cdot 4H_2O$, mw: 263.4, mp: decomp.
THR = U. An herbicide. See also boron compounds.

AMMONIUM BICAMPHORATE. Syns: *acid ammonium camphorate*, *ammonium camphorate*. Crystalline powder; freely sol in water. $NH_4HC_{10}H_{14}O_4 \cdot 3H_2O$, mw: 271.31.
THR = See camphor.

AMMONIUM BICARBONATE. Syns: *ammonium acid carbonate*, *ammonium hydrogen carbonate*. White crystals, sol in water, insol in alcohol. NH_4HCO_3, mw: 79, d: 1.586, mp: 108°.
Acute tox data: iv LD_{50} (mouse) = 245 mg/kg. [3]
THR = HIGH via iv route. A general purpose food additive. [109]

AMMONIUM BICHROMATE. Syn: *ammonium dichromate*. Bright orange red needles. $(NH_4)_2Cr_2O_7$, mw: 252.10, mp: decomp before it melts, d: 2.15 @ 25°.
Acute tox data: sc LD_{Lo} (guinea pig) = 30 mg/kg. [3]
THR = HIGH via sc, oral, inhal and contact routes. If swallowed it causes prompt vomiting, but if retained, may lead to kidney injury and ulceration of stomach. Chrome ulcers or sores of skin are well known, as is perforation of the nasal septum from chronic exposure to chrome salts. Prolonged inhal of dust can cause asthmatic symptoms. See chromium compounds.
Fire Hazard: Mod; reacts with reducing agents. An oxidizer. Decomp around 200°. Flam.

AMMONIUM BIFLUORIDE, SOLID or SOLUTION. Syn: *ammonium hydrogen fluoride*. White crystals. NH_4FHF, mw: 57.05, d: 1.21 @ 12°/12° (liquid), mp: 124.6°.
THR = HIGH via all routes. See also fluorides.
Disaster Hazard: See fluorides.

AMMONIUM BIMALATE. Syn: *acid ammonium malate*. Crystals, sol in 3 parts water, slightly sol in alcohol. $NH_4HC_4H_4O_5$, mw: 151.02, d: 1.51, mp: 161°.
THR = MOD via irr, oral and inhal routes.

AMMONIUM BINOXALATE. Colorless crystals. $NH_4HC_2O_4 \cdot H_2O$, mw: 125.08, mp: decomp, d: 1.556.
THR = See oxalates.

AMMONIUM BIPHOSPHATE. See ammonium phosphate, monobasic.

AMMONIUM BISULFATE. See ammonium hydrogen sulfate.

AMMONIUM BISULFITE. Syn: *ammonium hydrogen sulfite*. White crystals. NH_4HSO_3, mw: 99.1, mp: decomp.
THR = See bisulfites.
Disaster Hazard: See bisulfites.

AMMONIUM BITARTRATE. Syn: *acid ammonium tartrate*. White crystals, sol in water, acids and alkalies, insol in alcohol. $(NH_4)HC_4H_4O_6$, mw: 167, d: 1.636.
THR = See tartaric acid.

AMMONIUM BORATE. See ammonium biborate.

AMMONIUM BOROFLUORIDE.
THR = A strong irr. See also fluorides.
Disaster Hazard: Dangerous. See fluorides.

AMMONIUM BROMATE. Colorless crystals. Very water sol. NH_4BrO_3, mw: 145.96, mp: explodes.
THR = See bromates.
Fire Hazard: See bromates.
Explosion Hazard: Severe.
Disaster Hazard: Dangerous; see bromates.

AMMONIUM BROMIDE. Colorless, cubic, slightly hygroscopic crystals. NH_4Br, mw: 98.0, mp: sublimes @ 452°, bp: 235° (in vacuo), d: 2.429, vap. press: 1 mm @ 198.3°.
THR = See bromides. Can react violently with BrF_3, IF_7, K. [19]
Disaster Hazard: Dangerous; see bromides.

AMMONIUM BROMOPLATINATE. Red-brown, cubic crystals. $(NH_4)_2PtBr_6$, mw: 710.8, mp: 145° (decomp), d: 4.625.
THR = U. See also bromides and platinum compounds.

AMMONIUM BROMOSELENATE. Red octagonal crystals. $(NH_4)SeBr_6$, mw: 594.5, d: 3.326.
THR = HIGH. See selenium compounds and bromides.
Disaster Hazard: Dangerous; see selenium compounds and bromides.

AMMONIUM BROMOSTANNATE. Colorless crystals. $(NH_4)_2SnBr_6$, mw: 634.3, mp: decomp, d: 3.50.
THR = U. See also bromides and tin compounds.
Disaster Hazard: Dangerous; see bromides.

AMMONIUM FLUOBORATE. Crystals. NH_4BF_4, mw: 104.9, mp: sublimes, d: 1.851 @ 15°.
THR = See fluorides and boron compounds.

AMMONIUM FLUOGALLATE. White crystals. $(NH_4)_2GeF_6$, mw: 222.7, d: 2.564 @ 25°/25°.
THR = See fluorides and germanium compounds.

AMMONIUM FLUORIDE. White crystals. NH_4F, mw: 37.04, mp: subl, d: 1.009 @ 25°.
Acute tox data: ip LD_{50} (rat) = 32 mg/kg; oral LD_{50} (guinea pig) = 150 mg/kg. [*3*]
THR = HIGH via ip and oral routes.

AMMONIUM FLUOSILICATE. Syns: *cryptohalite, ammonium silico fluoride.* $(NH_4)_2SiF_6$, mw: 178.1, mp: subl, d: 2.01.
Acute tox data: Oral LD_{LO} (rat) = 100 mg/kg; oral LD_{50} (guinea pig) = 150 mg/kg. [*3*]
THR = HIGH via oral route. See fluosilicates and fluorides.

AMMONIUM FLUOSULFONATE. Colorless needles. NH_4SO_3F, mw: 117.1, mp: 244.7.
THR = See fluosulfonates.

AMMONIUM FLUOTITANATE. Crystals. $(NH_4)_2TiF_6$, mw: 198, mp: decomp.
THR = See fluorides.

AMMONIUM FLUOZIRCONATE. Crystals. $(NH_4)_2ZrF_6$, mw: 241.3, d: 1.154.
THR = See fluorides.

AMMONIUM FORMATE. White, deliquescent crystals. NH_4COOH, mw: 63.1, mp: 116°, bp: decomp @ 180°, d: 1.280.
Acute tox data: Oral LD_{50} (mouse) = 2250 mg/kg; iv LD_{50} (mouse) = 410 mg/kg. [*3*]
THR = MOD via oral and HIGH via iv routes.

AMMONIUM GLUTAMATE. See monoammonium glutamate.

AMMONIUM HEXAFLUOPHOSPHATE. Syn: *ammonium phosphorus hexafluoride.* Colorless crystals. NH_4PF_6, mw: 163, mp: decomp, d: 2.180.
THR = See fluorides and phosphates.

AMMONIUM HEXAFLUOPHOSPHATE FLUORIDE. White crystals or powder. $NH_4PF_6NH_4F$, mw: 200.06, mp: no melting, subl @ about 140°.
THR = See fluorides and ammonium hexafluophosphate.

AMMONIUM HEXANITRO COBALTATE. $(NH_4)_3Co \cdot (NO_2)_6$, mw: 389.
THR = See cobalt compounds and nitrites. Explodes @ 200°. Impact sensitive. [*19*]

AMMONIUM HYDRATE. See ammonium hydroxide.

AMMONIUM HYDROGEN CARBONATE. See ammonium bicarbonate.

AMMONIUM HYDROGEN FLUORIDE. See ammonium bifluoride.

AMMONIUM HYDROGEN SELENATE. Crystals. NH_4HSeO_4, mw: 162.0, mp: decomp, d: 2.162.
THR = See selenium compounds.

AMMONIUM HYDROGEN SULFATE. White, rhombic crystals, sol in water, insol in acetone. NH_4HSO_4, mw: 115.11, mp: 146.9°, d: 1.78.
Acute tox data: Oral LD_{50} (rat) = 3000 mg/kg. [*3*]
THR = MOD via oral route.
Disaster Hazard: Dangerous, when heated to decomp, emits highly toxic fumes and sulfuric acid and sulfur oxides.

AMMONIUM HYDROGEN SULFIDE. See ammonium sulfhydrate.

AMMONIUM HYDROGEN SULFITE. See ammonium bisulfite.

AMMONIUM HYDROSULFIDE. See ammonium sulfhydrate.

AMMONIUM HYDROXIDE. Syns: *aqua ammonium, water of ammonia, aqua ammonia, ammonium hydrate.* Colorless liquid. NH_4OH, mw: 35.05, mp: −77°.
Acute tox data: Oral LD_{LO} (human) = 43 mg/kg; inhal LC_{LO} (human) = 5000 ppm; oral LD_{50} (rat) = 350 mg/kg. [*3*]
THR = HIGH via oral and inhal routes. A general purpose food additive which migrates to food from packaging materials. [*109*]
Fire Hazard: Slight; when heated, emits toxic fumes; can react from mod to violently with acrolein, acrylic acid, chlorosulfonic acid, dimethyl sulfate, halogens, (Au + aqua regia), HCl, HF, HNO_3, oleum, β-propiolactone, propylene oxide, $AgNO_3$, Ag_2O, $(Ag_2O + C_2H_5OH)$, $AgMnO_4$, H_2SO_4. [*19*]
Disaster Hazard: Dangerous; emits irr fumes, and liquid can inflict burns. Use with adequate ventilation.

AMMONIUM HYPOPHOSPHITE. White granules. H_6NO_2P, mw: 83.
THR = When heated it can liberate highly toxic and flam PH_3. [*2*] See phosphine.

AMMONIUM IODIDE. Colorless, hygroscopic crystals. NH_4I, mw: 145, mp: subl @ 551°, bp: 220° (vacuo), d: 2.514 @ 25°, vap. press: 1 mm @ 210.9°.
THR = Can react violently with BrF_3, IF_7, K. [*19*]

AMMONIUM MAGNESIUM ARSENATE. Colorless crystals. $NH_4MgAsO_4 \cdot 6H_2O$, mw: 289.4, mp: decomp, d: 1.932 @ 15°.
THR = See arsenic compounds.

AMMONIUM-*m*-PERIODATE. Colorless crystals. NH_4IO_4, mw: 209, mp: explodes, d: 3.056.

THR = Can become very unstable and explode on contact. See iodates.

AMMONIUM PERMANGANATE. Crystalline solid. NH_4MnO_4, mw: 137.0, mp: explodes, d: 2.208 @ 10°.

THR = See manganese compounds.

Fire Hazard: Mod, by chemical reaction with reducing agents. A powerful oxidizer.

Explosion Hazard: High, when shocked or warmed to 60°. Can be exploded by percussion.

Disaster Hazard: Mod dangerous shock and heat will explode it; when heated to decomp, emits toxic fumes; can react with reducing material.

AMMONIUM PEROXYBORATE. White crystals. $NH_4BO_3 \cdot \frac{1}{2}H_2O$, mw: 85.9, mp: decomp.

THR = See boron compounds.

Fire Hazard: Slight, by chemical reaction with reducing agents. An oxidizer.

AMMONIUM PEROXY CHROMATE. Red-brown crystals. $(NH_4)_3CrO_8$, mw: 234.1, mp: decomp @ 40°, bp: explodes @ 50°.

THR = See chromium compounds.

Fire Hazard: Mod, by chemical reaction with reducing agents. A powerful oxidizer.

Explosion Hazard: Mod, when heated.

Disaster Hazard: Mod dangerous; when heated to decomp emits toxic fumes and may explode.

AMMONIUM PEROXY DISULFATE. See ammonium persulfate.

AMMONIUM PERRHENATE. White plates. NH_4ReO_4, mw: 268.2, mp: decomp, d: 3.97.

THR = U.

Fire Hazard: Mod, by chemical reaction with reducing agents.

AMMONIUM PERSULFATE. Syn: *ammonium peroxydisulfate*. White crystals. $(NH_4)_2S_2O_8$, mw: 228.20, mp: decomp @ 120°, d: 1.982.

Acute tox data: Oral LD_{50} (rat) = 820 mg/kg. [*3*]

THR = MOD via oral route.

Fire Hazard: Mod by chemical reaction with reducing agents. A powerful oxidizer.

Explosion Hazard: Mod, oxygen released quietly in a fire, probably at a low temperature. When mixed with Na_2O_2 and heated and/or crushed, can explode. Also can explode when mixed with (powdered Al and H_2). [*19*]

Disaster Hazard: Dangerous, see sulfates. Can react vigorously with reducing agents.

AMMONIUM PHOSPHATE, DIBASIC. Syns: *ammonium phosphate secondary*, *diammonium hydrogen phosphate*, *diammonium phosphate*, *DAP*. White crystals or powder, sol in water, insol in alcohol. $(NH_4)_2HPO_4$, mw: 132, d: 1.619, mp: 155° (decomp).

THR = U. A general purpose food additive which migrates to food from packaging materials. [*109*]

Disaster Hazard: See phosphates.

AMMONIUM PHOSPHATE, MONOBASIC. Syns: *ammonium acid phosphate*, *ammonium biphosphate*, *ammonium dihydrogen phosphate*, *ammonium phosphate primary*. Brilliant white crystals or powder, mod sol in water. $NH_4H_2PO_4$, mw: 115, d: 1.803 @ 19°, mp: 190°.

THR = U. A general purpose food additive. [*109*] Mixed with NaOCl the NaOCl decomp. [*19*]

Disaster Hazard: Dangerous; see phosphates.

AMMONIUM PHOSPHATE PRIMARY. See ammonium phosphate, monobasic.

AMMONIUM PHOSPHATE, SECONDARY. See ammonium phosphate, dibasic.

AMMONIUM PHOSPHIDE.

Acute tox data: Inhal LC_{LO} (rat) = 580 ppm for 1 hr, Inhal LC_{LO} (guinea pig) = 288 ppm for 2 hrs. [*3*]

THR = HIGH via inhal and oral routes. See phosphine.

AMMONIUM PHOSPHORUS HEXAFLUORIDE. See ammonium hexafluophosphate.

AMMONIUM PICRATE. Syns: *ammonium carbazotate*, *ammonium picronitrate*. Yellow crystals. $NH_4C_6H_2N_3O_7$, mw: 246.14, mp: decomp, bp: explodes @ 423°, d: 1.719.

THR = An allergen. MOD irr to skin, eyes and mu mem. See also picric acid, nitrates.

Fire Hazard: Mod, by spont chemical reaction. A powerful oxidizer.

Explosion Hazard: High, when shocked or exposed to heat or flame, particularly if contaminated by metals. See also explosives, high.

Disaster Hazard: Highly dangerous; will explode when shocked; when heated to decomp, emits highly toxic fumes of NO_x, etc; can react vigorously with reducing materials.

AMMONIUM PICRATE, WET. Syn: *ammonium carbazotate*.

THR = See ammonium picrate.

Fire Hazard: Mod by chemical reaction with reducing agents. An oxidizer.

Explosion Hazard: Mod, when heated.

Disaster Hazard: Dangerous; when heated to decomp, emits toxic fumes of oxides of nitrogen, etc., and explodes.

AMMONIUM PICRONITRATE. See ammonium picrate.

AMMONIUM POLYMANNURATE. See ammonium alginate.

AMMONIUM POLYSULFIDE. See ammonium sulfide.

AMMONIUM POTASSIUM SELENIDE. NH_4SeK, mp: 136.1.

THR = An exper (+) neo and carc. [*3*] There is question as to exper carc. [*9*]

AMMONIUM SACCHARIN. White crystals or a white crystalline powder; freely sol in water. $C_7H_8N_2O_3S$, mw: 200.

THR = A non-nutritive sweetener food additive. See also saccharin. [*109*]

AMMONIUM SELENATE. Colorless crystals. $(NH_4)_2SeO_4$, mw: 179.04, mp: decomp, d: 2.194 @ 20° / 4°.

THR = See selenium compounds.

AMMONIUM SELENIDE. White crystals. $(NH_4)_2Se$, mw: 115.0, mp: decomp.

THR = See selenium compounds.

Fire Hazard: See hydrogen selenide.

Disaster Hazard: Dangerous; when heated to decomp, or on contact with acid or acid fumes, it emits highly toxic fumes of selenium and will react with water or steam to produce toxic and flam vapors.

AMMONIUM SELENITE. Colorless or slightly reddish crystals. $(NH_4)_2SeO_3$, mw: 163.

THR = See selenium compounds.

AMMONIUM SILICOFLUORIDE. See ammonium fluosilicate.

AMMONIUM SULFAMATE. Syn: *ammate*. Deliquescent crystalline material (white crystalline solid). $NH_4OSO_2NH_2$, mw: 114.1, bp: 160° (decomp), mp: 131°.

Acute tox data: Oral LD_{50} (rat) = 1600 mg/kg; ip LD_{50} (rat) = 800 mg/kg. [*3*]

THR = MOD via oral and ip routes.

Explosion Hazard: Slight, when exposed to heat or by spont chemical reaction (hydrolysis); in a hot acid sol this material can undergo spont hydrolysis, liberating much heat.

Disaster Hazard: Dangerous; see sulfonates.

AMMONIUM SULFATE. Brownish-gray to white crystals. $(NH_4)_2SO_4$, mw: 132.09, mp: > 280° (de-
① comp), d: 1.77.

Acute tox data: Oral LD_{50} (rat) = 3000 mg/kg [*3*]

THR = MOD via oral route. A general purpose food additive. [*109*]

Disaster Hazard: Dangerous. Can react violently when mixed with (K + NH_4NO_3), $KClO_3$, KNO_2, (NaK + NH_4NO_3). [*19*]

AMMONIUM SULFHYDRATE. Syns: *ammonium hydrosulfide, ammonium hydrogen sulfide*. Powder or crystals. NH_4HS, mw: 51.11, mp: 118° (150 atm), d: 1.17, vap. press: 400 mm @ 21.8°.

Acute tox data: Oral LD_{Lo} (mouse) = 80 mg/kg; dermal LD_{Lo} (mouse) = 2457 mg/kg; ip LD_{Lo} (mouse) = 10 mg/kg. [*3*]

THR = HIGH via oral and ip routes; MOD via dermal route. HIGH irr. Penetrates skin readily.

Fire Hazard: See sulfides.

Disaster Hazard: See sulfides.

Explosion Hazard: See sulfides.

AMMONIUM SULFIDE. Syn: *ammonium polysulfide*. Yellow, hygroscopic crystals. $(NH_4)_2S$, mw: 68.2, mp: decomp.

THR = HIGH via oral and dermal routes of exposure. See sulfides. Evolves H_2S on contact with acid or acid fumes. Fatal poisoning has been reported from use in hair waving lotion.

Fire Hazard: See sulfides.

Explosion Hazard: See sulfides.

Disaster Hazard: See sulfides.

AMMONIUM SULFITE. Colorless crystals. $(NH_4)_2SO_3 \cdot H_2O$, mw: 134.16, mp: 60°-70° (decomp), bp: subl @ 150°, d: 1.41 @ 25°.

THR = See sulfites.

AMMONIUM SULFOCYANATE. See ammonium thiocyanate.

AMMONIUM TELLURATE. White powder. $(NH_4)_2TeO_4$, mw: 227.7, mp: decomp, d: 3.01 @ 25°.

THR = See tellurium compounds.

AMMONIUM TETRABORATE. See ammonium biborate.

AMMONIUM TETRACHLORO CUPRATE. $(NH_4)_2CuCl_4$, mw: 241.4.

THR = U. Can react violently with Na or K. [*19*]

AMMONIUM TETRACHLORO ZINCATE. White, thin shiny platelets. Hygroscopic and water sol. $ZnCl_2 \cdot 2NH_4Cl$, mw: 243.3, mp: 150° (approx), d: 1.879.

THR = Effects are those of components: Zinc chloride and ammonium chloride, both of which are tox and irr and are described under appropriate headings.

Disaster Hazard: Dangerous; see chlorides.

AMMONIUM TETRACHROMATE. $(NH_4)_2Cr_4O_{13}$, mw: 452.1.

THR = See chromium compounds. Decomp @ 175°. [*19*] A powerful oxidizer.

AMMONIUM TETRAPEROXY CHROMATE. $(NH_4)_3CrO_8$, mw: 234.1.

THR = See chromium compounds. Contact with

BENZOIC ACID ANHYDRIDE. See benzoic anhydride.

BENZOIC ACID-α-METHYLBENZYL ESTER. See α-methylbenzyl benzoic acid.

BENZOIC ALDEHYDE. See benzaldehyde.

BENZOIC ANHYDRIDE. Syn: *benzoic acid anhydride*. Crystals. $(C_6H_5CO)_2O$, mw: 226.2, mp: 42°, bp: 360°, d: 1.1989 @ 15°/4°, vap. press: 1 mm @ 135.6°.
THR = A MILD irr and allergen.
Fire Hazard: Slight, when heated.

BENZOL. See benzene.

BENZOL DILUENT. Flash p: −25°F, autoign. temp.: 450°F (these values will vary depending on the manufacturer).
THR = U.
Fire Hazard: Dangerous, when exposed to heat or flame or powerful oxidants.
To Fight Fire: Alcohol foam, water mist, fog, dry chemical.

BENZO(a)NAPHTHO(2,1,8-hi j)NAPHTHACENE.
THR = An exper carc. [23]

BENZO(a)NAPHTHO(8,1,2-cde)NAPHTHACENE. $C_{28}H_{16}$, mw: 352.4.
THR = An exper neo. [3, 23]

BENZO(h)NAPHTHO(1,2,f)QUINOLINE. $C_{21}H_{13}N$, mw: 279.4.
THR = An exper neo. [3, 23]

BENZO NITRILE. Syn: *phenyl cyanide*. Transparent, colorless oil, almond-like odor. C_6H_5CN, mw: 103.1, d: 1.246 @ 20°/4°, bp: 191°, d: 1.0102 @ 15°/15°F (OC), mp: −12.8°.
THR = HIGH. See nitriles.

BENZO(r,s,t)PENTAPHENE. Green-yellow needles. $C_{24}H_{14}$, mw: 302.4, mp: 280°–282°.
THR = An exper (+) neo and carc. [3, 11, 23]

BENZO(r,s,t)PENTAPHENE-5-CARBOXALDEHYDE. $C_{25}H_{14}O$, mw: 330.4.
THR = An exper neo. [3]

BENZO(ghi)PERYLENE.
THR = An exper carc. [23]

BENZO(a)PHENALENO(1,9-hi)ACRIDINE. $C_{27}H_{15}N$, mw: 353.4.
THR = An exper neo. [3]

BENZO(h)PHENALENO(1,9-6c)ACRIDINE.
THR = An exper neo. [3]

BENZO(d,e,f)PHENANTHRENE. See pyrene.

BENZO(c)PHENANTHRENE. $C_{18}H_{12}$, mw: 228.3.
THR = An exper carc. [3, 23]

BENZO(c)PHENANTHRENE-8-CARBOXALDEHYDE. $C_{19}H_{12}O$, mw: 256.3.
THR = An exper neo. [3]

5-BENZO(c)PHENANTHRYL METHYL KETONE. $C_{12}H_{14}O$, mw: 270.3.
THR = An exper carc. [3]

BENZO PHENONE. Syn: *phenyl ketone*, *diphenyl ketone*. Rhombic white crystals, persistent rose-like odor. $C_6H_5COC_6H_5$, mw: 182.21, mp (α): 49°, mp (β): 26°, mp (γ): 47°, bp: 305.4°, d (α): 1.0976 @ 50°/50°, d (β): 1.108 @ 23°/40°, vap. press: 1 mm @ 108.2.
THR = Details U. See also ketones.
Fire Hazard: Slight, when heated; can react with oxidiing materials.

BENZO PYRENE. See benzo(a)pyrene.

BENZO(a)PYRENE. Yellow crystals insol in water, sol in benzene, toluene, xylene. $C_{20}H_{12}$, mw: 252.3, mp: 179°, bp: 312° @ 10 mm.
THR = HIGH. An exper (+) carc, [3, 11, 23] neo and mutagen. A common contaminant of air, water, food, smoke.

BENZO(a)PYRENE-6-CARBOXALDEHYDE. $C_{21}H_{12}O$, mw: 280.3.
THR = An exper neo and carc. [3]

BENZO(a)PYRENE-6-CARBOXALDEHYDE THIO SEMICARBAZONE. $C_{22}H_{15}N_3S$, mw: 353.5.
THR = An exper carc. [3]

BENZO(a)PYRENE-4,5-EPOXIDE. $C_{20}H_{14}O$, mw: 270.2.
THR = An exper neo to mice via dermal route. [103]

BENZO(a)PYRENE-7,8-EPOXIDE. $C_{20}H_{14}O$, mw: 270.2.
THR = An exper neo to mice via dermal route. [103]

BENZO(a)PYRENE-6-METHANOL. $C_{21}H_{14}O$, mw: 282.4.
THR = An exper neo and carc. [3]

BENZO(a)PYRENE-4,5-OXIDE. $C_{20}H_{12}O$, mw: 268.3.
THR = An exper neo. [3]

BENZO(a)PYRENE-7,8-OXIDE.
THR = An exper carc. [3]

BENZO(a)PYREN-6-OL. $C_{20}H_{12}O$, mw: 268.3.
THR = An exper neo. [3] An exper neo to mice via sc and in routes. [103]

7H-BENZO(a)PYRIDO(3,2-g)CARBAZOLE. $C_{19}H_{12}N_2$, mw: 268.3.
THR = An exper neo. [3, 23]

7H-BENZO(c)PYRIDO(2,3-g)CARBAZOLE.
THR = An exper neo. [3, 23]

HYDROGEN DISULFIDE. Yellow oil. H_2S_2, mw: 66.15, mp: −89.7°, bp: 74.5°, d: 1.376, vap. press: 100 mm @ 22.0°.

THR = HIGH. See hydrogen sulfide and sulfides.

HYDROGEN FLUORIDE. See hydrofluoric acid.

HYDROGEN IODIDE. See hydroiodic acid.

HYDROGEN NITRATE. See nitric acid.

HYDROGEN PENTASULFIDE. Clear yellow oil. H_2S_5, mw: 162.35, mp: decomp, d: 1.67 @ 16°.

THR = HIGH. See hydrogen sulfide and sulfides.

③ **HYDROGEN PEROXIDE.** Syns: *hydrogen dioxide, t-stuff.* Colorless heavy liquid, or, at low temp., a crystalline solid. H_2O_2, mw: 34.016, bp: 158°, d: 1.71 @ −20°, 1.46 @ 0°, vap. press: 1mm @ 15.3°, mp: −2°.

THR = HIGH irr to skin, eyes and mu mem and via oral and inhal routes. A very powerful oxidizer. Pure H_2O_2, its solutions, vapors and mists are irr to body tissue. This irr can vary from mild to severe depending upon the conc of H_2O_2. For instance solutions of H_2O_2 of 35 wt% and over can easily cause blistering of the skin. Irr caused by H_2O_2 which does not subside upon flushing of the affected part with water should be treated by a physician. The eyes are particularly sensitive to irr by this material. It is used as a general purpose food additive; it is a substance which migrates to food from packaging materials. [*109*] It is a common air contaminant.

Fire Hazard: Dangerous by chemical reaction with flammable materials. H_2O_2 is a powerful oxidizer, particularly in the concentrated state. It is important to keep containers of this material covered because (1) uncovered containers are much more prone to react with flam vapors, gases, etc.; (2) because if uncovered, the water from an H_2O_2 solution can evaporate, concentrating the material and thus increasing the fire hazard of the remainder.

For instance, solutions of H_2O_2 of conc in excess of 65 wt% heat up spont when decomp to $H_2O + \frac{1}{2}O_2$. Thus 90 wt% solutions, when caused to decompose rapidly due to the introduction of a catalytic decomposition agent, can get quite hot and perhaps start fires.

Explosion Hazard: Severe, when highly conc or pure H_2O_2 is exposed to heat, mechanical impact, detonation of a blasting cap, or caused to decomp catalytically by metals, or on contact with acetic acid, acetic anhydride, acetone, (alcohols + H_2SO_4), Sb_2S_3, As_2S_3, *tert*-butyl alcohol, cellulose, charcoal, (Cl_2 + KOH), chlorosulfonic acid, CuS, ethanol, FeS, (formic acid + organic matter), H_2Se, hydrazine, (ketones + HNO_3), PbO_2, PbO, PbS, MnO_2, HgO, Hg_2O, MoS_2, HNO_3, organic matter, $KMnO_4$, $NaIO_3$, thiodiglycol, uns-dimethyl hydrazine. [*19*]

Although many mixtures of H_2O_2 and organic materials do not explode upon contact, the resultand combination is detonatable either upon catching fire or by impact.

The detonation velocity of aqueous solutions of H_2O_2 has been found to be about 6500 m/sec. for solutions of between 96 wt% and 100 wt% H_2O_2.

Another source of H_2O_2 explosions is from sealing the material in strong containers. Under such conditions even gradual decomposition of H_2O_2 to $H_2O + \frac{1}{2}O_2$ can cause large pressures to build up in the containers which may then burst explosively.

Disaster Hazard: Highly dangerous because when heated, or shocked or contaminated, the concentrated material can explode or start fires.

HYDROGEN PHOSPHIDE (DI). Colorless liquid. H_4P_2, mw: 65.99, mp: −10°, bp: 57.5° @ 735 mm, d: 1.012.

THR = HIGH. See phosphine and phosphides.

HYDROGEN PHOSPHIDE. See phosphine.

HYDROGEN PHOSPHIDE (POLYMER) (DI). Yellow solid. $(H_2P_4)_3$, mw: 377.81, mp: ignites @ 160°, bp: decomp, d: 1.83 @ 19°

THR = See phosphine and phosphides.

HYDROGEN SELENIDE. Colorless gas. H_2Se, mw: 80.98, mp: −64°, bp: −41.4°, d: 3.614 g/liter (gas); 2.12 @ −42° (liquid), vap. press: 10 atm @ 23.4°.

Acute tox data: Inhal TD_{LO} (human) = 0.2 ppm ⟶ CNS symptoms; inhal LC_{50} (guinea pig) = 1 mg/m^3 for 8 hrs. [*3*]

THR = VERY HIGH irr to skin, eyes and mu mem and via inhal route. An allergen. This material is a hazardous compound of selenium which can cause damage to the lungs and liver as well as conjunctivitis. It has been found that repeated 8 hr exposures to conc of 0.3 ppm prove fatal to guinea pigs by causing a pneumonitis, as well as injury to the liver and spleen. Conc of 0.3 ppm are readily detected by odor, but there is no noticeable irr effect at that level. Conc of 1.5 ppm or higher are strongly irr to the eyes and nasal passages.

As in the case of hydrogen sulfide, the odor of hydrogen selenide in concentrations below 1 ppm disappears rapidly because of olfactory fatigue. Although the odor and irr effects are both useful to an experienced investigator for estimating the conc, they do not offer a dependable warning to workmen who may be exposed to gradually increasing amounts and therefore become used to it. Due to its extreme toxicity and irr effects, it seldom is allowed to reach a conc in which it is flam in air.

LD$_{50}$ (mice) = 175 mg/kg; oral LD$_{50}$ (chicken) = 1886 mg/kg. [3]

THR = HIGH via oral route. A cholinesterase inhibitor. See parathion.

PHENCYCLIDINE. Syns: *elysion*, *PCP*. Crystals. $C_{17}H_{25}N$, mw: 243.4, mp: 46°–46.5°, bp: 135°–137°.

Acute tox data: iv TD_{LO} (human) = 0.01 mg/kg ⟶ CNS effects. Oral LD$_{50}$ (wild birds) = 42 mg/kg; oral LD$_{50}$ (ducks) = 237 mg/kg; oral LD$_{50}$ (pigeons) = 75 mg/kg; oral LD$_{50}$ (birds) = 133 mg/kg. [3]

THR = HIGH via oral route. Used as an anesthetic and analgesic in medicine. Even in low doses it causes serious psychologic disturbances. [2] Effects are characterized by loss of motor nerve coordination, amnesia and sudden violence following a fleeting exhilaration. A drug often abused in conjunction with other drugs of abuse, yielding totally unpredictable, often tragic results, such as confusion, paranoia, psychoses. [106]

PHENETHYL ALCOHOL. Syns: *2-phenyl ethanol*, *benzyl carbinol*. Colorless liquid, floral odor of roses. $C_6H_5CH_2CH_2OH$, mw: 122.14, mp: −27°, bp: 220°, flash p: 216°F, d: 1.0245 @ 15°, vap. d: 4.21.

Acute tox data: Oral LD$_{50}$ (rat) = 1790 mg/kg; ip LD$_{50}$ (mice) = 800 mg/kg; dermal LD$_{50}$ (rabbit) = 790 mg/kg; dermal LD$_{50}$ (guinea pig) = 5000 mg/kg. [3]

THR = MOD via oral, dermal and ip routes. Being studied for additional oncological information. [3] Reported as causing severe CNS injury to exper animals. A local anesthetic.

Fire Hazard: Low, when exposed to heat or flame; can react with oxidizing materials.

To Fight Fire: CO_2, dry chemical.

PHENETHYL HYDRAZINE SULFATE. $C_8H_{11}N_2 \cdot SO_4$, mw: 231.3.

THR = HIGH and an exper carc. [3]

N-(*p*-PHENETHYL)PHENYL ACETOHYDROXAMIC ACID.

THR = An exper neo. [3]

***o*-PHENETIDINE.** Syn: *2-aminophenetole*. Oily liquid. $C_8H_{11}NO$, mw: 137.2, mp: <−20°, bp: 229°, vap. press: 1 mm @ 67.0°.

THR = HIGH irr via oral, inhal and dermal routes and to skin, eyes and mu mem. See also aromatic amines.

Disaster Hazard: Dangerous; when heated to decomp, emits toxic fumes of NO_x.

***p*-PHENETIDINE.** Syn: *4-aminophenetole*. Colorless liquid. $C_8H_{11}NO$, mw: 137.2, mp: 3°, bp: 254°, flash p: 241°F, d: 1.0652 @ 16°/4°, vap. d: 4.73.

THR = HIGH irr via oral, inhal and dermal routes and to skin, eyes and mu mem. See also aromatic amines.

Fire Hazard: Slight, when exposed to heat or flame.

Disaster Hazard: Dangerous; when heated to decomp, emits highly toxic fumes of NO_x; reacts vigorously with powerful oxidizers.

To Fight Fire: Dry chemical, spray, mist.

PHENETOLE. See phenyl ethyl ether.

PHENIC ACID. See phenol.

PHENIDONE. Syn: *1-phenyl-3-pyrazolidone*. Crystals, water-soluble. $C_9H_{10}N_2O$, mw: 162.2, mp: 121°.

Acute tox data: Oral LD$_{50}$ (rat) = 200 mg/kg; ip LD$_{50}$ (rat) = 200 mg/kg. [3]

THR = HIGH via oral and ip routes.

Disaster Hazard: Dangerous; when heated to decomp, emits highly toxic fumes.

PHENOBARBITAL. White, shining, crystalline, odorless powder, bitter taste. $[CO(NHCO)_2C(C_2H_5)C_6H_5]$, mw: 232.2, mp: 174°–178°.

Acute tox data: Oral TD_{LO} (child) = 10 mg/kg ⟶ CNS effects; oral TD_{LO} (human) = 18 mg/kg ⟶ skin effects; oral TD_{LO} (human) = 0.214 mg/kg ⟶ psychotropic effects; oral LD$_{50}$ (rat) = 162 mg/kg; sc LD$_{50}$ (rat) = 200 mg/kg; rec LD$_{50}$ (rat) = 284 mg/kg; ip LD$_{50}$ (mice) = 340 mg/kg. [3]

THR = HIGH via oral, sc, rec and ip routes. An exper teratogen via oral route. [3] Repeated ingestion may lead to habituation.

Fire Hazard: Slight; when heated to decomp, emits toxic fumes.

PHENOL. Syns: *carbolic acid*, *phenic acid*, *phenylic acid*. White, crystalline mass which turns pink or red if not perfectly pure, burning taste, distinctive odor. C_6H_5OH, mw: 94.11, mp: 40.6°, bp: 181.9°, flash p: 175°F (CC), d: 1.072, autoign. temp.: 1319°F, vap. press: 1 mm @ 40.1°, vap. d: 3.24.

Acute tox data: Oral LD$_{50}$ (rat) = 414 mg/kg; dermal LD$_{50}$ (rat) = 669 mg/kg; ip LD$_{50}$ (rat) = 250 mg/kg; sc LD$_{50}$ (mice) = 344 mg/kg. [3]

THR = HIGH via oral, ip, sc and dermal routes. A co-carc [23] and an exper carc [3, 23] via dermal route. In acute phenol poisoning, the main effect is on the CNS. Absorption from spilling phenolic solutions on the skin may be very rapid, and death results from collapse within 30 min to several hrs. Death has resulted from absorption of phenol through a skin area of 64 in.^{2} Where death is delayed, damage to the kidneys, liver, pancreas and spleen and edema of the lungs may result. Absorbed phenol is partly excreted by the kidneys, partly oxidized. Part of the excreted portion is combined

OTASSIUM PERCARBONATE. White, granular mass, sol in water with the evolution of oxygen. $K_2C_2O_6 \cdot H_2O$, mw: 216.23, mp: 200°-300°.

THR = HIGH irr to skin, eyes and mu mem. A strong caustic, hence caustic to skin and mu mem.

OTASSIUM PERCHLORATE. Syn: *potassium hyperchlorate*. Colorless crystals or white crystalline powder. $KClO_4$, mw: 138.55, mp: 610° ± 10°, d: 2.52 @ 10°.

THR = Powerful oxidizer. HIGH irr to skin, eyes and mu mem. Has been implicated in aplastic anemia. Violent reaction with (Al + Mg), charcoal, F_2, Mg, (Ni + Ti), reducing agents, S. [*19*] Irr to skin and mu mem. Absorption can cause methemoglobinemia and kidney injury.

OTASSIUM-*m*-PERIODATE. Tetragonal, colorless crystals. KIO_4, mw: 230.0, mp: 582°, bp: $-O_2$ @ 300°, d: 3.618 @ 15°.

THR = HIGH irr to skin, eyes and mu mem. A strong irr. See also iodates.

Fire Hazard: An oxidizing agent and mod fire hazard.

Disaster Hazard: Dangerous, when exposed to heat or flame; on decomp, emits toxic fumes of iodine compounds.

OTASSIUM PERMANGANATE. Dark purple crystals with a blue metallic sheen, sweetish astringent taste. $KMnO_4$, mw: 158.03, mp: decomp @ < 240°, d: 2.703.

Acute tox data: Oral LD_{50} (rat) = 1090 mg/kg; sc LD_{50} (mice) = 500 mg/kg. [*3*]

THR = HIGH via sc; MOD via oral routes. A strong irr because of oxidizing properties. See also manganese compounds.

Fire Hazard: Mod, by chemical reaction. A powerful oxidizing agent. Spont flam on contact with glycerine, ethylene glycol, Al_4C_3, Sb, As, dimethyl sulfoxide, H_2O_2, H_2S_3, NH_2OH, organic matter, P, polypropylene, S, H_2SO_4, (H_2SO_4 + organic matter), (H_2SO_4 + KCl), Ti. [*19*] See also permanganates.

Disaster Hazard: Dangerous; keep away from combustible materials.

OTASSIUM PEROSMATE. See potassium osmate.

OTASSIUM PEROXIDE. Yellow, amorphous mass (white crystals). K_2O_2, mw: 110.19, mp: 490°.

THR = See peroxides, inorganic.

Fire Hazard: Dangerous, by spont chemical reaction. It is a very powerful oxidizer. Fires of this material should be handled like sodium peroxide fires.

Explosion Hazard: Mod, by spont chemical reaction. Also violent reactions with air, Sb, As, O_2, K, water. [*19*]

Disaster Hazard: Dangerous; will react with water or steam to produce heat; on contact with reducing material, can react vigorously; on contact with acid or acid fumes, can emit toxic fumes.

POTASSIUM PEROXYCHROMATE. Brown-red crystals. K_3CrO_8, mw: 297.3, mp: decomp @ 170°.

THR = HIGH tox. See chromium compounds.

Fire Hazard: Mod, by chemical reaction; a powerful oxidizer.

Disaster Hazard: Dangerous; keep away from combustible materials.

POTASSIUM PEROXYDISULFATE. See potassium persulfate.

POTASSIUM PERRHENATE. White crystals. $KReO_4$, mw: 289.41, mp: 350°, d: 4.887.

Acute tox data: ip LD_{50} (mice) = 692 mg/kg. [*3*]

THR = MOD via ip route. See rhenium compounds.

Fire Hazard: Mod, by chemical reaction; a powerful oxidizer.

Disaster Hazard: Dangerous. Keep away from combustible materials.

POTASSIUM PERRUTHENATE. Black crystals. $KRuO_4$, mw: 204.8, mp: decomp @ 440°.

THR = See ruthenium compounds.

Fire Hazard: Mod, by chemical reaction; a powerful oxidizer.

Disaster Hazard: Dangerous; keep away from combustible materials.

POTASSIUM PERSELENATE. Crystals. $KSeO_4$, mw: 182.1.

THR = HIGH. See selenium compounds.

Fire Hazard: Mod, by chemical reaction; a powerful oxidizer.

Disaster Hazard: Dangerous; when heated to decomp, or on contact with acid or acid fumes, emits highly toxic fumes of selenium; keep away from combustible materials.

POTASSIUM PERSULFATE. Syns: *anthion*, *potassium peroxydisulfate*. White, odorless crystals. $K_2S_2O_8$, mw: 270.3, mp: decomp @ 100°, d: 2.477.

THR = MOD irr and an allergen.

Fire Hazard: Mod, when exposed to heat or by chemical reaction. It liberates oxygen above 100° when dry or @ about 50° when in solution.

Disaster Hazard: Dangerous; when heated to decomp, emits highly toxic fumes of SO_x; can react with reducing materials.

POTASSIUM PHENOL SULFONATE. See potassium phenyl sulfate.

POTASSIUM PHENYLACETATE. Dry powder. $C_6H_5CH_2COOK$, mw: 174.2.

THR = U.

Disaster Hazard: Mod dangerous; when heated to decomp, emits tox fumes.

SODIUM CALCIUM ALUMINOSILICATE HYDRATED. Syn: *sodium calcium silicoaluminate.*

THR = U. An anticaking agent food additive. [*109*] See also silicates.

SODIUM CARBIDE. White powder. Na_2C_2, mw: 70.01, bp: 700°, d: 1.575 @ 15°.

THR = See sodium hydroxide and acetylene (liberated on contact with water).

Fire Hazard: Mod, by chemical reaction with oxidizers.

Explosion Hazard: In contact with Al, Br_2, CO_2, Cl_2, Fe, Pb, Hg, N_2O_5, P, SO_2, water. [*19*] Also on contact with bromine. See acetylene.

Disaster Hazard: See carbides.

To Fight Fire: CO_2, dry chemical.

SODIUM CARBONATE. Syns: *soda monohydrate, crystal carbonate.* White, odorless, small crystals or crystalline powder, alkaline taste. Na_2CO_3, mw: 106.0, mp: 851°, bp: decomp, d: 2.509 @ 0°.

Acute tox data: ip LD_{50} (mice) = 117 mg/kg; oral LD_{LO} (rat) = 4000 mg/kg. [*3*]

THR = HIGH via ip; MOD via oral routes. A general purpose food additive, it migrates to food from packaging materials. [*109*] Can react violently with Al, P_2O_5, H_2SO_4. [*19*]

SODIUM CARBONATE PEROXIDE. Fine white powder. $2Na_2CO_3 \cdot 3H_2O_2$, mw: 314.

THR = See sodium carbonate and hydrogen peroxide.

SODIUM CARBONYL. NaCO, mw: 51.

THR = HIGH. See carbonyls.

Fire Hazard: Mod, when exposed to heat or by chemical reaction with oxidizers. Heat causes evolution of carbon monoxide.

Explosion Hazard: Contact with air, water or possibly heat. [*19*]

Disaster Hazard: Dangerous; when heated to decomp, emits highly toxic fumes of sodium oxide and carbon monoxide; may explode on heating.

SODIUM CARBOXY METHYL CELLULOSE. Syns: *CMC, sodium cellulose glycolate, cellulose gum, CM cellulose.* A synthetic cellulose gum (the sodium salt of carboxy methyl cellulose not <99.5% on a dry weight basis, with maximum substitution of 0.95 carboxymethyl groups per anhydroglucose unit, and with a minimum viscosity of 25 centipoises for 2% weight aqueous solutions at 25°). Colorless, odorless, hygroscopic powder or granules, insol in most organic solvents.

THR = See polymers, soluble. A general purpose food additive, it is a substance which migrates to food from packaging materials. [*109*] An exper neo via sc route. [*3*]

SODIUM CASEINATE COMPLEX. Syn: *casein-sodium.* Coarse white powder, odorless, sol in water.

THR = An exper carc to mice via sc route. [*103*] A general purpose food additive. [*109*]

SODIUM CELLULOSE GLYCOLATE. See sodium carboxymethyl cellulose.

SODIUM CHLORATE. Syn: *soda chlorate.* Colorless, odorless crystals, cooling saline taste. $NaClO_3$, mw: 104.65, mp: 248°–261°, bp: decomp, d: 2.490 @ 15°.

Acute tox data: Oral LD_{50} (rat) = 1200 mg/kg; ip LD_{50} (mice) = 596 mg/kg; ukLD_{50} (child) = 185 mg/kg; oral TD_{LO} (women) = 800 mg/kg ⟶ effects on red blood corpuscles. [*3*]

THR = HIGH–MOD via oral, ip and uk routes. Can cause local irr to skin, eyes and mu mem. Ingestion of large quantities can be fatal. Symptoms are abdominal pain, nausea, vomiting, cyanosis and collapse. An herbicide. Can react violently with Al, $NH_4S_2O_3$, Sb_2S_3, As, As_2O_3, C, charcoal, MnO_2, metal sulfides, dibasic organic acids, organic matter, P, KCN, S, H_2SO_4, thiocyanates, Zn. [*19*]

SODIUM CHLORAURATE. See gold sodium chloride.

SODIUM CHLORIDE. Syns: *salt, halite, sea salt.* Colorless, transparent crystals or white crystalline powder. NaCl, mw: 58.45, mp: 801°, bp: 1413°, d: 2.165, vap. press: 1 mm @ 865°.

Acute tox data: Oral LD_{50} (rat) = 3000 mg/kg; ip LD_{50} (mice) = 2602 mg/kg; sc LD_{LO} (rat) = 3500 mg/kg. [*3*] In a human TD_{LO} = 8200 mg/kg for 23 days ⟶ blood pressure problems.

THR = MOD via oral, ip and sc routes. An exper teratogen via pa routes. [*3*] When bulk sodium chloride is heated to high temp., a vapor is emitted which is irr, particularly to the eyes. Ingestion of large amounts of sodium chloride can cause irr of the stomach. Improper use of salt tablets may produce this effect. A substance which migrates to food from packaging materials. [*109*] Violent reaction with BrF_3, Li. [*19*]

SODIUM CHLORITE. White crystals or crystalline powder. $NaClO_2$, mw: 90.45, bp: decomp @ 175° ⟶ O_2.

THR = U. May act as an irr due to oxidizing power.

Fire Hazard: A powerful oxidizing agent; ignited via friction, heat or shock.

Explosion Hazard: Dangerous from exposure to percussion, acids, organic matter, oxalic acid, P, S. [*19*]

Disaster Hazard: Dangerous; shock will explode it; when heated, emits highly toxic fumes of chlorides and may explode; can react vigorously on contact with reducing materials.

SODIUM NITRITE MIXTURES (Sodium nitrate, sodium nitrite, and potassium nitrate.)

SODIUM-*m*-NITROBENZENE SULFONATE. Crystals. $Na_2C_6H_4OSO_2Na$, mw: 225.2.

THR = U. See also nitrobenzene.

Disaster Hazard: Dangerous; see sulfonates and nitrites.

SODIUM NITROMETHANE. $NaCH_2NO_2$, mw: 83.3.

THR = U. See also nitroparaffins.

Fire Hazard: Mod, when exposed to heat or flame.

Explosion Hazard: Severe, when shocked or exposed to heat. Moisture can make it explode. [*19*]

Disaster Hazard: Dangerous; shock will explode it; when heated to decomp, emits highly toxic fumes of NO_x; can react with reducing materials.

SODIUM NITROPHENATE. See sodium-*p*-nitrophenoxide.

SODIUM-*p*-NITROPHENOXIDE. Syn: *sodium nitrophenate*. Yellow prisms. $NaOC_6H_4NO_2 \cdot 4H_2O$, mw: 233.16, mp: $-2H_2O$ @ 36°, $-4H_2O$ @ 120°, bp: decomp.

THR = See *p*-nitrophenol, sodium hydroxide and nitrates.

SODIUM-*o*-NITROPHENYL SULFIDE. $C_6H_4NaNO_2S$, mw: 177.1.

THR = Can explode during preparation. [*19*]

SODIUM NITROPRUSSIDE. Rhombic red crystals. $Na_2Fe(NO)(CN)_5 \cdot 2H_2O$, mw: 298.

Acute tox data: Oral LD_{LO} (rat) = 20 mg/kg; iv LD_{LO} (dog) = 1 mg/kg; iv LD_{LO} (cat) = 1 mg/kg; oral LD_{LO} (rabbit) = 40 mg/kg. [*3*]

THR = HIGH via oral and iv routes. The effects of this material are similar to that of nitrites, causing fall in blood pressure but no formation of methemoglobin. Large amounts, when taken internally, may form cyanide upon being metabolized. See also cyanides.

Disaster Hazard: Dangerous; see cyanides.

SODIUM OLEATE. White powder, slight tallow odor. $C_{17}H_{33}COONa$, mw: 304.5, mp: 232°–235°.

Acute tox data: iv LD_{50} (mice) = 152 mg/kg. [*3*]

THR = HIGH via iv route. Migrates to food from packaging materials. [*109*]

Fire Hazard: Slight, when exposed to heat or flame.

SODIUM OXALATE. White crystalline powder. $Na_2C_2O_4$, mw: 136.0, d: 2.34.

Acute tox data: sc LD_{LO} (mice) = 100 mg/kg. [*3*]

THR = HIGH via sc and oral routes. See oxalates.

SODIUM OXIDE. See sodium monoxide.

SODIUM OZONIDE. NaO_3, mw: 71.

THR = Violent reaction with acids, water. [*19*]

SODIUM PALMITATE.

THR = U. A substance which migrates to food from packaging materials. [*109*]

SODIUM PECTINATE.

THR = No data. A general purpose food additive. [*109*]

SODIUM PENTABORATE. See sodium borate.

SODIUM PENTACHLOROPHENATE. Syn: *sodium pentachlorophenolate*. Tan powder. C_6Cl_5ONa, mp 289.3.

Acute tox data: Oral LD_{50} (rat) = 210 mg/kg; sc LD_{50} (rat) = 72 mg/kg; dermal LD_{LO} (mice) = 164 mg/kg; dermal LD_{LO} (rabbit) = 270 mg/kg; it LD_{L} (rat) = 146 mg/kg. [*3*]

THR = HIGH via oral, sc, it and dermal routes. See pentachlorophenol and chlorides. A fungicide

SODIUM PENTACHLOROPHENOLATE. See sodium pentachlorophenate.

SODIUM PENTASULFIDE. Yellow crystals. Na_2S mw: 206.32, mp: 251.8°.

THR = See sulfides.

SODIUM PENTABARBITAL. White powder. $NaC_{11}H_{17}N_2O_3$, mw: 248.26.

Acute tox data: 0.4 mg/kg causes psychotropic effects on humans. Oral TD_{LO} (women) = 60 mg/kg cause CNS effects. Oral LD_{50} (rat) = 200 mg/kg; ip LD_{50} (rat) = 36 mg/kg; sc LD_{50} (rat) = 47 mg/kg; iv LD_{50} (rat) = 65 mg/kg; id LD_{50} (rat) = 39 mg/kg; or LD_{50} (duck, wild birds) = 75 mg/kg. [*3*]

THR = HIGH via oral, ip, sc, iv, id routes. See also barbiturates.

SODIUM PERACETATE. $Na \cdot C_2H_4O_3$, mw: 99.1.

THR = An exper neo. [*3*]

SODIUM PERBORATE TETRAHYDRATE. Syn *metaborate peroxyhydrate, sodium perborate tetrahydrate.* White crystals with saline taste, slightly water-sol. $NaBO_3 \cdot 4H_2O$, mw: 153.9, mp: 62°.

Acute tox data: ip LD_{50} (mice) = 538 mg/kg. [*3*]

THR = HIGH–MOD via ip route. See boron compounds and peroxides.

Fire Hazard: Slight, by chemical reaction. An ox dizer. Practically non-hazardous unless mixed with highly combustible or reactive organic compounds.

SODIUM PERBORSILICATE. White powder. Cor position: sodium borate, sodium silicate and hydrogen peroxide.

THR = See silicates, boron compounds and pe oxides.

Fire Hazard: Slight, by chemical reaction; can react with reducing materials.

SODIUM PERCARBONATE. Decomp in aqueous solution to hydrogen peroxide and sodium carbonate. $Na_2C_2O_6$, mw: 166.

THR = Probably toxic. An irr.

Fire Hazard: Dangerous; a powerful oxidizer.

SODIUM PERCHLORATE. Colorless deliquescent crystals. $NaClO_4$, mw: 122.45, mp: 482° (decomp).

Acute tox data: ip LD_{50} (mice) = 551 mg/kg. [*3*]

THR = MOD via ip route. See perchlorates. Forms an explosive with NH_4NO_3, CaH_2, charcoal, Mg, reducing agents, SrH_2. [*19*]

SODIUM PERIODATE. $NaIO_4$, mw: 213.9.

Acute tox data: ip LD_{50} (mice) = 58 mg/kg. [*3*]

THR = HIGH via ip route. A powerful oxidizer.

SODIUM PERMANGANATE. Purple to reddish-black crystals or powder. $NaMnO_4$, mw: 141.93, mp: decomp.

Acute tox data: iv LD_{Lo} (rabbit) = 55 mg/kg. [*3*]

THR = HIGH via iv route. See also manganese compounds.

Fire Hazard: Mod, by chemical reaction; a strong oxidizer.

Disaster Hazard: Dangerous; will react vigorously with combustible materials.

SODIUM PEROXIDE. Syns: *sodium dioxide*, *sodium superoxide*, *sodium binoxide*. White powder, turning yellow when heated. Na_2O_2, mw: 77.99, mp: decomp @ 460°, bp: decomp, d: 2.805.

THR = HIGH irr to skin, eyes and mu mem. See sodium hydroxide and peroxides, inorganic.

Fire Hazard: Dangerous, by chemical reaction; a powerful oxidizing agent. See peroxides, inorganic.

Explosion Hazard: Reacts violently with water, acids, powdered metals, acetic acid, acetic anhydride, Al, (Al + CO_2), $(NH_4)_2S_2O_8$, aniline, Sb, As, benzene, BN, CaC_2, charcoal, Cu, (KNO_3 + dextrose), ethyl ether, H_2S, glycerine, hexamethylenetetramine, Mg, (Mg + CO_2), MnO_2, organic matter, P, K, Se_2Cl_2, (AgCl + charcoal), Na, SCl, Sn, Zn. [*19*]

Disaster Hazard: Dangerous; will react with water or steam to produce heat and toxic fumes; can react vigorously with reducing materials.

To Fight Fire: Carbon dioxide or dry chemical. Combustible materials ignited by contact with sodium peroxide should be smothered with soda ash, salt or dolomite mixtures. Chemical fire extinguishers should not be used. If the fire cannot be smothered, it should be flooded with large quantities of water from a hose.

SODIUM PEROXYCHROMATE. Orange plates. Na_3CrO_8, mw: 249.99, mp: decomp @ 115°.

THR = HIGH irr to skin, eyes and mu mem. A powerful oxidizer. See chromium compounds.

Fire Hazard: Mod, by chemical reaction; a strong oxidizer.

Disaster Hazard: Dangerous; will react vigorously with combustible materials.

SODIUM PERSULFATE. White crystalline powder, sol in water, decomp by alcohol. $Na_2S_2O_8$, mw: 238.13.

Acute tox data: iv LD_{Lo} (rabbit) = 178 mg/kg; ip LD_{50} (mice) = 226 mg/kg. [*3*]

THR = HIGH via ip and iv routes.

Fire Hazard: Mod. An oxidizer.

Disaster Hazard: Dangerous; a powerful oxidizer. See sulfates.

SODIUM PHENOBARBITAL. White crystals. $NaC_{12}H_{11}N_2O_3$, mw: 254.22.

Acute tox data: Oral LD_{50} (rat) = 660 mg/kg; ip LD_{50} (rat) = 190 mg/kg; oral LD_{50} (mice) = 200 mg/kg; iv LD_{50} (mice) = 238 mg/kg; oral LD_{50} (rabbit) = 150 mg/kg. [*3*]

THR = HIGH via oral, ip and iv routes. An exper neo via oral route. [*3*] See also barbiturates.

SODIUM PHENOSULFONATE. $C_6H_6O_3S \cdot Na$, mw: 181.2.

Acute tox data: Oral LD_{50} (mice) = 3200 mg/kg. [*3*]

THR = MOD via oral route.

Disaster Hazard: Dangerous; see sulfonates.

SODIUM PHENOXIDE. White, deliquescent, crystalline needles. $NaOC_6H_5$, mw: 116.10.

THR = HIGH. See also phenol and sodium hydroxide. A powerful irr to skin, eyes and mu mem.

Disaster Hazard: Dangerous; when heated to decomp, or on contact with acid or acid fumes, emits highly toxic fumes.

SODIUM PHENYLACETATE. Dry powder. $C_6H_5CH_2COONa$, mw: 158.1.

THR = U. See also phenol.

Disaster Hazard: Dangerous; when heated to decomp, emits toxic fumes.

SODIUM PHENYL GLYCINAMINE-*p*-ARSONATE. See tryparsamide.

SODIUM-*o*-PHENYLPHENATE. Crystals or practically white flakes. $NaOC_6H_4C_6H_5$, mw: 192.2.

Acute tox data: Oral LD_{50} (rat) = 1160 mg/kg. [*3*]

THR = MOD via oral route. A fungicide.

Disaster Hazard: Dangerous; when heated to decomp, emits highly toxic fumes.

SODIUM-*o*-PHENYLPHENOLATE. See sodium-*o*-phenylphenate.

SODIUM PHOSPHATE, DIBASIC. Syns: *DSP*, *disodium phosphate*, *sodium orthophosphate* (*sec*), *disodium-o-phosphate*, *disodium hydrogen phosphate*. Colorless, translucent crystals or white powder, sol in methylamine, *o*-nitroaniline diazonium salt, water. [*19*] This material is unstable and can explode on rapid heating or percussion.

SODIUM SULFIDE NONAHYDRATE. $Na_2S \cdot 9H_2O$, mw: 240.2.

Acute tox data: ip LD_{50} (mice) = 53 mg/kg. [*3*]

THR = HIGH via ip and oral routes. See also sulfides.

SODIUM SULFITE. Hexagonal prisms or white powder. Na_2SO_3, mw: 126.06, bp: decomp, d: 2.633 @ 15.4°.

Acute tox data: iv LD_{50} (mice) = 175 mg/kg; oral LD_{LO} (rabbit) = 1181 mg/kg; in humans an oral TD_{LO} = 6 mg/kg causes CNS effects. [*3*]

THR = HIGH via iv and MOD via oral route. See sulfites. A chemical preservative food additive. [*109*]

SODIUM SULFOCYANATE. See sodium sulfocyanide.

SODIUM SULFOCYANIDE. Syns: *sodium sulfocyanate, sodium rhodanate, sodium rhodanide, sodium thiocyanate.* Colorless deliquescent crystals or white powder. NaCNS, mw: 81.08, mp: 287°.

Acute tox data: Oral LD_{50} (rat) = 764 mg/kg; ip LD_{50} (rat) = 540 mg/kg; iv LD_{50} (mice) = 484 mg/kg; sc LD_{LO} (rabbit) = 500 mg/kg. [*3*]

THR = MOD via oral, ip and sc; HIGH via iv routes. Large doses taken internally cause vomiting and convulsions. Chronic poisoning is manifested by weakness, confusion, diarrhea and skin rashes.

SODIUM SULFOVINATE. See sodium ethylsulfate.

SODIUM SUPEROXIDE. NaO_2, mw: 55.

THR = Decomp violently @ >250° to evolve O_2. Also reacts violently with water. See sodium peroxide for toxicity effects.

SODIUM TARTRATE. Syns: *sal tartar, disodium tartrate.* White crystals or granules, sol in water, insol in alcohol. $Na_2C_4H_4O_6 \cdot 2H_2O$, mw: 207.2, d: 1.82, loses $2H_2O$ @ 120°.

Acute tox data: Oral LD_{50} (rat) = 1290 mg/kg; sc LD_{LO} (cat) = 3000 mg/kg; oral LD_{50} (mice) = 4360 mg/kg. [*3*]

THR = MOD via oral and sc routes. A sequestrant food additive. [*109*]

SODIUM TELLURATE (VI). Hexagonal plates or white powder. $Na_2TeO_4 \cdot 2H_2O$, mw: 273.64, mp: decomp.

Acute tox data: Oral LD_{50} (rat) = 385 mg/kg; oral LD_{50} (mice) = 165 mg/kg; iv LD_{LO} (rat) = 31 mg/kg; ip LD_{LO} (rat) = 37 mg/kg. [*3*]

THR = HIGH via oral, ip and iv routes. See tellurium compounds.

SODIUM TELLURATE (IV). $Na_2H_2TeO_3$, mw: 223.6.

Acute tox data: Oral LD_{50} (rat) = 83 mg/kg; ip LD_{LO} (rat) = 4 mg/kg; iv LD_{LO} (rat) = 0.4 mg/kg. [*3*

THR = HIGH via oral, ip and iv routes. See telluri n compounds.

SODIUM TETRAZOLYL-5-AZIDE. $NaCN_7$, n 133.1.

THR = Detonates by percussion. [*19*]

SODIUM TETRABORATE. Syn: *sodium borc* White crystals. $Na_2B_4O_7$, mw: 201.27, mp: 741°, 1575° (decomp), d: 2.367.

Acute tox data: Oral LD_{LO} (infant human) = 1700 mg/kg; oral LD_{LO} (human) = 214 mg/kg; oral LI (rat) = 2660 mg/kg. [*3*]

THR = MOD via oral route. See also boron compounds.

SODIUM-2,3,4,6-TETRACHLOROPHENATE. S sodium-2,3,4,6-tetrachlorophenol.

SODIUM-2,3,4,6-TETRACHLOROPHENOL. Syr *sodium-2,3,4,6-tetrachlorophenate, sodium-2,3,4, tetrachlorophenolate.* Buff to light brown flakes. C_6HCl_4ONa, mw: 253.9, vap. d: 9.4.

THR = All chlorophenols are toxic. See also phen and chlorinated phenols.

Disaster Hazard: Dangerous. See chlorophenols.

SODIUM-2,3,4,6-TETRACHLOROPHENOLATE. See sodium-2,3,4,6-tetrachlorophenol.

SODIUM TETRAHYDROALUMINATE. NaAlH mw: 54.

THR = Violent reaction with water, tetrahydrofuran. [*19*]

SODIUM TETRAHYDROBORATE. See sodiur borohydride.

SODIUM TETRAHYDROGEN-*o*-TELLURATE. Se sodium tellurate (VI).

SODIUM TETRAPHENYL BORATE.

THR = U. See boron compounds.

SODIUM TETRASULFIDE. Yellow, cubic, hygroscopic crystals. Na_2S_4, mw: 174.26, mp: 275°, bp: decomp.

THR = HIGH. See sodium sulfide.

SODIUM THIOARSENATE. Monoclinic, yellow crystals. $Na_3AsS_4 \cdot 8H_2O$, mw: 416.29, mp: decomp.

THR = See arsenic compounds.

SODIUM THIOCYANATE. See sodium sulfocyanide.

SODIUM THIOGLYCOLATE. Hygroscopic crystals. $HSCH_2COONa$, mw: 114.1.

Acute tox data: ip LD_{50} (rat) = 140 mg/kg; iv LD_{LO} (rabbit) = 100 mg/kg; ip LD_{LO} (mice) = 200 mg/kg. [*3*]

THR = HIGH via ip and iv routes. See sulfides. This material yields hydrogen sulfide on decomp. The

REFERENCE NO. 15

The National Register of Historic Places

1976

dows set in almost round recesses, decorative brickwork and bargeboards, stone quoins and trim, 1st-story window with stained glass transom. Original L-shaped structure enlarged and redecorated with Queen Anne elements, late-19th C. *Private.*

Poughkeepsie. **LOCUST GROVE (SAMUEL F. B. MORSE HOUSE)** , 370 South St., 1830. Frame, clapboarding; 2 stories, modified T shape, gabled roof, interior chimneys, bracketed cornice, projecting octagonal wings, 4-story stuccoed end tower with round arched windows, porch with latticework fascia and posts, carriage house extension with large round arched openings; substantially expanded during Morse's ownership. Italianate. Home after 1847 of Samuel F. B. Morse, inventor of the telegraph and a noted artist who had studied and traveled in England and Europe. *Private; not accessible to the public:* NHL.

Poughkeepsie. **MAIN BUILDING, VASSAR COLLEGE,** Vassar College campus, Mid-19th C., James Renwick, architect. Brick, 4 stories with 5-story pavilions, U-shaped, mansard roof punctuated by towers and central convex mansard section. One of the earliest Second Empire buildings in the U.S.; reputedly designed after 16th C. Tuileries Palace. School founded by Matthew Vassar, Poughkeepsie philanthropist who pioneered higher education for women. *Private.*

POUGHKEEPSIE. MILL STREET-NORTH CLOVER STREET HISTORIC DISTRICT, 19th–20th C.. Residential area containing primarily 2-3-story brick houses from post-Civil War period in styles ranging from Greek Revival to those of the Victorian period; notable are the numerous Second Empire structures and the Queen Anne Italian Center (see also Italian Center, NY). Eastern section became city's civic and cultural center under direction of the Vassar family. *Multiple public/private.*

Poughkeepsie. **POUGHKEEPSIE CITY HALL,** 228 Main St., 1831. Brick, 2 stories, rectangular, gabled roof, denticulated cornice, front open balustraded frame belfry with hipped roof, rear cupola with pyramidal roof, front center entrance with transom and side lights; brownstone trim including wide belt course between stories, lintels, and sills; 2 brick additions; altered. Greek Revival. Built as market and village hall, presumably with open 1st-floor market area; served as post office, 1865–1886. *Municipal.*

Poughkeepsie. **SECOND BAPTIST CHURCH,** 36 Vassar St., Mid-19th C.. Brick base, frame, flush siding; 1 1/2 stories over high basement, rectangular temple-form, gabled roof, interior end chimneys, entablature surrounding building; front tetrastyle Doric pedimented portico with balustrade, oculus in tympanum, and 2 entrances with shouldered architraves; side pilasters; side rectangular windows, each with cornice and shouldered architrave; altered. Greek Revival. Property originally purchased from Matthew Vassar's family; building has been used for Protestant and Jewish worship. *Private.*

Poughkeepsie. **UNION STREET HISTORIC DISTRICT,** About 8 blocks in downtown Poughkeepsie centered around Union St., 19th C.. Working class urban neighborhood containing 173 historical commercial and residential structures; features numerous 2 1/2-story brick buildings in styles from Federal to those of the Victorian period, long narrow lots, and backyards. City's oldest section; settled largely by German, Irish, Italian, and Slavic immigrants, and by Blacks. *Multiple public/private.*

Poughkeepsie. **VASSAR HOME FOR AGED MEN,** 1 Vassar St., 1880. Brick, 3 stories over high basement, rectangular, low hipped roof with deck, interior end chimney, gabled section rises above cornice line on each side, bracketed cornice with narrow arched corbel tables below, stairway leads to front entrance with transom; 1-story balustraded porch with slender columns, similar side and rear porches with entrances; granite banding connects granite architraves and sills. Italianate. Built on the site of Matthew Vassar's town residence as home for men 65 and over, as established by Matthew Vassar, Jr., and John Guy Vassar. *Public.*

Poughkeepsie. **VASSAR INSTITUTE,** 12 Vassar St., 1882, J. A. Wood, architect. Brick, 2 1/2 stories, rectangular, convex mansard and hipped roof sections, interior chimney, round arched dormers with raised ridge, bracketed cornice with decorative frieze, front center 3-story tower, entrance porch with paired columns, recessed brick paneling, segmental arched openings, granite trim, rear lower wing with round arched windows houses auditorium; tower dome removed. High Victorian Italianate with Second Empire elements. Built for Matthew Vassar Jr. and John Guy Vassar; contained natural history museum and library. *Private.*

Poughkeepsie. **VASSAR, MATTHEW, ESTATE (SPRINGSIDE),** Academy and Livingston Sts., 1850–1852, Andrew Jackson Downing, architect. Rural estate containing a 2-story cottage with board-and-batten siding, gabled roof, bay windows, and decorative bargeboards, shutter trim, and bracketing; a gatehouse in similar style; and the remains of an L-shaped barn complex. Picturesque Gothic Revival Home of Matthew Vassar, Poughkeepsie brewer and Vassar College founder (see also Main Building, Vassar College, NY). Grounds also designed by early landscape architect Andrew Jackson Downing. *Private; not accessible to the public:* NHL; HABS.

Red Hook. **MAIZEFIELD,** 75 W. Market St., 18th–19th C.. Brick, 3 stories, rectangular main block with later additions, flat roof, 4 interior end chimneys, 1-story front entrance portico with Palladian window above, heavy cornice with block modillions. Federal. Only extant dependency–2-story, hipped roof board-and-batten cottage designed by Alexander Jackson Davis. Residence of Gen. David Van Ness,
prominent military and political leader in t
late-18th and early-19th C. *Private.*

Rhinebeck. **DELAMATER, HENRY, HOUS**
44 Montgomery St., 1844, Alexander Jacks
Davis, architect. Frame, board-and-batten s
ing; modified rectangle; hipped roof with cr
gable, each end with finial; interior chimne
carved scalloped bargeboards; 3 front Tud
arched openings, 1-story 3-bay-wide porch w
carved flat posts and brackets forming Tud
arches, balustraded deck; center 2nd story a
attic, each with rectangular window under bli
pointed arch with tracery; each side with b
window; interior designed by architect to ha
monize with exterior design; rear veranda e
closed and extended; board-and-batten carria
house. Excellent example of Gothic Reviv
cottage design advocated by Alexander Jacks
Davis and Andrew Jackson Downing. *Private*

Sylvan Lake vicinity. **SYLVAN LAKE ROC**
SHELTER, 5000 B.C.–700 A.D.. Undisturbe
stratified rock shelter; served as winter cam
for Archaic hunters beginning c. 5000 B.C. E
cavations between 1964 and 1966 revealed nu
merous remains of the Sylvan Lake Culture (
2500 B.C.), elements of the Susquehann
Tradition (c. 1500–1000 B.C.), and Middle a
Late Woodland deposits. *Private.*

ERIE COUNTY

Buffalo. **ALBRIGHT-KNOX ART GALLER**
1285 Elmwood Ave., in Delaware Par
1900–1905, Edward B. Green, architect. Pa
tially marble faced, 2 stories, modified H shap
gabled roof sections; E pedimented Ionic e
trance portico flanked by colonnaded win
ending in pavilions, each with caryatids by A
gustus Saint Gaudens; W semielliptical lon
porch flanked by colonnaded sections; interi
sculpture courtyard. Neo-Classical Reviv
Built to permanently house the collections
the Buffalo Fine Arts Academy. *Private.*

Buffalo. **BUFFALO STATE HOSPITAL,** 4
Forest Ave., 1871–1890, Henry Hobs
Richardson, architect. Random rough ashl
sandstone, brick; 3 1/2 stories above high bas
ment, main block with 5 W wards and 2
wards, gabled and hipped roof sections, gabl
and flared hipped dormers, front entran
recessed under 3-bay arcade flanked by pr
-jecting pavilion; 2 main-block towers w
steeply hipped roofs, shed dormers, and corn
turrets; machicolations, rectangular and se
mental arched windows, wings with projecti
cross-gable sections; 3 wards removed, 196
4 service buildings; site plan by Frederick La
Olmsted. Richardsonian Romanesque element
Early development example of Henry Hobs
Richardson's work. *State:* HABS.

Buffalo. **DELAWARE AVENUE HISTOR**
DISTRICT, W side of Delaware Ave. betwe
North and Bryant Sts., 19th–20th C.. Remai
ing section of elite residential area of predom
nantly turn-of-the-century grand dwelli
Era's Neo-Classical and Georgian Revival styl

ecology and environment

Draft

epresented in designs by noted architects such s McKim, Mead, and White Reflects verwhelmingly successful economic development stimulated by Pan-American Exposition, 901 Prominent residents included Anson C. oodyear and Millard Fillmore. *Multiple ublic/private*

uffalo **GUARANTY BUILDING PRUDENTIAL BUILDING)** , Church and 'earl Sts , 1894 1895. Louis Sullivan, rchitect Steel frame, terra cotta sheathing, 12 /2 stories, U-shaped, flat roof, front and side ntrances, each with large lunette at 2nd-story evel, first 2 stories topped by narrow cornice orm base for upper levels, upper-story fenes- tation organized in vertical bands under round rches, oculi in coved section below cornice, ecorative terra cotta ornament in low relief overs entire building; interior lobby with cast on and leaded glass skylight, mosaic frieze nd cast iron stairway; 1st-story store windows ltered 1970 to form flat plane behind piers. ullivanesque. A milestone in modern skys- raper development by Louis Sullivan, building accessfully integrates structural clarity with or- amentation. *Private:* NHL; HABS.

uffalo. **MACEDONIA BAPTIST CHURCH,** 11 Michigan Ave., 1845. Brick, 1 story, ectangular, gabled roof, enclosed entrance estibule flanked by round arched windows in ecessed rectangular panels, rounded and in- cribed stone plaque above entrance, modified eetinghouse plan with apse, 20th C altera- ons Social and religious center for Black ommunity for 125 years. Parish of Dr. J Ed- ard Nash, a founder of the Buffalo Urban eague and the local branch of the NAACP. *rivate.*

uffalo. **PIERCE ARROW FACTORY COM- LEX,** Elmwood and Great Arrow Aves., 1906, lbert Kahn, architect. Factory complex con- aining 14 major buildings mainly of reinforced oncrete steel with brick and glass curtain alls, saw-tooth roof sections, large spans up to 0', some Arts and Crafts decorative elements n Administration Building front. Represents nthesis of trends foreshadowing develop- ents in factory design; owned and operated by ierce Arrow Co. until 1938, buildings later onverted for diversified commercial use. *Mul- ple private.*

uffalo. **ST. PAUL'S EPISCOPAL ATHEDRAL,** 125 Pearl St., 1850–1851, ichard Upjohn, architect. Sandstone ashlar, 1 ory, irregular shape, gabled roof sections; cor- ce sections, some with modillions, some with efoil arcading; front 3-stage tower with tall ire, entrance porch, transept chapel with en- ance and adjacent 3-stage bell tower with ire, nave lancet windows with label molds, ttresses, towers completed 1870's, 1888 fire estroyed interior; new interiors designed by nglish architect, Robert Gibson, clerestory lded Fine example of Gothic Revival building lapted to unusual triangular site *Private:* ABS

Buffalo **THEODORE ROOSEVELT INAUGURAL NATIONAL HISTORIC SITE,** Delaware Ave , 1838 Site includes Ansley Wilcox house: brick, 2 1/2 stories, modified rectangle, gabled roof sections, some with end returns, interior end chimney, front full-width 2 story pedimented portico, center entrance with fanlight, Palladian window in tympanum, 1863 remodeling, portico moved, 1890's additions, 20th C. interior alterations, restored. Greek Revival. Built for officers' quarters as part of Poinsett Barracks, site of Theodore Roosevelt's inauguration Sept. 14, 1901 after William McKinley's assassination. Museum. *Federal/NPS.*

Buffalo. **U.S. POST OFFICE,** 121 Ellicott St., 1897–1901, James Knox Taylor, architect. Rock-faced granited base, granite ashlar; 4 1/2 stories over high basement, modified rectangle, gabled and pyramidal roof sections, numerous gabled dormers, modillion cornice; front center tall tower with corner turrets, gargoyles, and spire with crockets and finial; front 3 entrances recessed under 3-bay entrance porch with elaborate Gothic detailing, each side with 3-bay entry and 1–3 entrances; rear cast iron porte-cochere, string courses, windows grouped under pointed arches, molded and carved detail including foliate capitals and buffalo heads; 4-story-high central courtyard above 1st floor with steel and glass roof surrounded by galleries with rectangular, segmental, and pointed arched openings; 1936 remodeling included roofing of 1st floor of courtyard and skylight. Later Gothic Revival. Excellent example of late-19th C dual-nature architecture combining revivalist style with technological innovations; designed by James Knox Taylor, Supervising Architect of the U S. Treasury. *Federal/GSA.* HABS.

East Aurora. **FILLMORE, MILLARD, HOUSE,** 24 Shearer Ave., 1826. Frame, clapboarding, 1 1/2 stories, modified L shape, gabled roof sections, exterior end chimneys, 1-story full-width front tetrastyle Doric porch, front center entrance; moved, 1915 and 1930; altered, c. 1930 Greek Revival elements. Built by Millard Fillmore, lawyer, state and U S. representative, and U S. Vice President who became President upon the death of Zachary Taylor in 1850. *Private; not accessible to the public:* NHL.

East Aurora. **ROYCROFT CAMPUS,** Main and W. Grove Sts., Late-19th C.–1938. Complex containing approximately 9 structures, the majority of which feature crenelated towers, half-timbered gables, and stone or shingled exteriors. Built as part of Arts and Crafts artistic community established in late-19th C by writer Elbert Hubbard after visiting a similar English community organized by Arts and Crafts movement leader William Morris, utilized Medieval organization and building concepts as inspired by the writings of John Ruskin, in operation until 1938 *Multiple public/private.*

Irving **THOMAS INDIAN SCHOOL,** NY 438 on Cattaraugus Reservation, 1900, Barney and Chapman, architects Educational complex consisting of 9 principal brick Georgia[illegible] buildings and 25 dependencies; notable is the elaborate Administration Building with its ornate stone trim and decorative use of Indian related motifs and subject matter. Built by NY on reservation as a self-sufficient educational facility; school began, mid-18th C., as the Thomas Asylum of Orphan and Destitute Indian Children and developed into a successful, accredited educational institution; in operation until 1958 when closed as result of centralization of the public school system. *Tribal.*

ESSEX COUNTY

ADIRONDACK FOREST PRESERVE, *Reference—see Clinton County*

Crown Point. **FORT ST. FREDERIC,** Jct. of NY 8 and 9N, 1731. Limestone ruins of fort established by French to guard Lake Champlain route into Canada. Abandoned in 1759 after Lord Jeffrey Amherst captured nearby Fort Carillon, which the British renamed Fort Ticonderoga (see also Fort Ticonderoga, NY), during the French and Indian War. *State:* NHL.

Crown Point vicinity. **FORT CROWN POINT,** Crown Point Reservation, SW of Lake Champlain Bridge and NY 8, 1760. Limestone walls of 5-sided fort containing 6.5-acre parade ground and 2 of 3 original barracks, and surrounded by dry moat. Constructed by British as Fort Crown Point or Amherst after Lord Jeffrey Amherst who drove French from area during the French and Indian War. Damaged in 1773 when powder magazine exploded; reconstruction interrupted by Revolution was never completed. Occupied alternately by Americans and British during Revolution. *State:* NHL.

Essex vicinity. **CHURCH OF THE NAZARENE,** W of Essex on NY 22, 1855. Frame, board-and-batten siding; gabled roof with double pitch and end returns, front shoulder arched entrance, lancet windows, trefoil in gable; interior wooden arches spring from unengaged wooden posts to form primary roof support. Gothic Revival. Simple design apparently based upon small mission chapel prototype in Richard Upjohn's *Rural Architecture*, published 1852. *Private.*

Essex vicinity. **OCTAGONAL SCHOOLHOUSE,** On Rte. 22 in Bouquet, 1826, Benjamin Gilbert, builder. Rubble sandstone, 1 story, modified octagon, polygonal roof, octagonal open belfry with polygonal roof, front entrance with shed porch, rear entrance leads to frame vestibule addition; porch added. Octagon Mode. Probably state's oldest schoolhouse; served as school until 1952. *Municipal.*

Ironville. **IRONVILLE HISTORIC DISTRICT,** 19th C.. Rural residential area includes focal Penfield Homestead (1828), other houses, church, boardinghouse, Grange Hall, inn, schoolhouse, and ruinous remains of ironworks. Est. 1807; developed major iron industry; pioneered in industrial use of electricity. Museum. *Multiple private.*

REFERENCE NO. 16

CONTACT REPORT

Meeting [ ]   Telephone [X]   Other [ ]

CLIENT: USDA Soil Conservation Service

ADDRESS: 21 South Grove Road
East Aurora

CONTACT: Mr. John Whitney

PHONE NO.: 652-8480

FROM: D. Sutton

TO: P. Farrell

DATE: 1/10/89

CC:

SUMMARY: Whiting Development, NYSDEC Phase 1

Mr. Whitney stated that he did not believe that any cropland was being irrigated by groundwater with a 3 mile radius of the Whiting site within Erie County.* He did indicate that it was possible that private garden plots were irrigated by groundwater and that the Dande Farms Golf Course was irrigated by groundwater.

wj/XA602

I have discussed this with Frank Newton, County Executive Director of the Agricultural Stabilization and Conservation Service. We looked at the maps and decided there might be some irrigation within a 3 mile radius of the Whiting site.

John Whitney
District Conservationist.

*ODELL Farms on Bloomingdale Road may occassionally irrigate.

*GERALD KARCHER on Carney Road might irrigate.

CONTACT REPORT

AGENCY : USDA SOIL CONSERVATION SERVICE (SCS)
ADDRESS : 21 S. GROVE RD., EAST AURORA, NY
TELEPHONE : (716) 652-8480
PERSON CONTACTED : JOHN WHITNEY
TO : FRED MCKOSKY
FROM : PAM GUNTHER
DATE : AUGUST 25, 1987
SUBJECT : PRIME AGRICULTURAL LANDS THAT HAVE BEEN IN PRODUCTION SINCE 1982 FOR DEC PHASE 1 INACTIVE HAZARDOUS WASTE SITES OF ERIE CO.
XC : M. SIENKIEWICZ, G. FLORENTINO, J. SUNDQUIST, P. FARRELL, FILE ND-2000

John Whitney can provide *aerial photos (slides) for all hazardous waste sites in Erie Co. for the following years: 1938, 1958, 1966, 1978, 1981-1987. They cost $1.00 each with a 2 week turnover time. Payment must be received in advance.

To obtain location on prime agricultural lands that have been in production over the past 5 years we looked at enlarged 1978 aerial photos that are updated annually from farmers that maintain crop records with the Agricultural Stabilization Conservation Service (ASCS). To receive federal subsidies the farmers must be in contact with ASCS. Therefore, the ASCS has a good record of who's growing what and where. Truck farmers do not receive federal subsidies and are excluded from ASCS records. Attached is a list of the distances to each prime agricultural farmland from the inactive hazardous waste site and the soil type that classifies the land as prime. Note that ASCS has fewer soil types classified as prime ag. lands than does the New York State classification system. New York State classifies all ASCS prime ag. lands as prime but also includes more soil types. Note this difference for the Gutenkist site. All other sites will have the same ag. land for both state and ASCS. Note this distance was calculated for up to 2 miles away from the site.

Mr. Whitney has also provided me with a bibleography of ground water resources for Erie County which is attached. I have also ordered the attached USGS reports that were recently published.

		Distance	Soil Type
Buffalo - Hopkins		> 2 miles	-
E.I. Dupont		> 2 miles	-
FMC Corp.		> 2 miles	-
Whiting Development Corp.		0	Collamer silt loam, Ag. land adjacent to site
Republic Steel		> 2 miles	-
Snyder Tank Co.		> 2 miles	Varysburg gravelly loam
Village of Springville		300 ft.	Varysburg gravelly loam
James Fox site		300 ft	Manlius shaly silt loam
Sunkist	State	1600 ft.	Farnham shaly silt loam
	ASCS	6015 ft.	Blasdell shaly silt loam
Eden Sanitation Services		4950 ft.	Niagara silt loam (note: this land is only 2 acr
George Schreiber		700 ft.	Palmyra gravelly loam
Clarence Ready Mix		1700 ft.	-
Central Auto Wrecking		> 2 miles	Hamlen silt loam
Hi View Terrace		5280 ft.	-
Lift and Hopkins		> 2 miles	-
SB Warehouse		> 2 miles	-
Berns Metals		> 2 miles	*

* slides are actually available through the ASCS office not SCS, though we may provide technical assistance in identifying slides needed and in interpretation.

John R. Whitney
District Conservationist

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 915025

II. SITE NAME AND LOCATION

01 Site Name (Legal, common, or descriptive name of site) FMC Corporation - Chemical Division	02 Street, Route No., or Specific Location Identifier 34 Sawyer Road

03 City	04 State	05 Zip Code	06 County	07 County Code	08 Cong. Dist.
Town of Tonawanda	NY	14150	Erie	029	38

09 Coordinates

Latitude 42 58 21.0

Longitude 078 55 38.0

10 Type of Ownership (Check one)

[X] A. Private [ ] B. Federal ____ [ ] C. State [ ] D. County

[ ] E. Municipal [ ] F. Other ____ [ ] G. Unknown

III. INSPECTION INFORMATION

01 Date of Inspection	02 Site Status	03 Years of Operation
9 / 24 / 87 Month Day Year	[ ] Active [X] Inactive	1964 Beginning Year 1976 Ending Year [ ] Unknown

04 Agency Performing Inspection (Check all that apply)

[ ] A. EPA [ ] B. EPA Contractor ____ (Name of Firm) [ ] C. Municipal [ ] D. Municipal Contractor ____ (Name of Firm)

[ ] E. State [X] F. State Contractor E & E (Name of Firm) [ ] G. Other ____ (Specify)

05 Chief Inspector	06 Title	07 Organization	08 Telephone No.
A. Mark Sienkiewicz	Env. Specialist	Ecology and Environment	(716) 684-8060

09 Other Inspectors	10 Title	11 Organization	12 Telephone No.
Gene Florentino	Geologist	Ecology and Environment	(716) 684-8060
			( )
			( )
			( )
			( )

13 Site Representatives Interviewed	14 Title	15 Address	16 Telephone No.
Richard Wise	Env. Eng.	34 Sawyer Ave., Tonawanda	(716) 876-8300
			( )
			( )
			( )
			( )

17 Access Gained By (Check one)	18 Time of Inspection	19 Weather Conditions
[X] Permission [ ] Warrant	10:00	Partly Cloudy, 65° F., east wind

IV. INFORMATION AVAILABLE FROM

01 Contact	02 Of (Agency/Organization)	03 Telephone No.
Walter E. Demick	NYSDEC, Albany, New York	(518) 457-9538

04 Person Responsible for Site Inspection Form	05 Agency	06 Organization	07 Telephone No.	08 Date
M. Farrell		E & E	(716) 684-8060	10 / 7 / 87 Month Day Year

EPA Form 2070-13 (7-81) recycled paper

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 2 - WASTE INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 915025

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 Physical States
(Check all that apply)

☒ A. Solid
☐ B. Powder, Fines
☐ C. Sludge
☐ D. Other ____________
(Specify)
☐ E. Slurry
☒ F. Liquid
☐ G. Gas

02 Waste Quantity at Site
(Measure of waste quantities must be independent)

Tons 100
Cubic Yards ____________
No. of Drums ____________

03 Waste Characteristics (Check all that apply)

☒ A. Toxic
☒ B. Corrosive
☐ C. Radioactive
☐ D. Persistent
☐ E. Soluble
☐ F. Infectious
☐ G. Flammable
☐ H. Ignitable
☐ I. Highly volatile
☐ J. Explosive
☒ K. Reactive
☐ L. Incompatible
☐ M. Not applicable

III. WASTE TYPE

Category	Substance Name	01 Gross Amount	02 Unit of Measure	03 Comments
SLU	Sludge			
OLW	Oily waste			
SOL	Solvents			
PSD	Pesticides			
OCC	Other organic chemicals	Unknown		
IOC	Inorganic chemicals	100	tons	FMC estimated
ACD	Acids	Unknown		
BAS	Bases			
MES	Heavy Metals			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 Category	02 Substance Name	03 CAS Number	04 Storage/Disposal Method	05 Concentration	06 Measure of Concentration
IOC	Borax	1303-96-4	Burial	Unknown	
IOC	Hydrogen peroxide	7722-84-1	Burial	Unknown	
IOC	Sodium carbonate	497-19-8	Burial	Unknown	
IOC	Sodium persulfate	7775-27-1	Burial	Unknown	
IOC	Ammonium bicarbonate	1066-33-7	Burial	Unknown	
IOC	Ammonium carbonate	506-87-6	Burial	Unknown	
IOC	Ammonium hydroxide	1336-21-6	Burial	Unknown	
IOC	Ammonium sulfate	7783-20-2	Burial	Unknown	
ACD	Dipicolinic acid	499-83-2	Burial	Unknown	

V. FEEDSTOCKS (See Appendix for CAS Numbers)

Category	01 Feedstock Name	02 CAS Number	Category	01 Feedstock Name	02 CAS Number
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

SAX, 1984, Dangerous Properties of Industrial Materials
ECDEP, 1982, Hazardous Waste Site Profile, FMC

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 State
NY

02 Site Number
915025

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 [X] A. Groundwater Contamination — 02 [ ] Observed (Date) [X] Potential [ ] Alleged
03 Population Potentially Affected Unknown — 04 Narrative Description:

The potential exists for contaminants from the site to migrate into the groundwater. The potential is low due to impermeable clays.

01 [X] B. Surface Water Contamination — 02 [ ] Observed (Date) [X] Potential [ ] Alleged
03 Population Potentially Affected Unknown — 04 Narrative Description:

The potential exists for contaminated groundwater to flow into the Niagara River.

01 [ ] C. Contamination of Air — 02 [ ] Observed (Date) [ ] Potential [ ] Alleged
03 Population Potentially Affected — 04 Narrative Description:

None expected

01 [ ] D. Fire/Explosive Conditions — 02 [ ] Observed (Date) [ ] Potential [ ] Alleged
03 Population Potentially Affected — 04 Narrative Description:

None expected

01 [ ] E. Direct Contact — 02 [ ] Observed (Date) [ ] Potential [ ] Alleged
03 Population Potentially Affected — 04 Narrative Description:

None expected

01 [X] F. Contamination of Soil — 02 [ ] Observed (Date) [ ] Potential [ ] Alleged
03 Area Potentially Affected 1.0 (Acres) — 04 Narrative Description:

The potential exists for contaminated soils.

01 [ ] G. Drinking Water Contamination — 02 [ ] Observed (Date) [ ] Potential [ ] Alleged
03 Population Potentially Affected — 04 Narrative Description:

None expected

01 [X] H. Worker Exposure/Injury — 02 [ ] Observed (Date) [X] Potential [ ] Alleged
03 Workers Potentially Affected Unknown — 04 Narrative Description:

The potential exists for FMC and Niagara Mohawk workers to have been exposed, but no reports exist.

01 [ ] I. Population Exposure/Injury — 02 [ ] Observed (Date) [ ] Potential [ ] Alleged
03 Population Potentially Affected — 04 Narrative Description:

None expected

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 State NY

02 Site Number 915025

II. HAZARDOUS CONDITIONS AND INCIDENTS (Cont.)

01 [ ] J. Damage to Flora 02 [ ] Observed (Date ______) [ ] Potential [ ] Alleged
04 Narrative Description:

Not observed

01 [ ] K. Damage to Fauna 02 [ ] Observed (Date ______) [ ] Potential [ ] Alleged
04 Narrative Description:

Not observed

01 [ ] L. Contamination of Food Chain 02 [ ] Observed (Date ______) [ ] Potential [ ] Alleged
04 Narrative Description:

None expected

01 [ ] M. Unstable Containment of Wastes (Spills/Runoff/Standing liquids, Leaking drums) 02 [ ] Observed (Date ______) [ ] Potential [ ] Alleged
03 Population Potentially Affected ______ 04 Narrative Description:

None observed

01 [ ] N. Damage to Offsite Property 02 [ ] Observed (Date ______) [ ] Potential [ ] Alleged
04 Narrative Description:

None expected

01 [X] O. Contamination of Sewers, Storm Drains, WWTPs 02 [ ] Observed (Date ______) [X] Potential [ ] Alleged
04 Narrative Description:

A potential exists for contaminants to infiltrate a sewer line which transects the site. This line flows to the Niagara River.

01 [ ] P. Illegal/Unauthorized Dumping 02 [ ] Observed (Date ______) [ ] Potential [ ] Alleged
04 Narrative Description:

None expected

05 Description of Any Other Known, Potential, or Alleged Hazards

III. TOTAL POPULATION POTENTIALLY AFFECTED ______

IV. COMMENTS

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Ecology and Environment, 1987, Site Inspection

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 915025

II. PERMIT INFORMATION

01 Type of Permit Issued (Check all that apply)	02 Permit Number	03 Date Issued	04 Expiration Date	05 Comments
[ ] A. NPDES SPDES				
[ ] B. UIC				
[ ] C. AIR				
[ ] D. RCRA				
[ ] E. RCRA Interim Status				
[ ] F. SPCC Plan				
[ ] G. State (Specify)				
[ ] H. Local (Specify)				
[ ] I. Other (Specify)				
[X] J. None				

III. SITE DESCRIPTION

01 Storage Disposal (Check all that apply)	02 Amount	03 Unit of Measure	04 Treatment (Check all that apply)
[ ] A. Surface Impoundment			[ ] A. Incineration
[ ] B. Piles			[ ] B. Underground Injection
[ ] C. Drums, Above Ground			[ ] C. Chemical/Physical
[ ] D. Tank, Above Ground			[ ] D. Biological
[ ] E. Tank, Below Ground			[ ] E. Waste Oil Processing
[X] F. Landfill	100	tons	[ ] F. Solvent Recovery
[ ] G. Landfarm			[ ] G. Other Recycling Recovery
[ ] H. Open Dump			[ ] H. Other ______ (Specify)
[ ] I. Other ______ (Specify)			

05 Other

[X] A. Buildings On Site

06 Area of Site

1 Acres

07 Comments:

Wastes were disposed of in pits (2-4) on FMC property.
They have been covered with clay.

IV. CONTAINMENT

01 Containment of Wastes (Check one)

[ ] A. Adequate, Secure [X] B. Moderate [ ] C. Inadequate, Poor [ ] D. Insecure, Unsound, Dangerous

02 Description of Drums, Diking, Liners, Barriers, etc.

Natural clay in area with expected low permeability. Disposal pits capped with clay and plastic.

V. ACCESSIBILITY

01 Waste Easily Accessible: [ ] Yes [X] No

02 Comments:

24-hour security
Perimeter fenced

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Ecology and Environment, 1987, Site Inspection
ECDEP, 1982, Hazardous Waste Site Profile, FMC

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 State NY

02 Site Number 915025

II. DRINKING WATER SUPPLY

01 Type of Drinking Supply (Check as applicable)

	Surface	Well
Community	A. [X]	B. [ ]
Non-community	D. [X]	D. [ ]

02 Status

Endangered	Affected	Monitored
A. [ ]	B. [ ]	C. [X]
D. [ ]	E. [ ]	F. [X]

03 Distance to Site

A 0.6 (mi)

B 0.6 (mi)

III. GROUNDWATER

01 Groundwater Use in Vicinity (Check one)

[ ] A. Only Source for Drinking

[ ] B. Drinking (Other sources available) Commercial, Industrial, Irrigation (No other water sources available)

[ ] C. Commercial, Industrial, Irrigation (Limited other sources available)

[X] D. Not Used, Unuseable

02 Population Served by Groundwater 0

03 Distance to Nearest Drinking Water well >2 (mi)

04 Depth to Groundwater 35-54 (ft)

05 Direction of Groundwater Flow West

06 Depth to Aquifer of Concern 35 (ft)

07 Potential Yield of Aquifer Unknown (gpd)

08 Sole Source Aquifer [ ] Yes [X] No

09 Description of Wells (including usage, depth, and location relative to population and buildings)

No wells on site

10 Recharge Area

[X] Yes

[ ] No

Comments: Overburden aquifer recharged by precipitation. Landfill area is, however, covered with plastic.

11 Discharge Area

[ ] Yes

[X] No

Comments:

IV. SURFACE WATER

01 Surface Water (Check one)

[X] A. Reservoir, Recreation, Drinking Water Source

[ ] B. Irrigation, Economically Important Resources

[ ] C. Commercial, Industrial

[ ] D. Not Currently Used

02 Affected/Potentially Affected Bodies of Water

Name:	Affected	Distance to Site
Niagara River	[ ]	0.4 (mi)
	[ ]	(mi)
	[ ]	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 Total Population Within

One (1) Mile of Site	Two (2) Miles of Site	Three (3) Miles of Site
A. 782 No. of Persons	B. 18,113 No. of Persons	C. 62,125 No. of Persons

02 Distance to Nearest Population 0.8 (mi)

03 Number of Buildings Within Two (2) Miles of Site 7,004

04 Distance to Nearest Off-Site Building 0.1 (mi)

05 Population Within Vicinity of Site (Provide narrative description of nature of population within vicinity of site, e.g., rural, village, densely populated urban area)

Commercial and industrial area, high density. Population area located 0.8 miles to the east.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 State	02 Site Number
NY	915025

VI. ENVIRONMENTAL INFORMATION

01 Permeability of Unsaturated Zone (Check one)

[ ] A. 10^{-6} - 10^{-8} cm/sec [ ] B. 10^{-4} - 10^{-6} cm/sec [ ] C. 10^{-4} - 10^{-3} cm/sec [X] D. Greater Than 10^{-3} cm/sec

02 Permeability of Bedrock (Check one)

[ ] A. Impermeable (Less than 10^{-6} cm/sec) [ ] B. Relatively Impermeable (10^{-4} - 10^{-6} cm/sec) [X] C. Relatively Permeable (10^{-2} - 10^{-4} cm/sec) [ ] D. Very Permeable (Greater than 10^{-2} cm/sec)

03 Depth to Bedrock: 65 (ft)

04 Depth of Contaminated Soil Zone: 12 (ft)

05 Soil pH: Unknown

06 Net Precipitation: 9 (in)

07 One Year 24-Hour Rainfall: 2.1 (in)

08 Slope

Site Slope: 0-3 %

Direction of Site Slope: West

Terrain Average Slope: 0-3 %

09 Flood Potential

Site is in NA Year Floodplain

10

[ ] Site is on Barrier Island, Coastal High Hazard Area, Riverine Floodway

11 Distance to Wetlands (5 acre minimum)

ESTUARINE	OTHER
A. >2 (mi)	B. 0.6 (mi)

12 Distance to Critical Habitat (of Endangered Species)

>2 (mi)

Endangered Species:

13 Land Use in Vicinity

Distance to:

COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS, NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS PRIME AG LAND	AG LAND
A. 0.0 (mi)	B. >2 (mi)	C. >2 (mi)	D. >2 (mi)

14 Description of Site in Relation to Surrounding Topography

Site is 1-acre equipment storage lot located 0.1 mile southeast of the corner of River Road and Sawyer Avenue in the Town of Tonawanda. North and east of the site is the FMC office building and plant. South of the site is the Niagara Mohawk railroad spur. West of the site is the Huntley power plant. Further west is the Niagara River. The site is level.

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

NYS Dept. of Health, 1982, Community Water Supply Atlas
USDA, SCS, 1986, Soil Survey of Erie County General Sciences Corporation, 1986, Graphical Exposure Modeling System

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 915025

II. SAMPLES TAKEN None

Sample Type	01 Number of Samples Taken	02 Samples Sent to	03 Estimated Date Results Available
Groundwater			
Surface Water			
Waste			
Air			
Runoff			
Spill			
Soil			
Vegetation			
Other			

III. FIELD MEASUREMENTS TAKEN

01 Type	02 Comments
HNu	No organic vapors detected above background.

IV. PHOTOGRAPHS AND MAPS

01 Type [X] Ground [ ] Aerial

02 In Custody of Ecology and Environment
(Name of organization or individual)

03 Maps
[X] Yes
[ ] No

04 Location of Maps
Ecology and Environment

V. OTHER FIELD DATA COLLECTED (Provide narrative description of sampling activities)

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E & E, 1987, Site Inspection

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 7 - OWNER INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 915025

II. CURRENT OWNER(S)			PARENT COMPANY (If applicable)		
01 Name Niagara Mohawk Power Corp.		02 D+B Number	08 Name Niagara Mohawk Power Corp.		09 D+B Number
03 Street Address (P.O. Box, RFD #, etc.) 3500 River Road		04 SIC Code	10 Street Address (P.O. Box, RFD #, etc.) 300 Erie Boulevard		11 SIC Code
05 City Tonawanda	06 State NY	07 Zip Code 14150	12 City Syracuse	13 State NY	14 Zip Code 13202
01 Name FMC Corporation		02 D+B Number	08 Name FMC Corporation		09 D+B Number
03 Street Address (P.O. Box, RFD #, etc.) 34 Sawyer Avenue		04 SIC Code	10 Street Address (P.O. Box, RFD #, etc.) P. O. Box 845		11 SIC Code
05 City Tonawanda	06 State NY	07 Zip Code 14150	12 City Buffalo	13 State NY	14 Zip Code 14240
01 Name		02 D+B Number	08 Name		09 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code	10 Street Address (P.O. Box, RFD #, etc.)		11 SIC Code
05 City	06 State	07 Zip Code	12 City	13 State	14 Zip Code
01 Name		02 D+B Number	08 Name		09 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code	10 Street Address (P.O. Box, RFD #, etc.)		11 SIC Code
05 City	06 State	07 Zip Code	12 City	13 State	14 Zip Code

III. PREVIOUS OWNER(S) (List most recent first)			IV. REALTY OWNER(S) (If applicable, list most recent first)		
01 Name FMC Corporation		02 D+B Number	01 Name		02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.) 34 Sawyer Avenue		04 SIC Code	03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code
05 City Tonawanda	06 State NY	07 Zip Code 14150	05 City	06 State	07 Zip Code
01 Name Blount, Thomas.		02 D+B Number	01 Name		02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.) Unknown		04 SIC Code	03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code
01 Name Gunner, Joan E.		02 D+B Number	01 Name		02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.) Unknown		04 SIC Code	03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION

01 State NY	02 Site Number 915025

II. CURRENT OPERATOR (Provide if different from owner)

01 Name

02 D+B Number

03 Street Address (P.O. Box, RFD #, etc.)

04 SIC Code

05 City

06 State

07 Zip Code

08 Years of Operation

09 Name of Owner

OPERATOR'S PARENT COMPANY (If applicable)

10 Name

11 D+B Number

12 Street Address (P.O. Box, RFD #, etc.)

13 SIC Code

14 City

15 State

16 Zip Code

III. PREVIOUS OPERATOR(s) (List most recent first; provide only if different from owner)

01 Name

02 D+B Number

03 Street Address (P.O. Box, RFD #, etc.)

04 SIC Code

05 City

06 State

07 Zip Code

08 Years of Operation

09 Name of Owner During This Period

01 Name

02 D+B Number

03 Street Address (P.O. Box, RFD #, etc.)

04 SIC Code

05 City

06 State

07 Zip Code

08 Years of Operation

09 Name of Owner During This Period

01 Name

02 D+B Number

03 Street Address (P.O. Box, RFD #, etc.)

04 SIC Code

05 City

06 State

07 Zip Code

08 Years of Operation

09 Name of Owner During This Period

PREVIOUS OPERATORS' PARENT COMPANIES (If applicable)

10 Name

11 D+B Number

12 Street Address (P.O. Box, RFD #, etc.)

13 SIC Code

14 City

15 State

16 Zip Code

10 Name

11 D+B Number

12 Street Address (P.O. Box, RFD #, etc.)

13 SIC Code

14 City

15 State

16 Zip Code

10 Name

11 D+B Number

12 Street Address (P.O. Box, RFD #, etc.)

13 SIC Code

14 City

15 State

16 Zip Code

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 915025

II. ON-SITE GENERATOR

01 Name	02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code

05 City	06 State	07 Zip Code

III. OFF-SITE GENERATOR(S)

01 Name	02 D+B Number	01 Name	02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code

05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code

01 Name	02 D+B Number	01 Name	02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code

05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code

IV. TRANSPORTER(S)

01 Name	02 D+B Number	01 Name	02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code

05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code

01 Name	02 D+B Number	01 Name	02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code

05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

D1722

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION

01 State
NY

02 Site Number
915025

II. PAST RESPONSE ACTIVITIES

01 [ ] A. Water Supply Closed 02 Date ______ 03 Agency ______
04 Description:

01 [ ] B. Temporary Water Supply Provided 02 Date ______ 03 Agency ______
04 Description:

01 [ ] C. Permanent Water Supply Provided 02 Date ______ 03 Agency ______
04 Description:

01 [ ] D. Spilled Material Removed 02 Date ______ 03 Agency ______
04 Description:

01 [ ] E. Contaminated Soil Removed 02 Date ______ 03 Agency ______
04 Description:

01 [ ] F. Waste Repackaged 02 Date ______ 03 Agency ______
04 Description:

01 [ ] G. Waste Disposed Elsewhere 02 Date ______ 03 Agency ______
04 Description:

01 [ ] H. On Site Burial 02 Date ______ 03 Agency ______
04 Description:

01 [ ] I. In Situ Chemical Treatment 02 Date ______ 03 Agency ______
04 Description:

01 [ ] J. In Situ Biological Treatment 02 Date ______ 03 Agency ______
04 Description:

01 [ ] K. In Situ Physical Treatment 02 Date ______ 03 Agency ______
04 Description:

01 [ ] L. Encapsulation 02 Date ______ 03 Agency ______
04 Description:

01 [ ] M. Emergency Waste Treatment 02 Date ______ 03 Agency ______
04 Description:

01 [ ] N. Cutoff Walls 02 Date ______ 03 Agency ______
04 Description:

01 [ ] O. Emergency Diking/Surface Water Diversion 02 Date ______ 03 Agency ______
04 Description:

01 [ ] P. Cutoff Trenches/Sump 02 Date ______ 03 Agency ______
04 Description:

01 [ ] Q. Subsurface Cutoff Wall 02 Date ______ 03 Agency ______
04 Description:

D1722

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION

01 State NY

02 Site Number 915025

II. PAST RESPONSE ACTIVITIES (Cont.)

01 [ ] R. Barrier Walls Constructed 02 Date ______ 03 Agency ______
04 Description:

01 [ ] S. Capping/Covering 02 Date ______ 03 Agency ______
04 Description:

01 [ ] T. Bulk Tankage Repaired 02 Date ______ 03 Agency ______
04 Description:

01 [ ] U. Grout Curtain Constructed 02 Date ______ 03 Agency ______
04 Description:

01 [ ] V. Bottom Sealed 02 Date ______ 03 Agency ______
04 Description:

01 [ ] W. Gas Control 02 Date ______ 03 Agency ______
04 Description:

01 [ ] X. Fire Control 02 Date ______ 03 Agency ______
04 Description:

01 [ ] Y. Leachate Treatment 02 Date ______ 03 Agency ______
04 Description:

01 [ ] Z. Area Evacuated 02 Date ______ 03 Agency ______
04 Description:

01 [ ] 1. Access to Site Restricted 02 Date ______ 03 Agency ______
04 Description:

01 [ ] 2. Population Relocated 02 Date ______ 03 Agency ______
04 Description:

01 [ ] 3. Other Remedial Activities 02 Date ______ 03 Agency ______
04 Description:

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

D1722

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION

01 State	02 Site Number
NY	915025

II. ENFORCEMENT INFORMATION

01 Past Regulatory/Enforcement Action [ ] Yes [X] No

02 Description of Federal, State, Local Regulatory/Enforcement Action

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

D1722

6. ASSESSMENT OF DATA ADEQUACY AND RECOMMENDATIONS

Data regarding waste type and characteristics, soil contamination, and contamination migration remain inadequate for a complete site assessment. Of primary importance is that contaminants may be migrating along or infiltrating into the sewer line that transects the middle of the site. A Phase II study is recommended to further assess the contaminants on the site and to assess the possibility of migration.

Recommendations for the Phase II sampling program include the following:

- Collection of surface and subsurface soil samples, on and in the vicinity of the site;
- Collection of samples from manholes located upgradient and downgradient from the site and comparison with SPDES outfall monitoring results;
- Collection of samples along the outside of the sewer lines to assess the potential for migration along the line;
- Collection of groundwater samples from alongside the line using the monitoring wells; and
- Collection of sewer samples to identify possible contaminant loadings.

7. REFERENCES

Ecology and Environment, Inc., September 24, 1987, Site Inspection Logbook and Photologs, Buffalo, New York.

Empire Soils Investigations, Inc., 1980, Groundwater Contamination Study, DuPont, Orchard Park, New York.

Erie County Department of Environment and Planning, 1982, Hazardous Waste Site Profile, FMC Corporation, Buffalo, New York.

Evans, Joe, September 15, 1987, NYSDEC, personal communication, Olean, New York.

Farquar, James, NYSDEC, August 26, 1987, personal communication and review of NYSDEC file information on wetlands, significant habitats, and floodplains, Olean, New York.

Federal Emergency Management Agency, 1975, Flood Insurance Rate Map, Tonawanda, U.S. Department of Housing and Urban Development, Washington, D.C.

FMC Corporation, 1969, Buffalo Plant Soil Study, West Parcel of Land, Buffalo, New York.

FMC Corporation, 1983, In Plant Sewers and Outfall to Niagara River, Drawing No. B-13561, Buffalo, New York.

General Sciences Corporation, 1986, Graphical Exposure Modeling System (GEMS), Volume 3, Graphics and Geodata Handling, Prepared for USEPA Office of Pesticides and Toxic Substances Exposure Evaluation Division.

Interagency Task Force on Hazardous Wastes, March 1979, Draft Report on Erie and Niagara Counties, New York.

Knowles, G. D., and R. Tramontano, 1980, New York State Department of Environmental Conservation and New York State Department of Health, Hazardous Waste Disposal Sites Report.

Koszalka, Edward J., et al., United States Geological Survey, March 1985, Preliminary Evaluation of Chemical Migration to Groundwater and the Niagara River from Selected Waste Disposal Sites, Chicago, Illinois.

LaSala, A.M., 1968, Groundwater Resources in the Erie-Niagara Basin, New York State Conservation Department, Albany, New York.

Murtagh, W.J., 1976, The National Register of Historic Places, USDI National Park Service, Washington, D.C., with updates from the Federal Register in 1979, 1989, 1981, and 1982.

Niagara River Toxics Committee, October 1984, Report of the Niagara River Toxics Committee.

Sax, N.I., 1984, Dangerous Properties of Industrial Materials, 6th ed., Van Nostrand Reinhold Company, New York.

Snider, James R., 1977, East River Wetland Determination, Buffalo, New York.

United States Department of Agriculture, Soil Conservation Survey, 1986, Soil Survey of Erie County, 1986, published in cooperation with Cornell University, Ithaca, New York.

Whitney, John, USDA, SCS, August 25, 1987, personal communication, East Aurora, New York.

Wilding, J., October 18, 1978, personal communication, FMC Corporation, Resident Manager, letter to Joseph T. LaMarca, Project Engineer, Niagara Mohawk Power Corporation, Buffalo, New York.

Wise, Richard, December 14, 1988, personal communication, FMC Corporation, Buffalo, New York.

Yochum, Paul R., September 24, 1987, Manager, FMC Corporation, personal communication, Buffalo, New York.

APPENDIX A

PHOTOGRAPHIC RECORD

ecology and environment, inc.

PHOTOGRAPHIC RECORD

Client: New York State Department of Environmental Conservation E & E Job No.: ND-2021

Camera: Make Olympus OM-10 SN: 238746

Photographer: M. Sienkiewicz

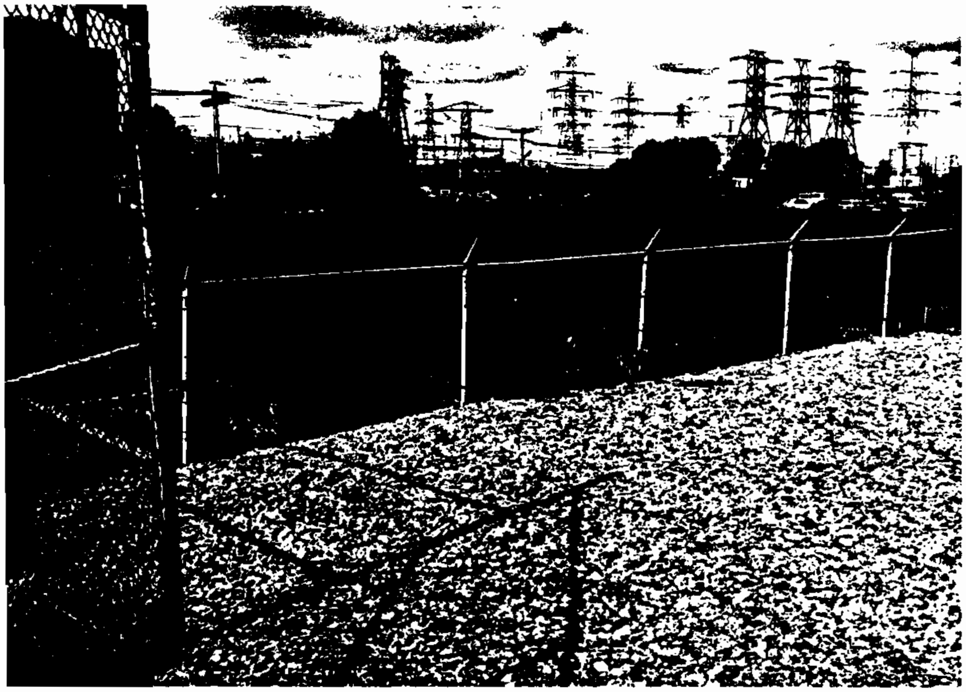
Date/Time: 9/24/87; 11:00

Lens: Type: 35-70 mm

SN: 301285

Frame No.: 1

Comments*: FMC site from the northwest.



Photographer: M. Sienkiewicz

Date/Time: 9/24/87; 11:00

Lens: Type: 35-70 mm

SN: 301285

Frame No.: 2

Comments*: Surface water in ditch at west end of site.

*Comments to include location

PHOTOGRAPHIC RECORD

Client: New York State Department of Environmental Conservation E & E Job No.: ND-2021

Camera: Make Olympus OM-10 SN: 238746

Photographer: M. Sienkiewicz

Date/Time: 9/24/87; 11:00

Lens: Type: 35-70 mm

SN: 301285

Frame No.: 3

Comments*: Site from southeast corner looking north.

Photographer: M. Sienkiewicz

Date/Time: 9/24/87; 11:00

Lens: Type: 35-70 mm

SN: 301285

Frame No.: 4

Comments*: Site from southeast corner looking north. Note sewer line manhole.

*Comments to include location

D1722

APPENDIX B

UPDATED NYSDEC INACTIVE HAZARDOUS WASTE SITE DISPOSAL SITE REGISTRY FORM

47-15-11 (10/83)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID AND HAZARDOUS WASTE

INACTIVE HAZARDOUS WASTE
DISPOSAL SITE REPORT

Priority Code: 2a   Site Code: 915025

Name of Site: FMC Corporation - Chemical Division   Region: 9

Street Address: 34 Sawyer Avenue

Town/City: Tonawanda   County: Erie

Name of Current Owner of Site: Paul R. Yochum - Manager

Address of Current Owner of Site: Box 845, Buffalo, New York 14240

Type of Site: [ ] Open Dump [ ] Structure [ ] Lagoon
[X] Landfill [ ] Treatment Pond

Estimated Size: 1.0 acre(s)

Site Description:

Former waste disposal pits used by FMC from 1964 to 1976 for the disposal of 100 tons of persulfates, perborates, sodium carbonates, peroxide, hydrogen peroxide, and dipicolinic acid. Presently the site is used as an equipment storage lot.

Hazardous Waste Disposed: [ ] Confirmed [X] Suspected

Type and Quantity of Hazardous Wastes Disposed:

Type	Quantity (Pounds, Drums, Tons, Gallons)
Persulfates, perborates,	100 tons
peroxides, acids	

Time Period Site was Used for Hazardous Waste Disposal:

N/A, 19 64 To N/A, 19 76

Owner(s) During Period of Use: FMC Corporation

Site Operator During Period of Use: FMC Corporation

Address of Site Operator: 34 Sawyer Avenue, Tonawanda, New York

Analytical Data Available: ☐ Air ☐ Surface Water ☐ Groundwater
☒ Soil ☐ Sediment ☐ None

Contravention of Standards: ☐ Groundwater ☐ Drinking Water
☐ Surface Water ☐ Air

Soil Type: Odessa silty loam, compact clay

Depth to Groundwater Table: 35-54 feet

Legal Action: Type: None ☐ State ☐ Federal

Status: ☐ In Progress ☐ Completed

Remedial Action: ☐ Proposed ☐ Under Design
☐ In Progress ☐ Completed

Nature of Action:

Assessment of Environmental Problems:

Possible migration of contaminants from the site via sewer line.

Assessment of Health Problems:

None expected.

Person(s) Completing This Form:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION	NEW YORK STATE DEPARTMENT OF HEALTH
Name:	Name:
Title:	Title:
Name:	Name:
Title:	Title:
Date:	Date:

APPENDIX C

PHOTOCOPIED REFERENCES

FMC Corporation

Industrial Chemical Division
Box 845
Buffalo New York 14240
(716) 876-8300

October 18, 1978

FMC

Mr. Joseph T. LaMarca
Project Engineer
Niagara Mohawk Power Corporation
300 Erie Boulevard
Syracuse, New York 13202

Niagara Mohawk Coal Unloading Project
Land Purchase from FMC Corporation, dated June 14, 197

Dear Joe:

In June of 1977, negotiations were completed for sale by FMC Corporation of an 0.8 acre strip of land, approximately 30' wide along the westerly boundary of the FMC Plant property. This sale, executed at Niagara Mohawk's solicitation, provided needed clearance for your coal unloading expansion and modernization.

At that time an old abandoned disposal area existed at this edge of the FMC property which was pointed out to you and your people during site visits. Your surveyors, engineers, and field crew were aware of it and worked across it as a small segment extended onto your newly acquired property.

Since that time the disposal area has been covered over and graded with clay, the soil from recent trenchwork elsewhere on FMC land. This was done at the behest of a New York State Department of Environmental Conservation Team which inspected the area. They have subsequently re-inspected the area. The NYSDEC was informed of the transfer of the small portion of this disposal area to Niagara Mohawk.

You have just completed the property deal in this area with the construction of the prescribed fence line which, therefore, crosses this disposal area.

The disposal area, which as you know from your deep foundation excavation, is in a clay type deposit. It had not been used recently. It had earlier been used to receive trash - including some fibre and metal drums, wooden pallets and cardboard, as well as plant floor sweepings which constituted scrap and spillage from the plant processes. The chemicals being produced at this location are peroxygen materials - ammonium, potassium and sodium persulfate sodium perborate; calcium and zinc peroxide; peracetic acid; and, in the past dipicolinic acid, this latter used in small quantities as a reagent in the other chemicals. Over a period of time the peroxygen value of these chemicals degrades leaving simple salts.

It is FMC's understanding that the grading for the realigned track spur may extend over your portion of this former disposal area. It is assumed that you will continue to use good engineering practices in this area, and will suitably comply with the Agreement of Purchase which calls for, under Section 2e "Be responsible for final grade and restore paved surfaces".

Yours truly,

J. Wilding
Resident Manager

jdh

INTERVIEW ACKNOWLEDGEMENT FORM

SITE NAME : George Schreiber
E.I. DuPont Company
FMC Corp.-Chem. Division

PERSON CONTACTED : Joe Evans

AFFILIATION : NYSDEC-Div. of Fish and Wildlife

ADDRESS : 128 South St., Olean, NY

TYPE OF CONTACT : Telephone

I.D. NUMBER : 915112
915019
915025

DATE : September 15,

PHONE NUMBER : 716-372-0888

CONTACT PERSON(S) : Gene Florentin

INTERVIEW SUMMARY

Requested the following Stream Information:

Hampton Brook

- The entire creek is Class B.
- There is very little fisheries information because the brook is small and the upper section seasonally dries up.
- There is no stocking.

Eighteen Mile Creek

- Class A off the junction of Hampton Brook.
- Stocked with salmon and trout downstream of the water intake Dam in Hamburg, therefore they cannot migrate Upstream or into Hampton Brook.
- Also contains natural small mouth bass and many other small fish.

Niagara River and Tonawanda Channel

- Entire river is Class A and a natural reproduction area for many fish.
- It is not stocked, however, Lake Erie is stocked with salmon and trout and they migrate into the river.

ACKNOWLEDGEMENT

I have read the above transcript and I agree that it is an accurate summary of the information verbally conveyed to Ecology and Environment, Inc. interviewer(s) (as revised below, if necessary).

Revisions (please write in any corrections needed to above transcript)

Signature:

Date:

SUBSURFACE EXPLORATION
SOIL
AND
CONCRETE
TESTING

MEMBER AMERICAN SOCIETY FOR TESTING & MATERIALS

EMPIRE SOILS INVESTIGATIONS, INC.
GROTON • BUFFALO • ROCHESTER • SYRACUSE • ALBANY
BUFFALO AREA OFFICE:
S-3858 SHELDON ROAD / P. O. BOX 229, ORCHARD PARK, NEW YORK 14127
AREA CODE 716 649-8110

9-3

January 8, 1980

E.I. DuPont DeNemours & Co.
Yerkes Plant, Station B - Drawer L
Buffalo, New York 14207

Gentlemen:

The following report is an accumulation of the data accumulated from permeability tests performed on undisturbed samples from Borings B-3D, B-4D amd B-7D with reference to the DuPont Ground Water Contamination Study.

The actual undisturbed shelby tube samples were retrieved during the site investigation portion of our work, performed in August of 1979. All samples were extracted from the tubes and subjected to visual classification, natural water content, unit weight and permeability. The permeability tests were all performed at two individual differential heads of 5 and 10 PSI respectively. All test results are indicated on the attached data sheets.

If you have any further questions or if we can assist you in any way, do not hesitate to contact us at any time.

Very truly yours,

EMPIRE SOILS INVESTIGATIONS, INC.

Stanley J. Blas Jr.

Stanley J. Blas, Jr.
Soils and Materials Engineer
Director of Testing Services

SJB/gel

CONSTANT HEAD PERMEABILITY TEST
WITH BACKPRESSURE SATURATION

PROJECT: GROUND WATER CONTAMINATION STUDY, DUPONT
SAMPLE: BORING B-70, Sample 16, 30.0' to 32.0'.

Sample Data:

Height:	10.37 cm
Diameter:	7.30 cm
Dry Unit Weight:	90.1 pcf
Moisture Content before Test:	32.3 %
Moisture Content after Test:	32.6 %
Back Pressure:	50 & 45 psi
Cell Confining Pressure:	77 psi

Test Data:

Differential Head, psi	5	10
Coefficient of Permeability cm/sec.:	1.16×10^{-8}	1.08×10^{-8}

Note: TRACE AMOUNT OF FINE GRAVEL OR COARSE SAND EMBEDDED IN THE SOIL CAUSED SCORING OF SPECIMEN SURFACE. TO PREVENT SEEPAGE THROUGH SCORES PERMEABILITY TEST WAS PERFORMED IN THE TRIAXIAL CELL.

CONSTANT HEAD PERMEABILITY TEST
WITH BACKPRESSURE SATURATION

PROJECT: GROUND WATER CONTAMINATION STUDY, DUPONT

SAMPLE: BORING B-4D, SAMPLE 16, 30.0' to 32.0'

Sample Data:

Height: 14.61 cm

Diameter: 7.30 cm

Dry Unit Weight: 105.6 pcf

Moisture Content before Test: 21.7 %

Moisture Content after Test: 21.2 %

Back Pressure: 50 & 45 psi

Cell Confining Pressure: 77 psi

Test Data:

Differential Head, psi	5	10
Coefficient of Permeability cm/sec.:	1.59×10^{-8}	1.54×10^{-8}

Note: TRACE AMOUNT OF FINE GRAVEL OR COARSE SAND EMBEDDED IN THE SOIL CAUSED SCORING OF SPECIMEN SURFACE. FOR THIS REASON PERMEABILITY TEST HAD TO BE PERFORMED IN A TRIAXIAL CELL.

CONSTANT HEAD PERMEABILITY TEST
WITH BACKPRESSURE SATURATION

PROJECT: GROUND WATER CONTAMINATION STUDY, DUPONT
SAMPLE: BORING 8-3D, Sample 16, 30.0' to 32.0'

Sample Data:

Height:	6.83 cm
Diameter:	7.11 cm
Dry Unit Weight:	107.1 pcf
Moisture Content before Test:	21.6 %
Moisture Content after Test:	21.2 %
Back Pressure:	50 & 45 psi
Cell Confining Pressure:	77 psi

Test Data:

Differential Head, psi	5	10
Coefficient of Permeability cm/sec.:	1.56×10^{-8}	1.60×10^{-8}

Note: TRACE AMOUNT OF FINE GRAVEL OR COARSE SAND EMBEDDED IN THE SOIL CAUSED SCORING OF SPECIMEN SURFACE. TO PREVENT SEEPAGE THROUGH SCORES PERMEABILITY TEST WAS PERFORMED IN THE TRIAXIAL CELL.

CONSTANT HEAD PERMEABILITY TEST
WITH BACKPRESSURE SATURATION

PROJECT: GROUND WATER CONTAMINATION STUDY, DUPONT
SAMPLE: BORING 8-3D, Sample 16, 30.0' to 32.0'

Sample Data:

Height: 6.83 cm
Diameter: 7.11 cm
Dry Unit Weight: 107.1 pcf
Moisture Content before Test: 21.6 %
Moisture Content after Test: 21.2 %
Back Pressure: 50 & 45 psi
Cell Confining Pressure: 77 psi

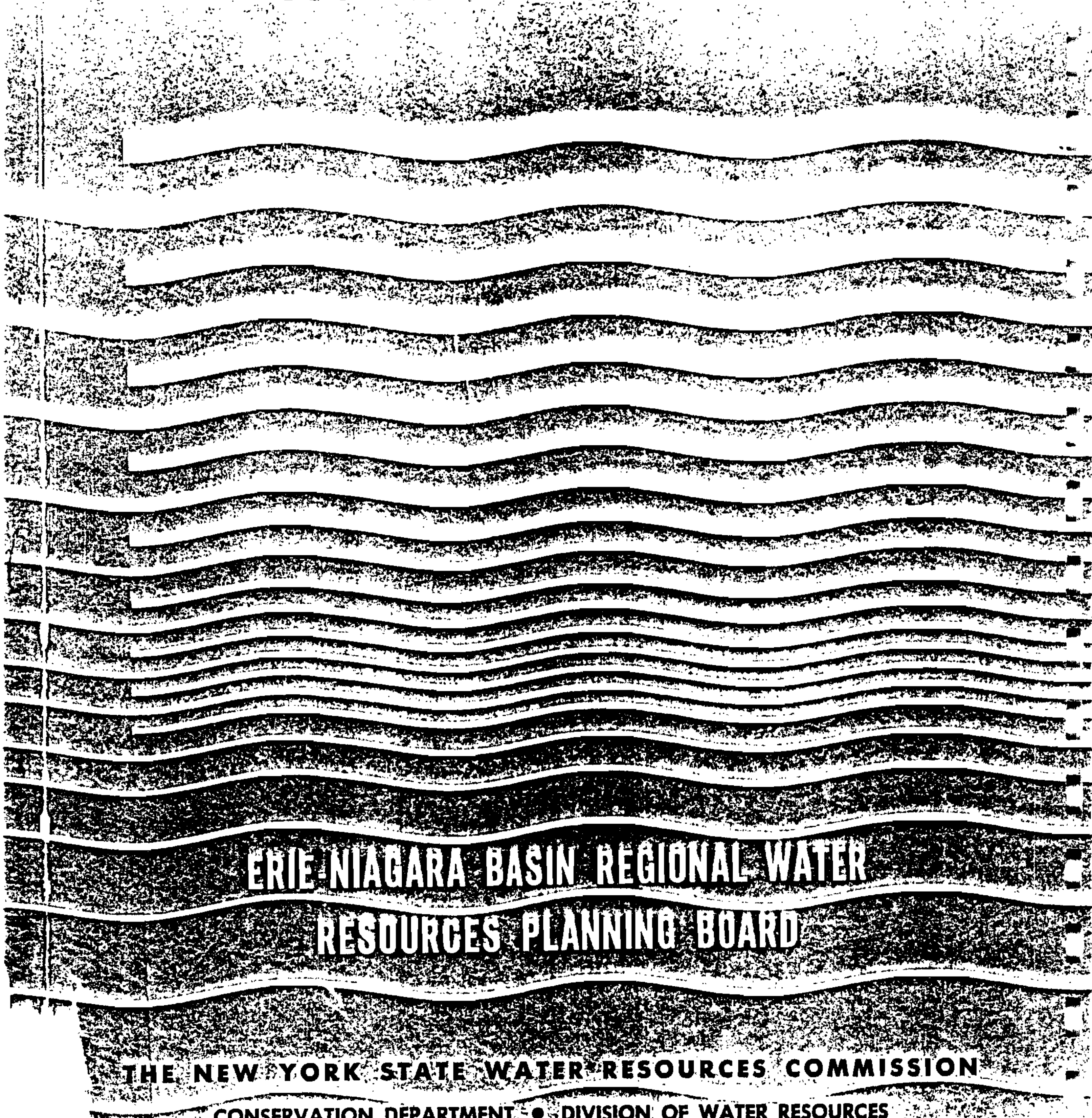
Test Data:

Differential Head, psi	5	10
Coefficient of Permeability cm/sec.:	1.56×10^{-8}	1.60×10^{-8}

Note: TRACE AMOUNT OF FINE GRAVEL OR COARSE SAND EMBEDDED IN THE SOIL CAUSED SCORING OF SPECIMEN SURFACE. TO PREVENT SEEPAGE THROUGH SCORES PERMEABILITY TEST WAS PERFORMED IN THE TRIAXIAL CELL.

Erie-Niagara Basin

Ground-Water Resources



ERIE-NIAGARA BASIN REGIONAL WATER
RESOURCES PLANNING BOARD

THE NEW YORK STATE WATER RESOURCES COMMISSION

CONSERVATION DEPARTMENT • DIVISION OF WATER RESOURCES

GROUND-WATER RESOURCES OF THE ERIE-NIAGARA BASIN, NEW YORK

Prepared for the
Erie-Niagara Basin Regional Water Resources
Planning Board

by

A. M. La Sala, Jr.

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
in cooperation with
THE NEW YORK STATE CONSERVATION DEPARTMENT
DIVISION OF WATER RESOURCES

STATE OF NEW YORK
CONSERVATION DEPARTMENT
WATER RESOURCES COMMISSION

Basin Planning Report ENB-3

1968 C-11

CONTENTS

CONTENTS (Continued)

recycled paper ecology and environment

47-15-11(2/80)

HAZARDOUS WASTE DISPOSAL SITES REPORT
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Code: ~~D~~ E
Site Code: 915025
Name of Site: FMC Corp.-Chemical Division Region: 9
County: Erie Town/City Tonawanda
Street Address: 34 Sawyer Ave.

Status of Site Narrative:

Waste disposal pits have been properly closed.

Type of Site: Open Dump ☐ Landfill ☐ Structure ☐ Treatment Pond(s) ☐ Lagoon(s) ☐ Pits ☒
Number of Ponds ____
Number of Lagoons ____
Number of pits 4
Estimated Size ____ Acres

Hazardous Wastes Disposed? Confirmed ☐ Suspected ☒

*Type and Quantity of Hazardous Wastes:

TYPE	QUANTITY (Pounds, drums, tons, gallons)
Persulfates, perborates	
sodium carbonate peroxide	100 tons total
hydrogen peroxide, peracetic acid,	
calcium & zinc peroxide, magnesium,	
urea, pyrophosphate, diplcolinic acid	

*Use additional sheets if more space is needed.

47-15-11(2/80)

Name of Current Owner of Site: FMC Corp.
Address of Current Owner of Site: ______

Time Period Site Was Used for Hazardous Waste Disposal:
______, 19 64 To ______, 19 76

Is site Active ☐ Inactive ☒
(Site is inactive if hazardous wastes were disposed of at this site and site was closed prior to August 25, 1979)

Types of Samples: Air ☐ Groundwater ☐ None ☒
Surface Water ☐ Soil ☐

Remedial Action: Proposed ☐ Under Design ☐
In Progress ☐ Completed ☒
Nature of Action: Capping

Status of Legal Action: ______ State ☐ Federal ☐

Permits Issued: Federal ☐ Local Government ☐ SPDES ☐
Solid Waste ☐ Mined Land ☐ Wetlands ☐ Other ☐

Assessment of Environmental Problems:

Continued monitoring required to confirm effective closure.

Assessment of Health Problems:

Unknown.

Persons Completing this Form:

G. D. Knowles	Ronald Tramontano
New York State Department of Environmental Conservation	New York State Department of Health
Date April 15, 1980	Date April 15, 1980

1/18/80
GDK:cl

recycled paper

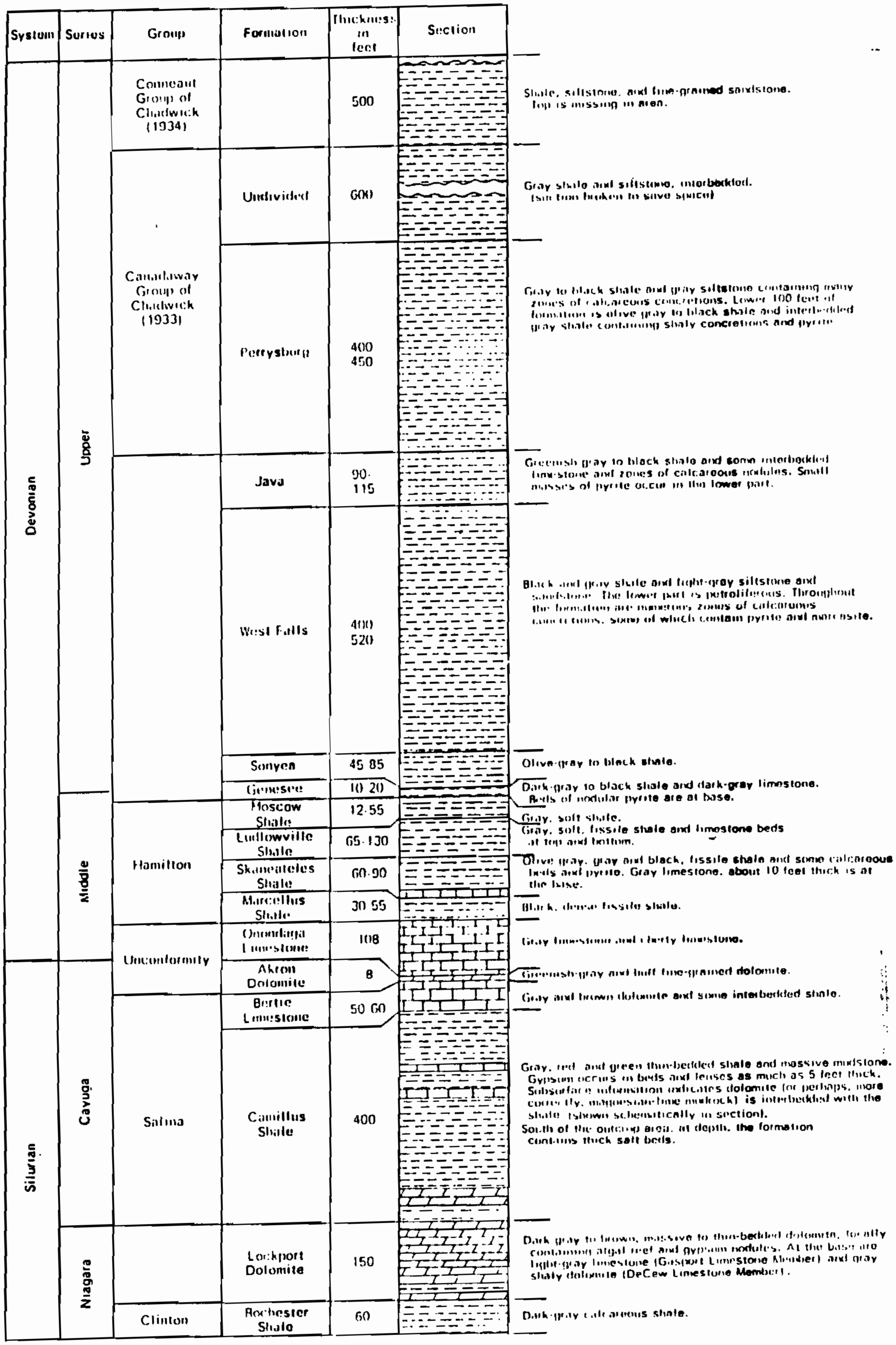
GEOLOGY AND TOPOGRAPHY

The Erie-Niagara basin is underlain by layers of sedimentary bedrock which are largely covered with unconsolidated deposits. Descriptions of the various bedrock units are given in figure 2. The bedrock consists mainly of shale, limestone, and dolomite; the Camillus Shale contains a large amount of interbedded gypsum. All the bedrock units were built up by fine-grained sediments deposited in ancient seas during the Silurian and Devonian Periods and, therefore, are bedded or layered. The dip of the rocks (inclination of the bedding planes) is gently southward at from 20 to 60 feet per mile, but the average dip is between 30 and 40 feet per mile. The dip is so gentle that it is hardly perceptible in outcrops.

The unconsolidated deposits are mostly glacial deposits formed during Pleistocene time about 10,000-15,000 years ago when an ice sheet covered the area. The glacial deposits consist of: (1) till, which is a nonsorted mixture of clay, silt, sand, and stones deposited directly from the ice sheet; (2) lake deposits, which are bedded clay, silt, and sand that settled out in lakes fed by the melting ice; and (3) sand and gravel deposits, which were laid down in glacial streams. The glacial sand and gravel deposits are of both the ice-contact and outwash types, as will be explained later in the report. The glacial deposits generally are less than 50 feet thick in the northern part of the basin. They are considerably thicker in some valleys in the southern part and reach a maximum known thickness of 600 feet near Chaffee. Other unconsolidated deposits are alluvium formed by streams in Recent times and swamp deposits formed by accumulation of decayed plant matter in poorly drained areas.

Relief of the present land surface is due to preglacial erosion of the bedrock and subsequent topographic modification by glaciation. In contrast to the southward dip of the rocks, the land surface rises to the south largely because preglacial erosion was more vigorous in the northern part of the basin. The shale in the southern part of the basin is somewhat more resistant to erosion than the rocks in the northern part of the basin but not significantly so. Figure 3 shows the relationship of the topography and rock structure and delineates the two topographic provinces of the basin: the Erie-Ontario Lowlands and the Appalachian Uplands. The rocks crop out in belts which trend generally east-west. The bedrock geologic map, plate 2, shows that the outcrop belts bend around to the southwest near Lake Erie. They assume this direction mainly because relatively intense erosion in the Erie-Ontario Lowland near Lake Erie has exposed the rock at lower elevations than farther east. The Lockport Dolomite and the Onondaga Limestone, because they are relatively resistant to erosion, form low ridges in the northern part of the basin. Tonawanda, Murder, and Ellicott Creeks descend the escarpment of the Onondaga at falls and cataracts.

In the hilly southern half of the basin (the Appalachian Uplands), preglacial valleys, deepened by glacial erosion, are cut into the shale. The valleys are partly filled with glacial deposits so that some of the present streams flow 200 to 600 feet above the bedrock floors of the valleys as shown in figure 3.



System	Series	Group	Formation	Thickness in feet	Section	
Devonian	Upper	Conneaut Group of Chadwick (1934)		500		Shale, siltstone, and fine-grained sandstone. Top is missing in area.
		Canadaway Group of Chadwick (1933)	Undivided	600		Gray shale and siltstone, interbedded. (Section broken to save space)
			Perrysburg	400 450		Gray to black shale and gray siltstone containing many zones of calcareous concretions. Lower 100 feet of formation is olive gray to black shale and interbedded gray shale containing shaly concretions and pyrite
			Java	90- 115		Greenish gray to black shale and some interbedded limestone and zones of calcareous nodules. Small masses of pyrite occur in the lower part.
			West Falls	400 520		Black and gray shale and light-gray siltstone and sandstone. The lower part is petroliferous. Throughout the formation are numerous zones of calcareous concretions, some of which contain pyrite and marcasite.
			Sonyea	45-85		Olive-gray to black shale.
			Genesee	10-20		Dark-gray to black shale and dark-gray limestone. Beds of nodular pyrite are at base.
	Middle	Hamilton	Moscow Shale	12-55		Gray, soft shale.
			Ludlowville Shale	65-130		Gray, soft, fissile shale and limestone beds at top and bottom.
			Skaneateles Shale	60-90		Olive gray, gray and black, fissile shale and some calcareous beds and pyrite. Gray limestone, about 10 feet thick is at the base.
			Marcellus Shale	30-55		Black, dense fissile shale.
		Unconformity	Onondaga Limestone	108		Gray limestone and cherty limestone.
Silurian	Cayuga		Akron Dolomite	8		Greenish-gray and buff fine-grained dolomite.
		Salina	Bertie Limestone	50-60		Gray and brown dolomite and some interbedded shale.
			Camillus Shale	400		Gray, red, and green thin-bedded shale and massive mudstone. Gypsum occurs in beds and lenses as much as 5 feet thick. Subsurface information indicates dolomite (or perhaps, more correctly, magnesian-lime mudrock) is interbedded with the shale (shown schematically in section). South of the outcrop area, at depth, the formation contains thick salt beds.
	Niagara		Lockport Dolomite	150		Dark gray to brown, massive to thin-bedded dolomite, locally containing algal reef and gypsum nodules. At the base are light-gray limestone (Gasport Limestone Member) and gray shaly dolomite (DeCew Limestone Member).
		Clinton	Rochester Shale	60		Dark-gray calcareous shale.

Figure 2.--Bedrock units of the Erie-Niagara basin.

Many domestic-supply wells penetrate from 1 foot to a few feet into the soluble rocks and produce small but adequate yields. On the other hand, industrial wells that were intended to produce large supplies of water give a truer picture of the water-supply potential of the rocks. Data on industrial wells show that the Camillus Shale will yield as much as 1,200 gpm and the limestone unit as much as 300 gpm and probably more. But the data also show that the rocks produce low yields at places. This is shown by such wells as 301-848-1 which was drilled to obtain a large supply for an industry but which yielded only 30 gpm. The water-bearing zones obviously are unevenly distributed through the rocks. Factors that control the occurrence of the water-bearing zones cannot be evaluated at the present time to the extent necessary to predict exactly where the zones occur.

The Lockport Dolomite is the least productive unit of the soluble rocks. Within the Erie-Niagara basin yields of wells in the Lockport range from about 4 to 90 gpm. Depth of the wells range from 20 to 70 feet. Most of the deeper wells were drilled where the depth to bedrock is greatest. Domestic-supply wells generally are finished in the fracture zone at the rock surface or in a bedding joint within the uppermost 30 feet of the rock. It is usually not necessary to drill deeper into the Lockport if only a small supply is needed.

Drilling deeper in an attempt to intersect additional bedding-plane openings at depth would provide higher yields but, generally, at the expense of lower water levels and therefore higher pump lifts. Johnston (1964) collected data on a much larger number of wells along the outcrop belt of the Lockport Dolomite than were inventoried in the Erie-Niagara basin. He found that wells drawing water from the lower 40 feet of the Lockport (the northern part of the outcrop area) yield from 1/2 to 20 gpm and have an average yield of 7 gpm. Wells finished in the upper part of the Lockport (the southern part of the outcrop area) yield from 2 to 110 gpm and have an average yield of 31 gpm. Yields of as much as 50 or 100 gpm are possible from the Lockport in the Erie-Niagara basin but would be exceptional.

CAMILLUS SHALE

Bedding and lithology

The Camillus Shale lies above the Lockport Dolomite and crops out to the south of where the dolomite is exposed. Exposures of the Camillus Shale are rare in the Erie-Niagara basin because of the low relief of the outcrop area and the cover of glacial deposits. Geologists who have studied the Camillus in the study basin agree that it consists mostly of gray shale. (For example, see Buehler and Tesmer, 1963, p. 29-30.) Subsurface data, on the other hand, indicate that a considerable amount of gray limestone and dolomite is interbedded with the shale. Along with these carbonates, gypsum comprises a significant part of the Camillus Shale. Some of the gypsum beds are as much as 5 feet thick. Gypsum also occurs in the Camillus as thin lenses and veins. Table 1,

Table 1.--Log of a gypsum-mine slope near Clarence Center

(Site 300-839-A)

Log	Depth below land surface (feet)
Topsoil, subsoil, gravel and clay	0-25.5
Soft gray limestone mixed with clay	25.5-27.5
Soft dark-gray limestone	27.5-29.5
Soft shaly limestone, thin bedded	29.5-38.0
Crushed dark-gray limestone interbedded with 2-inch seams of brown limestone	38.0-40.8
Dark-gray limestone interbedded with seams of gypsum 1 1/2 to 3 inches thick	40.8-43.6
Hard gray limestone interbedded with thin streaks of gypsum 1/8 to 1/2 inch thick	43.6-45.1
Soft gray limestone	45.1-49.1
Hard gray limestone interbedded with thin streaks of gypsum	49.1-52.1
Hard gray limestone	52.1-57.6
Gypsum	57.6-58.3
Brown limestone	58.3-59.3
Gray limestone	59.3-61.3
Soft, crumbly green-gray material (shale)	61.3-64.3
Mottled rock rich in gypsum	64.3-65.1
Soft brown limestone	65.1-65.7
Cap rock -- hard dark-gray limestone	65.7-66.8
Soft shaly material	66.8-66.9
Gypsum	66.9-71.4

which is a log compiled during construction of a mine slope, illustrates the occurrence of gypsum and the predominance of carbonate rocks in some parts of the Camillus.

Though the Camillus dips southward at approximately 40 feet to the mile, the dip is not uniform. Gypsum miners say the formation "rolls," to describe the gentle folding of its beds. The formation is marked by broad, low folds with amplitudes of a few feet and spacings of a few hundred feet between crests. The fold axes generally are east-west.

Water-bearing openings

The extensive beds of gypsum make the Camillus Shale unique among the shale formations of the basin. The importance of the gypsum lies in its solubility; gypsum is far more soluble than the enclosing rocks, whether shale, dolomite, or limestone. Where gypsum has been dissolved, openings exist for the passage and storage of water.

The effect of the solution of gypsum on the water-bearing properties of the Camillus Shale (and other rocks) can be readily appreciated. Where the topmost beds of the Camillus crop out at the base of the falls of Murder Creek at Akron, the Camillus seems to be an impermeable shale. If one judged the water-bearing properties of the Camillus on the basis of this outcrop alone, he would be wrong. Yields of water wells and drainage into gypsum mines prove that large volumes of water do move through the Camillus.

Clues to the nature of the water-bearing openings in the Camillus can be obtained by considering some of the circumstances where large volumes of water were obtained. About 1885, the Buffalo Cement Company located a 4-foot thick bed of gypsum only 43 feet below land surface by test drilling in Buffalo on Main Street near Williamsville. A shaft was sunk with the intention of beginning a subsurface mining operation, but when the gypsum was struck the shaft was flooded with ground water. The report is that "..... a pump with a capacity of 2,000 gallons per minute failed to make any impression upon it [the water] and the attempt was abandoned" (Newland and Leighton, 1920, 209-210).

In 1964, a gypsum mine near Clarence Center received an unexpected inflow of ground water. Several hundred gallons of water per minute continuously enters the mine at a place about midway down the entry slope. This water is pumped out by a drainage system diagrammatically shown in figure 6. Ordinarily, only small seeps occur in the remainder of the mine from roof bolts and small cracks in the roof. At a distance of more than a mile from the entry slope, the working face intersected an unplugged drill hole. Water poured into the mine at an alarming rate until the hole was plugged with much effort.

Large-yield wells, such as those at Tonawanda and North Tonawanda, obtain water from thin intervals of gypsum-bearing rock. The gypsum in the Camillus Shale obviously is related to the occurrence of large quantities of water. Gypsum is a highly soluble mineral and is

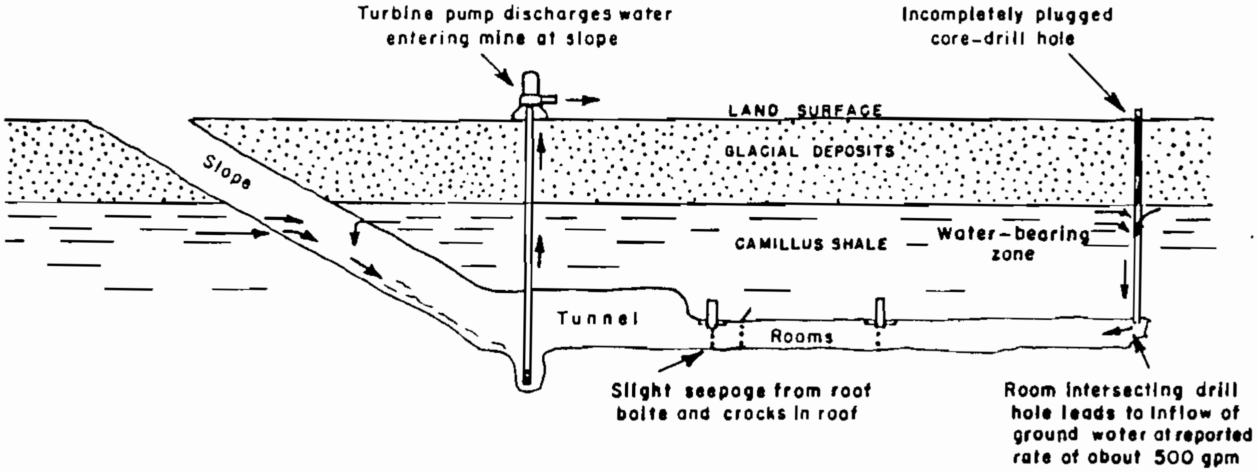


Figure 6.--Occurrence of ground water in the Camillus Shale at a gypsum mine near Clarence Center.

dissolved by circulating ground water faster than are the enclosing rocks. Very likely the openings in the Camillus that yield copious amounts of water were formed by the solution of gypsum by ground water. The water-bearing zones are mainly horizontal because most of the gypsum occurs in horizontal beds and thin zones of gypsiferous shale and dolomite. Only those gypsum zones actually exposed to circulating ground water can be widened by solution. The gypsum must be in contact with an open fracture through which the water can move. If no open fracture exists, the gypsum cannot be dissolved. The occurrence of ground water at the gypsum mine shown in figure 6 is a further illustration. The 4 1/2-foot thick bed that is mined at a depth of 66.9 feet (table 1) is dry because of the lack of vertical fractures to transmit water to it.

The solution-widened water-bearing zones occur at various depths and stratigraphic horizons in the Camillus. The existence of such zones is borne out by well data. For instance, wells 303-850-1 and -2 are 90 feet apart and obtain water from the same 2- to 3-foot thick zone at a depth of 67 to 68 feet. Such zones may be continuous for as much as 1 or 2 miles but information is not available on the extent of individual zones. The gypsum occurs principally in lenticular beds. The thicker beds may be 3 or 4 miles in lateral extent. The thinner beds can be expected to be much smaller in extent.

A zone of fracturing and solution extending several feet below the rock surface yields relatively small but sufficient water supplies for domestic use. This zone appears to be present throughout the area and is unrelated to stratigraphic position.

Hydrologic and hydraulic characteristics

The Camillus Shale forms a low topographic trough split down the axis by Tonawanda Creek. Ground water that enters the formation discharges mainly to the creek. Little water is discharged to the small, barely incised streams on the Camillus. These streams are dry much of the year.

Coefficients of transmissibility given in table 2 were computed for the Camillus Shale on the basis of specific capacities of wells penetrating a considerable thickness of the aquifer, by the method described by Walton (1962, p. 12-13).

Table 2.--Specific-capacity tests of wells finished in the Camillus Shale

Well number	Pumping rate (gpm)	Duration of pumping (hours) e: estimated	Drawdown (feet)	Specific capacity (gpm/ft)	Coefficient of transmissibility (gpd/ft)
a/ 258-853-1	1,090	e8	53	21	40,000
-2	90	--	22	4	7,000
258-855-1	500	e8	17	29	55,000
-2	1,000	e8	26	38	70,000
-3	1,500	e8	38	39	70,000
303-850-1	700	24	10	70	--
-2	660	e8	8	83	--

a/ Well also penetrates water-bearing zone in Lockport Dolomite.

The large specific capacities of wells 303-850-1 and -2 probably result in part from recharge induced from Sawyer Creek. Measurements of recovery of water levels in well 303-850-1 were made when well 303-850-2 was shut down after a year of continuous pumping. From these data, a coefficient of transmissibility of about 80,000 per foot and a coefficient of storage of 0.025 were computed. The computed transmissibility is about half the transmissibility that would have been indicated from specific capacity if recharge were not induced from Sawyer Creek.

Yields of wells

The Camillus Shale is by far the most productive bedrock aquifer in the area. Except in the vicinity of Buffalo and Tonawanda, where industrial wells produce from 300 to 1,200 gpm, no attempt has been made to obtain large supplies from the formation. However, the inflow of water to gypsum mines near Clarence Center and Akron indicate that large supplies are not necessarily restricted to the Buffalo and the Tonawanda area. Two examples of large flows of water encountered in gypsum mining have already been mentioned. Pumpage from gypsum mines near Clarence Center (including the mine mentioned previously) is substantial. The water pumped is discharged to Got Creek. On July 2, 1963, the creek had a flow of 2.1 mgd (million gallons per day) about half a mile downstream from the mines, that was due almost entirely to the pumpage. Water for industrial use is pumped from a flooded, abandoned gypsum mine at Akron. This pumpage, at a rate of 500 to 700 gpm, has had no appreciable effect on the water level in the mine.

Probably the larger solution openings are most common in discharge areas near Tonawanda Creek and its tributaries and near the Niagara River; the flow of ground water becomes concentrated as it approaches the streams to which it discharges. Other discharge areas, such as low-lying swampy areas and headwaters of small streams that have perennial flow, are likely places to drill wells.

LIMESTONE UNIT

Bedding and lithology

The term "limestone unit" in this report is applied to a sequence of limestone and dolomite overlying the Camillus Shale. The limestone unit includes the Bertie Limestone at the base, the Akron Dolomite, and the Onondaga Limestone at the top. The lithology and thickness of these units are shown in figure 7. The Bertie Limestone and the Akron Dolomite are Silurian in age and are separated from the overlying Onondaga Limestone of Devonian age by an unconformity or erosional contact.

The Bertie Limestone is mainly dolomite and dolomitic limestone but contains interbedded shale particularly in the thin-bedded lower part of the formation. The middle part is brown, massive dolomite, and the upper part is gray dolomite and shale whose beds are of variable thickness. The total thickness of the formation is about 55 feet (Buehler and Tesmer, 1963, p. 30-31).

The Akron Dolomite is composed of greenish-gray and buff dolomite beds varying from a few inches to about a foot in thickness. The upper contact of the Akron is erosional and is often marked by remnants of shallow stream channels. Thin lenses of sandy sediments lie in the bottoms of some channels. The thickness of the formation is generally between 7 and 9 feet (Buehler and Tesmer, 1963, p. 33-34).

OCCURRENCE OF WATER IN UNCONSOLIDATED DEPOSITS

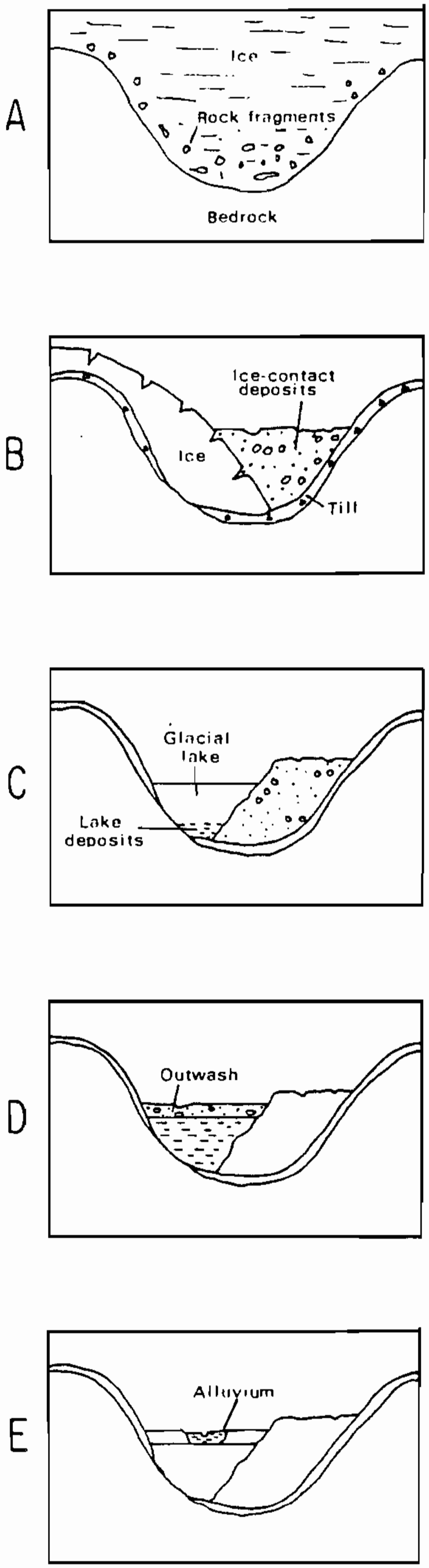
The unconsolidated deposits overlie the bedrock units previously discussed and consist of a variety of granular material. The bulk of the unconsolidated deposits are glacial in origin and include till, lake deposits, and sand and gravel deposits. The materials laid down since glaciation are thin and consist of alluvium and swamp deposits.

The deposits vary in their hydrologic characteristics because of differences in their lithology and thickness and because of their distribution and spatial relationships to one another. Plate 3 is a geologic map showing the division of the unconsolidated deposits into several groups on the basis of their origin. The distribution of these groups at the surface is readily apparent from the map. An understanding of the geologic processes that formed the deposits allows their subsurface distribution to be inferred. The map, therefore, can be read in three dimensions through proper interpretation.

An explanation of the origin and general features of the several types of deposits is given in figure 8. When the ice sheet advanced over the area, the ice tore and abraded the bedrock surface. The hills were somewhat reduced and rounded and the valleys were deepened. Some of the rock material eroded from the bedrock was redeposited by the ice and forms the poorly sorted mantle material that is called till (fig. 8A). Eventually, the ice began to wane with a change in climate. As the amount of snow nourishing it decreased, the ice sheet thinned. It had difficulty maintaining flow over rough topography along its marginal zone. The margin became scalloped, and some marginal zones grew so thin that they stagnated. These zones separated from the ice sheet and wasted away in place.

The sequence of deposition in an upland valley during retreat generally followed a particular order. A temporary valley was formed between the wasting ice and the rock wall of the valley. Melt water from the ice sheet, which at times of rapid melting was released in enormous quantities, flowed through the valley away from the retreating ice sheet. The melt water carried a heavy load of sediment washed out of the ice. It deposited sediment, mainly sand and gravel, and began to fill up the valley. This type of sand and gravel deposit is an ice-contact deposit (fig. 8B). In southward drained valleys, ice-contact deposits could form at low levels, even in the valley bottoms. In northward drained valleys, because of the divide to the south, the ice-contact deposits could form only high on the sides of the valley above the level of melt-water lakes impounded to the level of the spillway over the divides.

As the ice sheet melted back, a lower outlet for the melt water was uncovered. The melt-water stream was diverted from the ice-contact deposit. As the stagnant ice mass bordering the ice-contact deposits continued to melt away, the sand and gravel held up by the ice mass subsided toward the center of the valley. A lake formed in the open area left by the ice as it melted (fig. 8C). In a southward drained valley, the lake would be caused by a dam of earlier glacial deposits across the valley, perhaps part of the ice-contact deposits. In a northward drained valley, the lake would be formed between the divide to the south and the ice sheet to the north. Fine-grained sediments (clay, silt, and fine sand) settled out



Ice advances over area and gathers load by eroding bedrock. Later, at the base of the ice, rock fragments are deposited to form till. (See B)

Ice begins to melt. Sand and gravel (ice-contact) deposits are laid down in a temporary valley between ice and valley wall.

Stagnant ice melts. Ice-contact deposits slope toward center of valley. A glacial lake forms in which clay and silt accumulate.

Glacial lake is filled with sediment or is drained. Glacial streams flow over surface of lake deposits and lay down sand and gravel deposits.

Recent stream cuts into glacial deposits and lays down alluvium consisting of silt, sand and gravel.

Figure 8.--Origin of unconsolidated deposits.

in the lake and gradually filled it (fig. 8D).

Eventually the lake deposits built up to the threshold of the dam, or the dam was cut away by the water spilling over it, or the ice sheet retreated northward opening up the valley. Streams could then flow over the surface of the lake deposits and lay down a second sand and gravel deposit, an outwash deposit (fig. 8D). The sources of the stream waters were the wasting ice sheet (particularly so in southward drained valleys), small masses of wasting ice remaining in tributary valleys, and precipitation. The thickest and most extensive outwash deposits were formed in southward drained valleys and in zones peripheral to the ice sheet. With time, the ice sheet retreated still farther northward, the glacial streams ceased to flow, and glacial deposition came to an end.

As the ice sheet retreated farther north, the climate more nearly approached that of the present. A drainage system developed in response to precipitation. Streams began to incise channels into the deposits. Vegetation took hold as the weather warmed and helped stabilize the slopes. In time, with a change in regimen, the streams began to lay down alluvium (fig. 8E).

The sequence of events discussed above and shown in figure 8 is generalized. Nevertheless, it is useful in understanding the occurrence of the unconsolidated deposits, particularly in valley areas where they constitute an important source of ground water. In the following sections the lithology and water-bearing characteristics of each of the major types of deposits in the Erie-Niagara basin will be discussed.

TILL

As shown in plate 3, till is the most widespread of all the unconsolidated deposits in the Erie-Niagara basin. Till is essentially a nonsorted material whose character depends principally upon the types of rocks over which the ice passed and the vigor with which the ice crushed and abraded the rock. Till overlying the shale is dark gray and clayey or silty. In some areas, mainly on hillsides and terraces south of Cattaraugus Creek, part of the till is stony material. Till on the soluble rocks is light red and silty; in some morainic ridges it is mostly fine sand.

Thickness of the till varies considerably from a thin cover of 2 or 3 feet to more than 200 feet along the divides between Cattaraugus Creek and the northwestward flowing streams, such as Tonawanda, Buffalo, and Eighteenmile Creeks. On flat terraces mapped as till in Buttermilk Creek valley, the stony till is as much as 30 feet thick.

Only small supplies of water are available from till. The permeability of till is so small that wells with large wall areas are required to obtain even small supplies. This requirement for a large wall area is met by digging large-diameter wells.

LAKE DEPOSITS

Lake deposits consist of horizontally bedded clay, silt, and sand. They form a thin skin over till and bedrock in the Erie-Ontario Lowlands, but reach thicknesses of 300 feet or more in some valleys in the uplands. Thick sequences of clay (such as penetrated by well 229-842-1 near Springville) are so impermeable as to yield no water to wells. The lake deposits also contain thick sections of water-bearing fine sand in the major valleys of the Appalachian Uplands. This fine sand is called quicksand because it moves into wells. Small supplies can be developed from the fine sand by careful well construction, but usually these deposits are not utilized as sources of water.

GLACIAL SAND AND GRAVEL DEPOSITS

Glacial sand and gravel deposits include the ice-contact and outwash deposits shown in plate 3. In addition, deltaic deposits are present within the area. A prominent delta (lat 42°30', long 78°56') west of Collins, composed of sand and gravel, was built out from Clear Creek into a lake that occupied the Erie-Ontario Lowlands. Another delta (lat 42°50', long 78°34') was formed by Little Buffalo Creek, northeast of Marilla. These deltas are shown arbitrarily in plate 3 as ice-contact deposits. Deltaic deposits, presently concealed, probably interfinger with glacial lake deposits in the major valleys of the Appalachian Uplands where tributary streams deposited coarse-grained sediments in lakes. Subsurface data indicate deltaic deposits interfinger with lake deposits near the junction of Crow and Tonawanda Creeks south of the Attica State Prison. The sand and gravel deposits occur principally in the valleys of the Appalachian Uplands with only scattered, minor occurrences elsewhere. The relationship of the sand and gravel to the other unconsolidated deposits and to the bedrock is shown in figure 8. Where the deposits are thick and water bearing, they constitute the best aquifers found in the Erie-Niagara basin.

Lithology and thickness

The glacial sand and gravel deposits exhibit a variety of textures and sedimentary structures but they all are marked by stratification and a high degree of sorting. Characteristic of the deposits are horizontal beds of well-sorted sand, lenticular beds of cobble and boulder gravel, and scattered beds and lenses of open-work gravel. These various materials are interbedded in varying proportions, though boulder gravel is not present in most outwash deposits.

The deposits form thick fills in valleys of the upland section. In the valley bottoms the saturated thickness of the deposits exceeds 100 feet at many places. Thick deposits underlying terraces along the valley walls are to a large extent above the saturated zone. Buried sand and gravel deposits 10 to 40 feet thick underlie lake deposits in some valleys.

The thickness of the sand and gravel deposits can be inferred from the surficial geologic map (pl. 3) and the data on wells (table 6). The sand and gravel mapped as ice-contact deposits extends downward to till or bedrock. Till forms only a thin cover on the bedrock in most valleys, so the depth to bedrock can be assumed to be the thickness of the ice-contact deposits. The sand and gravel deposits mapped as outwash, on the other hand, are generally thin and overlie lake deposits in most valleys. The outwash deposits are thinnest wherever lake deposits are mapped in narrow bands along the edge of outwash terraces or as small areas within larger areas of outwash.

A thick outwash deposit of high permeability lies in the Tonawanda Creek valley south of Batavia. This outwash deposit contains open-work gravel which enhances its permeability. In addition its saturated thickness exceeds 70 feet. This is the most permeable large deposit known in the study basin.

The sand and gravel deposits that underlie lake deposits in the major valleys are not mapped. The location and thickness of these deposits are known only from subsurface data. The only such deposit developed for large ground-water supplies is at Gowanda. Small to moderate capacity public-supply wells are also developed from buried sand and gravel deposits at Holland, Varysburg, and at Hamburg for the Biehler Meadows development.

Hydraulic properties

Coefficients of transmissibility of the sand and gravel deposits given in table 4 were estimated on the basis of reported specific capacities of larger yield wells using graphs given by Walton (1962, p. 12-13). If the screened interval is small in relation to the thickness of the aquifer, the computed transmissibility applies mainly to the materials opposite the screen. The position of the aquifer and the depth of the screened interval are given to allow evaluation of these factors. The transmissibilities computed for some wells may be misleading because the drawdowns may have been affected by infiltration from streams. The transmissibility of the aquifer at well 259-809-1 is phenomenally high. Various wells drilled for the city of Batavia also had specific capacities that indicated similarly high transmissibilities. Yet, the transmissibilities computed from the specific capacities of wells 258-809-1 and 259-809-7 are an order of magnitude less. Irregularly distributed zones of open-work gravel in these deposits may account for this disparity.

Yields of wells

The yields of wells in the sand and gravel deposits vary greatly depending on the permeability and saturated thickness of the deposits and on well construction. Most wells for domestic supply are 6-inch diameter drilled wells with open-end casings. Such wells have low yields because they are necessarily inefficient; this type of construction is cheap and is adequate for household supplies. Wells drilled for public supplies are constructed for high efficiency and give a representative picture of the availability of water in the sand and gravel deposits. Efficient

Table 4.--Specific-capacity tests of wells finished in sand and gravel deposits

Well number	Pumping rate (gpm)	Drawdown (feet)	Specific capacity (gpm/ft)	Position of aquifer (feet below land surface)		Screened interval (feet below land surface)	Coefficient of transmissibility (gpd/ft)
				Top	Bottom		
227-856-1	545	92	5.9	332	377	336-376	12,000
-4	517	81.3	6.4	301	347	303-333	12,000
229-822-1	425	30.5	13.9	1/ 24	75	64-74	17,000
229-856-1	150	9.5	15.8	1/ 19	35	30-35	18,000
230-840-1	830	25	33	100	157	119-138	40,000
231-825-1	150	3	50	1/ 16	48	38-48	55,000
-2	502	7.1	71	1/ 17	49	39-49	100,000
232-825-1	305	6.9	44.2	1/ 7	>53	44-49	60,000
234-856-3	254	19.3	13.1	1/ 11	>35	25-35	15,000
238-832-1	300	33	9.1	--	--	--	20,000
238-855-1	130	42.7	3.0	43	58	47-57	4,500
-2	137	12.6	10.9	1/ 9	24	19-24	13,000
239-853-1	115	42.4	2.7	47	54	49-54	3,500
246-836-1	690	46.5	14.8	40	>112	75-105	20,000
-2	700	102	6.9	72	>132	121-131	10,000
254-829-1	220	11.1	19.8	1/ 9	>34	29-34	25,000
258-809-1	456	12.8	35.6	1/ 26	>49	41-49	40,000
259-809-1	600	1.5	400	1/ 15	>64	40-60	600,000
-7	200	4.4	45.6	1/ 14	>60	50-60	60,000

1/ For a water-table aquifer, the depth to the water table is given.

wells yield 500 to 600 gpm from sand and gravel deposits in most valleys in the Uplands. The highly permeable outwash deposits in Tonawanda Creek valley provide yields of 1,000 to 1,400 gpm. Wells with these yields cannot be developed everywhere in the sand and gravel deposits. It is necessary to locate a sufficient thickness of water-saturated coarse-grained material (generally 10 to 20 feet), in which a screen can be set. Several test holes may be needed to locate the required aquifer materials. The success of communities and industries in developing large-yield supplies from sand and gravel deposits indicates that the relatively thick zones of permeable materials needed for well development are abundant.

ALLUVIUM AND SWAMP DEPOSITS

Some alluvium lies along all streams. Larger streams have built flood plains or terraces of alluvium consisting of silt, sand, and gravel. In most of the smaller streams with steep gradients, the alluvium is a bed deposit of gravel. The gravelly alluvium along Cattaraugus Creek is tapped for small supplies at places by means of driven and dug wells. Alluvial deposits otherwise are not significant sources of water.

Swamp deposits of muck and sediments lie in poorly drained areas. They generally mark areas of ground-water discharge. Because of their generally low permeability, they are not a significant source of water.

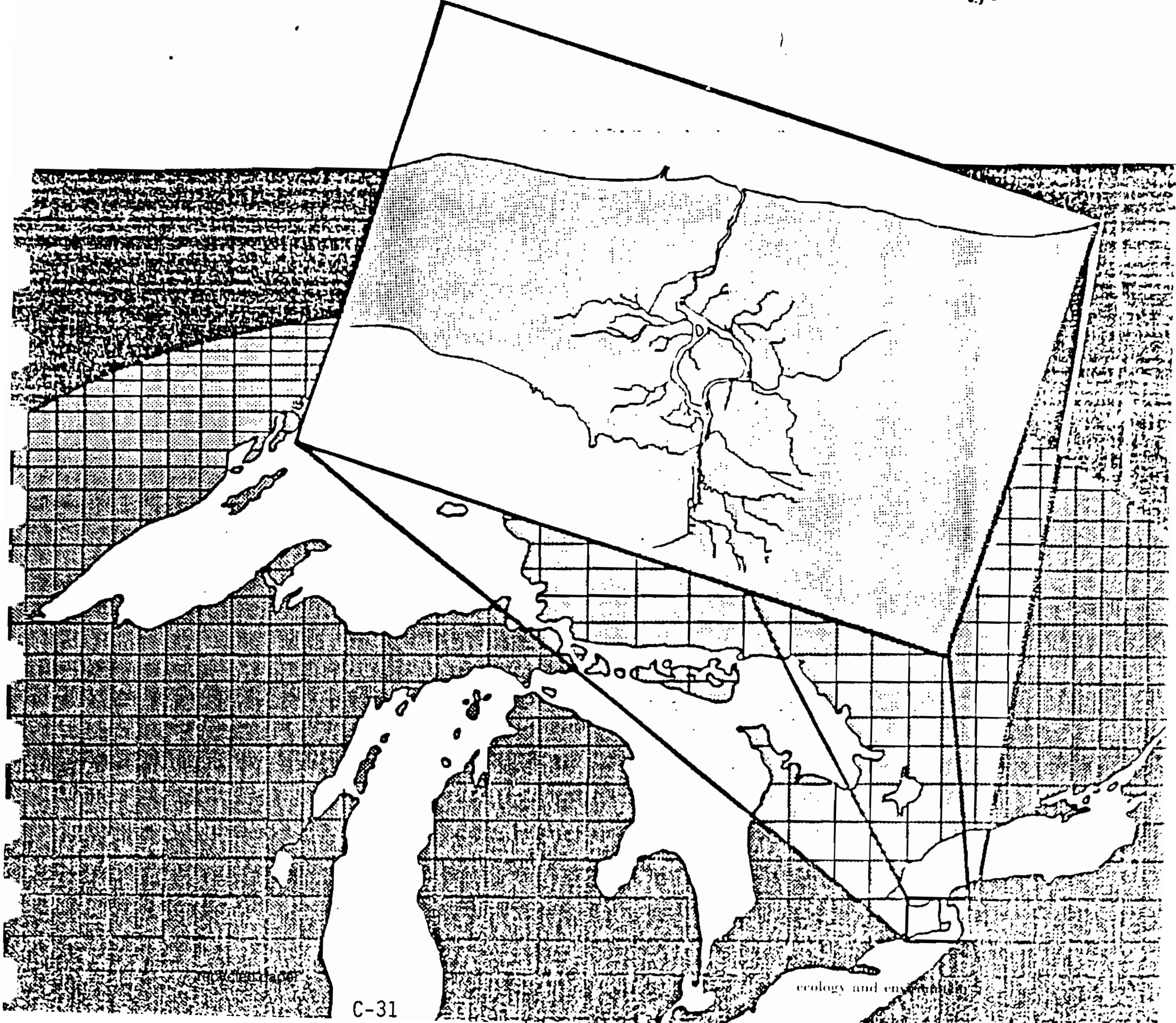
United States
Environmental Protection
Agency

Great Lakes National
Program Office
536 South Clark Street
Chicago, Illinois 60605

March 1985

EPA

Preliminary Evaluation Of Chemical Migration To Groundwater and The Niagara River from Selected Waste-Disposal Sites



"Preliminary Evaluation of Chemical Migration to Groundwater and the Niagara River from Selected Waste-Disposal Sites"

By

Edward J. Koszalka, James E. Paschal, Jr.,

Todd S. Miller and Philip B. Duran

Prepared by the U.S. Geological Survey

in cooperation with the

New York State Department of Environmental Conservation

for the

U.S. ENVIRONMENTAL PROTECTION AGENCY

130. EXOLON CORPORATION (Literature review) NYSDEC 915023

General information and chemical-migration potential.--The Exolon Company, on East Niagara Street in the City of Tonawanda, manufactures aluminum oxide and silicon carbide abrasives for grinding wheels and general industrial use. The company was reported to have disposed of refractory bricks, iron tailings, and coal cinders in a low area of approximately 1.5 acres.

The potential for contaminant migration is indeterminable from the data available.

Geologic information.--The soils are lacustrine silt, sand, and clay deposits. The site has one well, which is reported to be 140 ft deep. Information provided by the site owner indicates the following geologic log:

Depth (ft)	Description
0 - 4	sandy loam
4 - 80	clay and silt
80 - 86	sand
86 - 140	bedrock (Camillus Shale)

Hydrologic information.--Ground-water data are scant. Depth to water has been reported to be approximately 4 ft. The water table probably fluctuates seasonally during spring and other wet periods. Horizontal flow would be greatest during these periods, particularly in the sandy loam. The direction of flow would probably be northward toward the Erie-Barge Canal. Ground water could flow vertically through the sandy loam but would be impeded by the deeper clay and silt layer.

Chemical information,--No chemical information is available, and no monitoring has been planned.

131. FMC CORPORATION (USGS field reconnaissance)

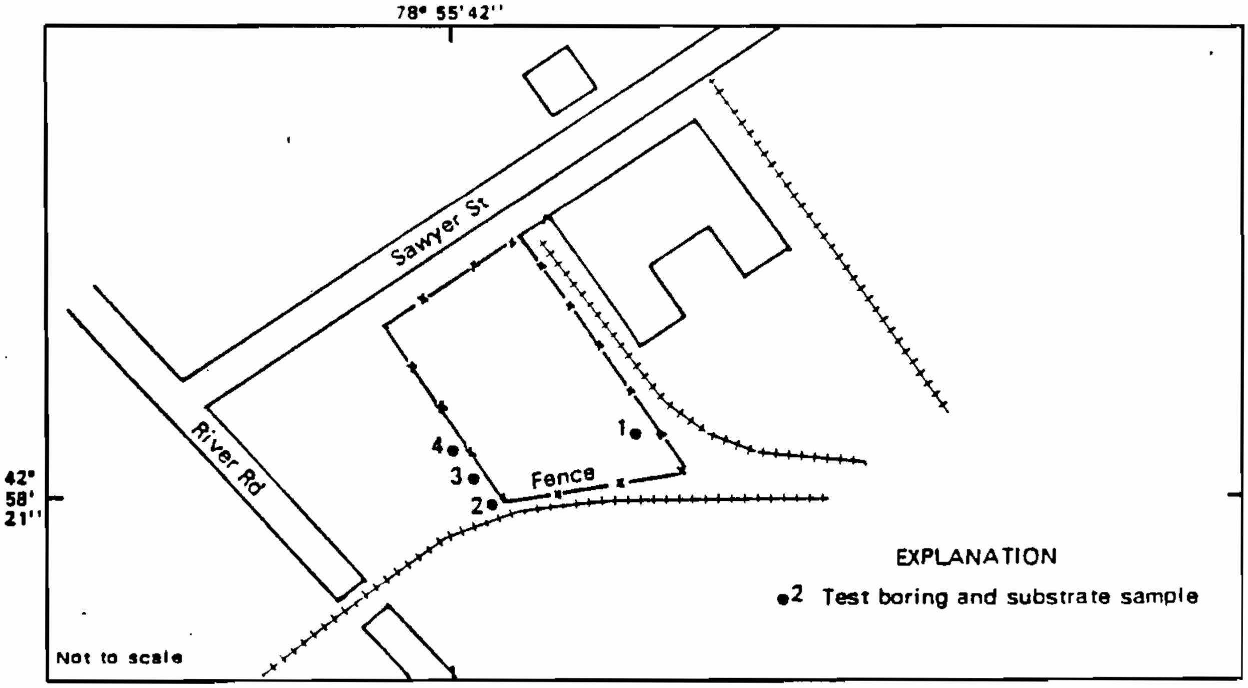
General information and chemical-migration potential.--The FMC Corporation site, in the town of Tonawanda, contains disposal pits for approximately 100 tons of persulfates, perborates, sodium carbonate peroxide, hydrogen peroxide, peracetic acid, calcium and zinc peroxide, magnesium, urea, pyrophosphate, and dipicolinic acid. The site was in operation from 1964-76. The pits have since been closed.

The potential for downward migration is probably limited by the underlying clay unit. The potential for offsite lateral migration is indeterminable.

Geologic information.--The site consists of a glacial lacustrine deposit overlying bedrock of Camillus Shale. The depth to bedrock is greater than 60 ft.

The Geological Survey drilled four test borings in 1982; the locations are shown in figure B-21. The geologic logs are as follows:

Boring no.	Depth (ft)	Description
1	0 - 0.5	Topsoil.
	0.5 - 6.5	Clay, reddish, dry, tight.
		Note: Moved forward and took 0.5 sample with hand auger.
2	0 - 2.0	Clay, red, "cap"?
	2.0 - 3.0	Sand, some clay, dark green, wet.
	3.0 - 11.5	Clay, reddish.
		SAMPLE: 2.5 ft.
3	0 - 2.5	Clay, red, some fill and gravel.
	2.5 - 3.5	Clay, dark green, some sand, damp.
	3.5 - 6.5	Clay, red, dry, tight.
		SAMPLE: 2.0 ft?
4	0 - 2.5	Clay, red.
	2.5 - 3.0	Clay, dark green.
	3.0 - 3.5	Clay, red, tight. Hit hard material at 3.5 ft.
		SAMPLE: 2.5 ft.



Base from USGS field sketch, 1982

Figure B-21. Location of sampling holes at FMC Corporation, site 131, Tonawanda.

Hydrologic information.--No ground water was encountered in the test borings. The moist material encountered in borehole 2 can be attributed to a buried water main that was leaking at the time of drilling.

Chemical information.--The U.S. Geological Survey collected a substrate sample from each borehole for iron and zinc analysis in 1982 and for organic compounds in 1983. Results are given in table B-22. The samples contained 18 organic priority pollutants, 23 organic nonpriority pollutants, and some unknown hydrocarbons.

Table B-22.--Analyses of substrate samples from FMC, site 131, Sawyer Street, Tonawanda, N.Y.
[Locations shown in fig. B-21. Concentrations are in µg/kg; dashes indicate that constituent or compound was not found, LT indicates it was found but below the quantifiable detection limit.]

	Sample number and depth below land surface (ft)			
First sampling (08-04-82)	1 (0.5)	2 (2.5)	3 (2.5)	4 (2.5)
Inorganic constituents				
Iron	160,000	470,000	410,000	370,000
Zinc	1,000	17,000	29,000	13,000
	Sample number			
Second sampling (08-19-83)	1A	2A	3A	4A
Inorganic constituents				
Molecular sulfur	--	10,000	--	--
Organic compounds				
Priority pollutants				
Acenaphthene	*	*	*	*
Fluoranthene	*	*	*	*
Naphthalene	*	*	*	--
Bis(2-ethylhexl) phthalate	*	--	--	*
Di-n-butyl phthalate	--	*	--	--
Di-n-octyl phthalate	--	--	--	*
Benzo(a)anthracene	*	*	*	*

[1] Tentative identification based on comparison with the National Bureau of Standards (NBS) library. No external standard was available. Concentration reported is semiquantitative and is based only on an internal standard. GC/MS spectra were examined and interpreted by GC/MS analysts.

* Compounds detected but not quantified--Holding time exceeded before GC/MS acid- and base-neutral extractable compounds were extracted.

Table B-22.--Analyses of substrate samples from FMC, site 131, Sawyer Street, Tonawanda, N.Y. (continued)
[Locations shown in fig. B-21. Concentrations are in µg/kg; dashes indicate that constituent or compound was not found, LT indicates it was found but below the quantifiable detection limit.]

	Sample number			
Second sampling (08-19-83)	1A	2A	3A	4A
Organic compounds (continued)				
Priority pollutants (continued)				
Benzo(a)pyrene	*	*	*	*
Benzo(b)fluoranthene and benzo(k)fluoranthene	*	--	*	*
Chrysene	*	*	*	*
Acenaphthylene	*	--	--	--
Anthracene	*	*	*	--
Benzo(ghi)perylene	*	*	*	*
Fluorene	*	*	*	--
Phenanthrene	*	*	*	--
Dibenzo(a,h)anthracene	*	*	*	*
Indeno(1,2,3-cd)pyrene	*	*	*	*
Pyrene	*	*	*	*
Nonpriority pollutants				
Dibenzofuran	*	*	*	*
2-Methylnaphthalene	*	*	*	--
Benzoic acid	--	*	*	--
1-Methylnaphthalene[1]	*	--	--	--
Dibenzothiophene[1]	*	--	--	--
Acridine[1]	*	--	--	--
Phenanthridine[1]	*	--	--	--
9H-carbazole[1]	*	--	*	--
9-Methylphenanthrene[1]	*	--	--	--
3-Methylphenanthrene[1]	*	--	--	--
4-Methylphenanthrene[1]	*	--	--	--
7-Methyl-9H-carbazole[1]	*	--	--	--
1-Phenylnaphthalene[1]	*	--	--	--
9,10-Anthracenedione[1]	*	--	--	--
9-Ethylphenanthrene[1]	*	--	--	--
2,5-Dimethylphenanthrene[1]	*	--	--	--
1-Methylpyrene[1]	*	*	*	--
7-Methylbenzo(a) anthracene[1]	*	--	*	--
4-Cyclopenta(def) phenanthrene[1]	*	--	--	--
Perylene	--	--	*	--
Hexadecanoic acid[1]	--	--	*	--
4-Hydroxy-3-methoxy-benzaldehyde[1]	--	--	*	--
4H-Cyclopenta(def) phenanthrene[1]	--	--	*	--
Unknown hydrocarbons[1]	*	*	*	--

ecology and environment, inc.

BUFFALO CORPORATE CENTER
368 PLEASANTVIEW DRIVE, LANCASTER, NEW YORK 14086, TEL. 716/684-8060
International Specialists in the Environment

December 12, 1988

Mr. Richard Wise
FMC Corporation
Box 845
Buffalo, NY 14240

Dear Mr. Wise:

As discussed in our telephone conversation of Monday, December 12, 1988, Ecology and Environment, Inc., (E & E) is conducting Phase I investigations for New York State Department of Environmental Conservation (NYSDEC). As part of these studies, E & E prepared a draft report on the FMC property, located in Tonawanda, NY, which reportedly contained waste disposal pits. In NYSDEC's review of the report, they requested further information on the sewer that was installed across the property. I have listed the questions below and left spaces for you to write in the answers.

1. When was the sewer line installed? Fall, 1973.
2. What was done with the excavated material when the sewer was installed? Broadcast on FMC property in vicinity of sewer line.
3. What type of material was used to backfill the sewer excavation (e.g., gravel, excavated materials, etc..)? Granular backfill up to spring line of pipe. Balance of backfill was excavated material compacted.

NYSDEC requires that all information in a Phase I report be fully documented. Please fill in the answers and sign this letter to acknowledge that you have provided us with this information and that it is correct to the best of your knowledge.

Richard K Wise
Signature

12/14/88
Date

Your prompt attention to this matter is appreciated. If you have any questions, please call me at (716) 684-8060.

Sincerely,

Peggy Farrell
Margaret J. Farrell, CHMM
Project Manager

oio/XA602

FMC Corporation
[illegible]
[illegible]
[illegible] New York [illegible]
[illegible]

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

FMC

December 14, 1988

Margaret J. Farrell, CHMM
Project Manager
Ecology and Environment, Inc.
368 Pleasantview Dr.
Lancaster, NY 14086

Dear Ms. Farrell,

The information which you requested in your December 12, 1988 letter is attached. Please call me at 879-0405 if you have additional questions.

Very truly yours,

Richard K. Wise

Richard K. Wise
Environmental Engr. Supv.

cms
Attachment