SUPPORTING DOCUMENTS FOR ENGINEERING INVESTIGATIONS AT INACTIVE HAZARDOUS WASTE SITES

Aluminum Match Plate Corporation Site No. 915005

Town of Tonawanda Erie County

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., *Director*

By:

DUNN ENGINEERING COMPANY
In association with
TAMS CONSULTANTS, INC.

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November 1993

PRELIMINARY SITE ASSESSMENT
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ENGINEERING INVESTIGATIONS AT INACTIVE HAZARDOUS WASTE SITES

PHASE I INVESTIGATION

Aluminum Match Plate Site No: 915005
Tonawanda Erie County

DATE: February 1986

Prepared for:
New York State
Department of
Environmental Conservation
50 Wolf Road, Albany, New York 12233
Henry G. Williams, *Commissioner*

Division of Solid and Hazardous Waste
Norman H. Nosenchuck, P.E., *Director*

By:

Recra Environmental, Inc.

2/3123

ENGINEERING INVESTIGATIONS AT INACTIVE HAZARDOUS WASTE SITES IN THE STATE OF NEW YORK
PHASE I INVESTIGATIONS
FOURTH ROUND

Aluminum Match Plate Corporation
Tonawanda, Erie County, New York
Site #915005

Prepared For:

Division of Solid and Hazardous Waste
New York State Department of Environmental Conservation
50 Wolf Road
Albany, NY 12233-0001

Prepared By:

Recra Environmental, Inc.
4248 Ridge Lea Road
Amherst, NY 14226

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A-2

USEPA, Preliminary Evaluation of Chemical Migration to Groundwater and the Niagara River from Selected Waste-Disposal Sites, 1985.

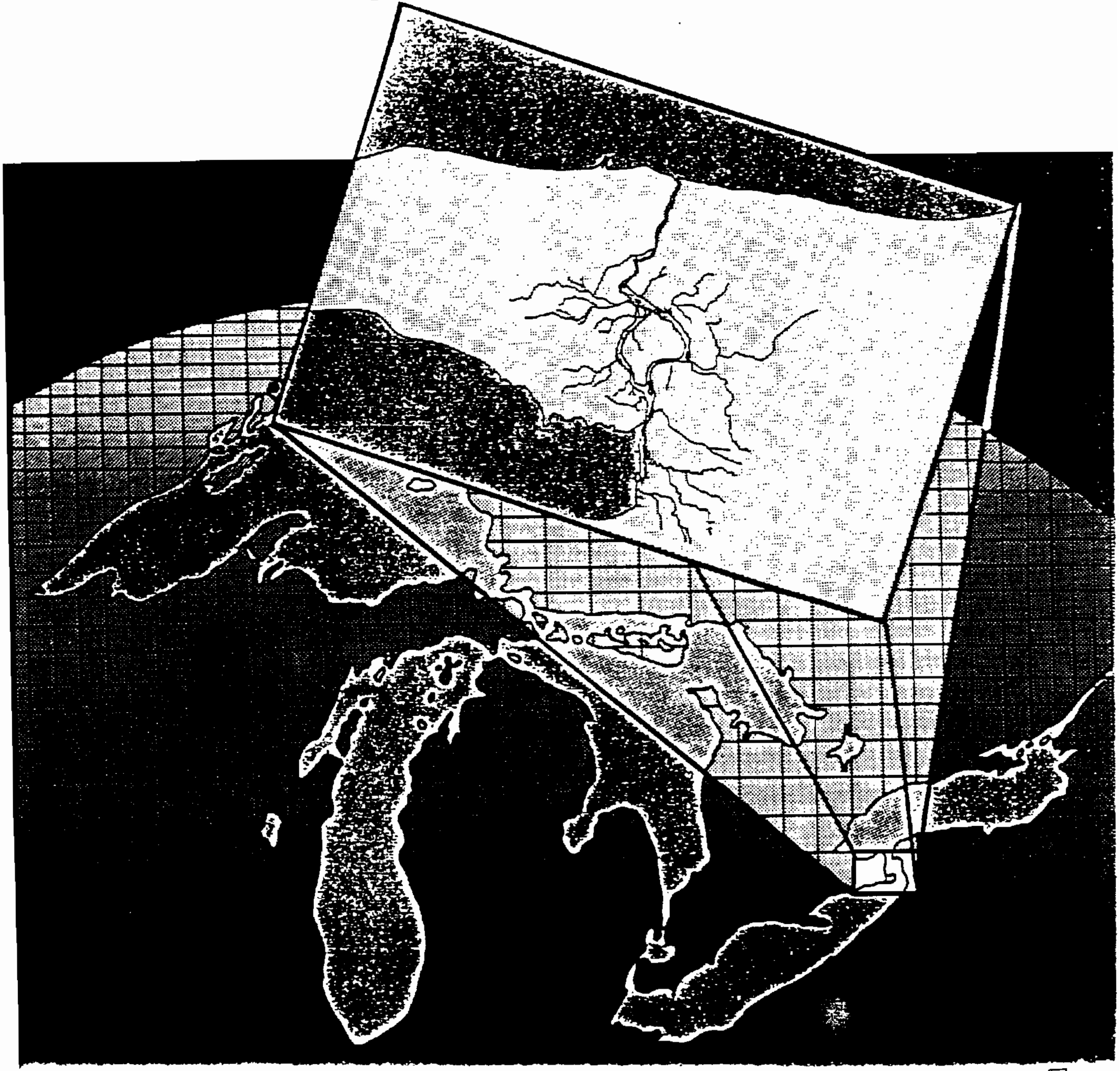
Environmental Protection
Agency

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

TONAWANDA AREA

Geology

The Tonawanda study area (pl. 2) consists of unconsolidated deposits of clay, sand, and till of Pleistocene and Holocene age overlying Camillus Shale bedrock of Silurian age.

Bedrock Units.--The Camillus Shale is the only bedrock unit encountered in the area. As described previously, it is a gray, red, and green thin-bedded unit with massive mudstone and also contains beds and lenses of gypsum. Thickness of the shale is estimated to be 400 ft but decreases to the north near the contact with the Lockport Dolomite.

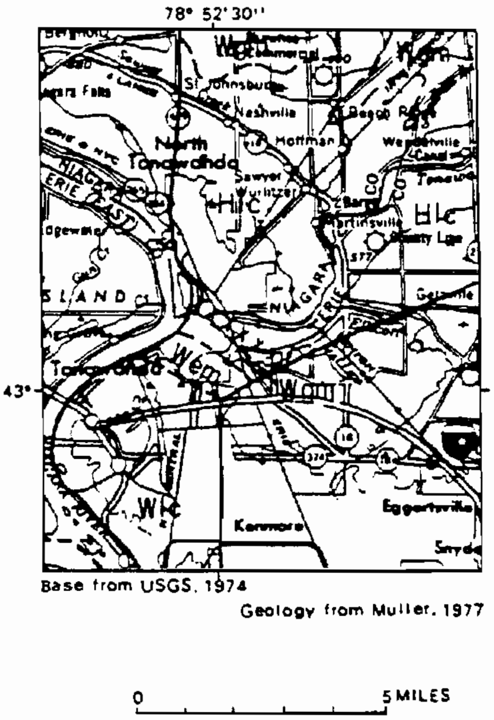
Unconsolidated Deposits.--The unconsolidated units consist of glacial material deposited during the latter part of the Pleistocene epoch and lacustrine material deposited during the early Holocene. The distribution of unconsolidated deposits in the area is shown in figure 5.

The Pleistocene materials are similar to those in the Buffalo area except for a ground-moraine deposit, which consists mainly of lodgment till, silty clay till, and sandy till. This deposit was formed by the transport and deposition of material beneath the southward flowing continental ice sheet (Muller, 1977) and is thus compacted and relatively impermeable.

The northern part of the area contains a Holocene lacustrine deposit consisting primarily of clay with stringers of sand and silt. Most stringers are less than 3 inches thick and are discontinuous throughout the area.

The U.S. Geological Survey drilled five test holes in 1982 to obtain additional data on the subsurface geology of the area. (Locations of these holes, SA-4 through SA-8, are shown on pl. 2.) The geologic logs are as follows:

Boring No.	Depth (ft)	Description
SA-4	0 - 1.5	Topsoil
	1.5 - 6.5	Clay, sand, green
	6.5 - 18.5	Clay, pink
	18.5	Bedrock
SA-5	0 - 6.5	Road fill, rubble
	6.5 - 19.0	Clay, pink
	19.0 - 24.5	Sand
	24.5	Bedrock
SA-6	0 - 3.0	Topsoil, rubble
	3.0 - 28.0	Clay, pink
	28.0 - 44.0	Sand, silty
	44.0	Bedrock
SA-7	0 - 1.5	Topsoil
	1.5 - 16.5	Clay, gray-green
	16.4 - 19.0	Clay, pink
	19.0 - 27.0	Clay, sandy pink
	27.0	Bedrock



Base from USGS, 1974

Geology from Muller, 1977

EXPLANATION

Holocene

Hlc

Lake silt, sand and clay

Pleistocene

Wlc

Lake silt, sand and clay

Wem

End moraine

Wgm

Ground moraine

———	Boundary of area
⊥⊥⊥⊥	Glacial marginal position
– – – – –	Geologic contact, dashed where uncertain
xxxxxx	Strand line

Figure 5. Surficial geology of the Tonawanda area.

Boring No.	Depth (ft)	Description
SA-8	0 - 1.5	Topsoil
	1.5 - 31.5	Clay, red
	31.5 - 63.0	Clay, red, interbedded with gravel
	63.0	Bedrock

The information obtained from these test borings, together with the data from the disposal sites, can be used to characterize the geology of the area in general terms. The unconsolidated deposits, primarily the Pleistocene and Holocene lacustrine clays, are encountered within 6 ft of land surface. Their thickness, which seems to be dependent upon the depth to bedrock, ranges from 18.5 to 63.0 ft. The test drilling confirmed the boundaries of the unconsolidated deposits as drawn by Muller (1977). Also, the Pleistocene and Holocene clay units are similar except in color and the presence of sand stringers in the latter.

Aquifer Lithology and Water-Bearing Characteristics

The hydrologic system of the Tonawanda area is similar to that of the Buffalo area--a bedrock aquifer consisting of Camillus shale overlain by an aquifer of unconsolidated deposits.

Water within the bedrock aquifer flows through the joints, fractures, and solution cavities within the unit. The Camillus Shale is estimated to have a transmissivity ranging from 7,000 to 70,000 (gal/d)/ft (LaSala, 1968). Regionally, under nonpumping conditions, ground water in the shale moves west and south. Ground water in shallow bedrock discharges into Tonawanda Creek, Ellicott Creek, and the Niagara River (pl. 2)

The overlying aquifer consists of unconsolidated morainal and clay deposits. The morainal material is generally a clayey till whose permeability is as low as that of the lacustrine clays. During the test drilling, ground water was encountered at various depths within the clayey units; also encountered were stringers of permeable sand that initially yielded considerable amounts of water. The yield diminished with time, however, as the stringers became dewatered.

The low permeability of the deposits causes a seasonal perched water table, similar to that of the Buffalo area, during periods of high precipitation. This water table discharges into areas of low topography and eventually into nearby surface-water bodies.

The hydrologic properties of the unconsolidated aquifer have been discussed in several consultant reports on the geohydrology of the major disposal sites; these reports are cited in the site descriptions (appendix B).

Permeability tests done by consultants on clay samples from several of the disposal sites indicate that the vertical permeability is low, ranging from 10^{-6} to 10^{-8} cm/s. This is probably the reason for the nearly steady water levels in monitoring wells screened in this aquifer. Horizontal permeability may be orders of magnitude greater than vertical permeability.

The direction of ground-water movement in the aquifer is generally toward the major surface-water bodies--the Niagara River and Ellicott, Sawyer, and Tonawanda Creeks (pl. 2).

Ground-Water Quality

The chemical quality of ground water in the bedrock aquifer has been investigated by LaSala (1968). Concentrations of sulfate ranged from 100 to 1,000 mg/L and hardness (as $CaCO_3$) from 1,500 to 3,000 mg/L. Chloride concentrations ranged from 100 to 1,500 mg/L, and specific conductance from 1,500 to 9,000 µmho/cm at 25°C.

Water samples were collected in the fall of 1982 from five observation wells (SA-4, 5, 6, 7, and 8; locations shown in pl. 2) screened in the unconsolidated deposits above the bedrock contact and were analysed for priority pollutants. Four of the wells were along the eastern edge of the area and one was adjacent to the Niagara River. Results of the analyses (table 16) indicate that concentrations of cadmium, lead, and zinc exceeded USEPA drinking-water criteria and NYS ground-water standards. A few organic compounds were detected, all in minimal quantities except methylene chloride and toluene. Chlordane was detected at a well along the eastern edge of the area, and α-chlordane was detected at one well adjacent to the Gratwick-Riverside Park site along the Niagara River. Additional sampling of ground water in the aquifer would be needed to define its quality in the Tonawanda area.

Three substrate samples were collected at localities not affected by waste-disposal sites in the Tonawanda area and were analyzed for heavy metals; results are given in table 15.

Table 15.--Heavy-metal concentrations in substrate samples from undisturbed soils in Tonawanda, N.Y., May 31, 1983 and June 1, 1983.
[Concentrations in µg/kg. Locations shown in pl. 2]

Location	Sample number	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
Beaver Island State Park	SB-4	4,000	8,000	10,000	100,000	200	20,000	57,000
Mount Olive Cemetery	SB-5	4,000	20,000	20,000	30,000	120	30,000	58,000
Oppenheim Park	SB-6	1,000	20,000	20,000	20,000	110	20,000	59,000
Ellicott Creek Park	SB-7	4,000	10,000	20,000	20,000	120	20,000	47,000

Table B-15.--Analyses of substrate samples from Tonawanda Coke, site 110, Tonawanda, N.Y., May 24, 1983 (continued)
[Locations shown in fig. B-15. 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 (4.0)	(split)	2 (4.0)	3 (4.0)
Organic compounds (continued)				
Nonpriority pollutants				
Acetone	--	(164**)	379**	--
Carbon disulfide	180**	(614**)	620**	161**
Diethyl phthalate	--	(*)	--	--
2-Hexanone	--	(--)	--	17.1**
4-Methyl-2-pentanone	--	(--)	--	6.3**
Styrene	--	(--)	86.1**	--
O-xylene	4.7**	(25.5**)	238**	17.1**
4-Chloroaniline	*	(--)	--	--
Dibenzofuran	--	(*)	--	*
2-Methylnaphthalene	*	(*)	--	*
4-Methylphenanthrene[1]	--	(*)	--	--
Tetrahydrofuran[1]	--	(--)	--	*
Perylene	--	(*)	--	--
1-Methylnaphthalene[1]	*	(--)	--	--
1,8-Dimethylnaphthalene[1]	*	(--)	--	--
Thiophene[1]	--	(--)	*	--
2-Methylbutane[1]	--	(--)	--	*
Cyclohexane[1]	--	(--)	--	*
Unknown hydrocarbons[1]	*	(*)	--	--

111. ALUMINUM MATCH PLATE CORPORATION (USGS field reconnaissance) NYSDEC 915005

General information and chemical-migration potential.--The Aluminum Match Plate Corporation site, a 1-acre area in the city of Tonawanda, was used to dispose of an unknown quantity of molding sand with phenolic binder and aluminum grindings.

The potential for the downward movement of contaminants is probably small because of the thick clay below. Chemical data give no indication of horizontal migration. The potential for contaminant migration is indeterminable.

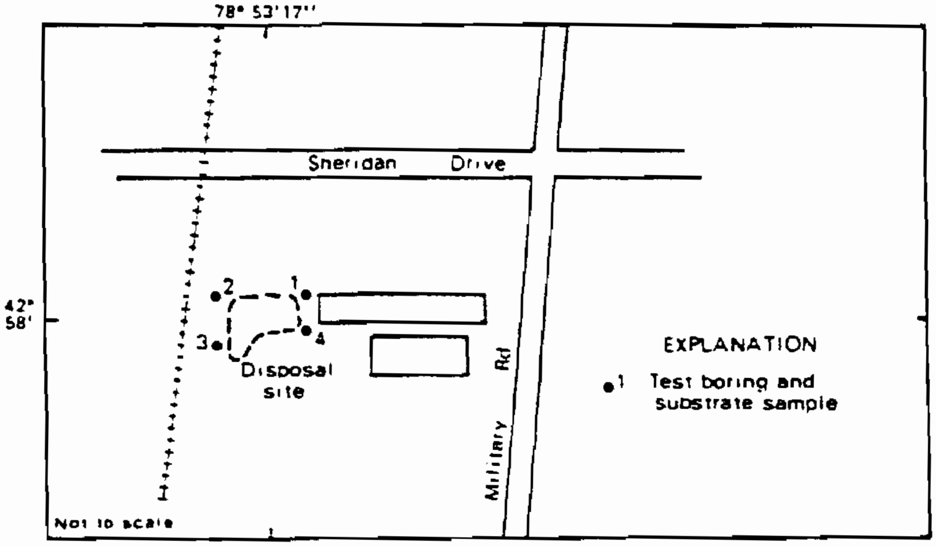
Geologic information.--The site consists of glacial lacustrine clay overlying bedrock of Camillus Shale. The shale is about 60 ft below land surface.

The U.S. Geological Survey drilled four test borings on the site in 1982; the locations are shown in figure B-16. The geologic logs are as follows:

Boring no.	Depth (ft)	Description
1	0 - 1.0	Topsoil with clay cap.
	1.0 - 4.0	Clay, sandy, gray-green.
	4.0 - 8.5	Clay, red, dry.
		SOIL SAMPLE: 3.0 ft.
2	0 - 1.5	Topsoil, black.
	1.5 - 2.0	Clay, yellow.
	2.0 - 2.5	Clay, red, tight.
		SOIL SAMPLE: 1.5 ft.
3	0 - 1.5	Topsoil, black.
	1.5 - 5.0	Clay, red.
		SOIL SAMPLE: 1.5 ft.
4	0 - 2.0	Topsoil, black.
	2.0 - 5.0	Clay, red.
		SOIL SAMPLE: 1.5 ft.

<u>Hydrologic information</u>.--No ground water was encountered in the test borings nor in previous test drilling along Military Road (pl. 2), and no ground water was encountered to a depth of 16 ft.

<u>Chemical information</u>.--The U.S. Geological Survey collected four soil samples from the boreholes for iron, mercury, and phenols analyses; results are given in table B-16. Only iron was detected.



Base from USGS field sketch, 1982

Figure B-16. Location of sampling holes at Aluminum Match Plate Corporation, site 111, Tonawanda.

Table B-16.--Analyses of substrate samples from Aluminum Match Plate, site 111, Tonawanda, N.Y., July 20, 1982.
[Locations shown in fig. B-16. 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 3.0	2 1.5	3 1.5	4 1.5
Inorganic constituents				
Iron	11,000,000	13,000,000	11,000,000	8,200,000
Mercury	--	--	--	--
Organic compounds				
Phenol	--	--	--	--

114. ASHLAND PETROLEUM COMPANY (Literature review) NYSDEC 915061

General information and chemical-migration potential.--This site, in the northern part of the town of Tonawanda, is a solid-waste landfill containing spent lime, clay, wood, concrete, metal, and phosphoric acid catalysts. The potential for contaminant migration is indeterminable because data are lacking.

Geologic information.--The U.S. Geological Survey drilled four test borings on the site in 1975. The geologic logs indicated bedrock (Camillus Shale) at approximately 80 ft below grade. Overlying the bedrock is a sequence of silt and clay layers with occasional embedded gravel.

Hydrologic information.--No hydrologic information is available.

Chemical information.--No chemical data are available, and no monitoring has been proposed.

115. ASHLAND PETROLEUM COMPANY (Literature review) NYSDEC 915008c

General information and chemical-migration potential.--This site, received low-level radioactive material during 1944-46. Approximately 8,000 tons of uranium ore tailings containing 0.54 percent uranium was spread over the area to a depth of 2 ft.

No data are available to determine contaminant migration by ground-water movement. However, the chemical analyses of water from adjacent drainage ditches indicate the presence of some heavy metals and low-level radiation, which indicates possible offsite migration by surface runoff. The potential for contaminant migration in ground water is indeterminable.

15

A-3

Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map (FIRM), Town of Tonawanda, New York, Erie County (Community Panel Number 360260 0001-0009), 1982.

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

TOWN OF
TONAWANDA,
NEW YORK
ERIE COUNTY

PANELS: 1, 2, 3, 4, 5, 6, 7, 8, 9

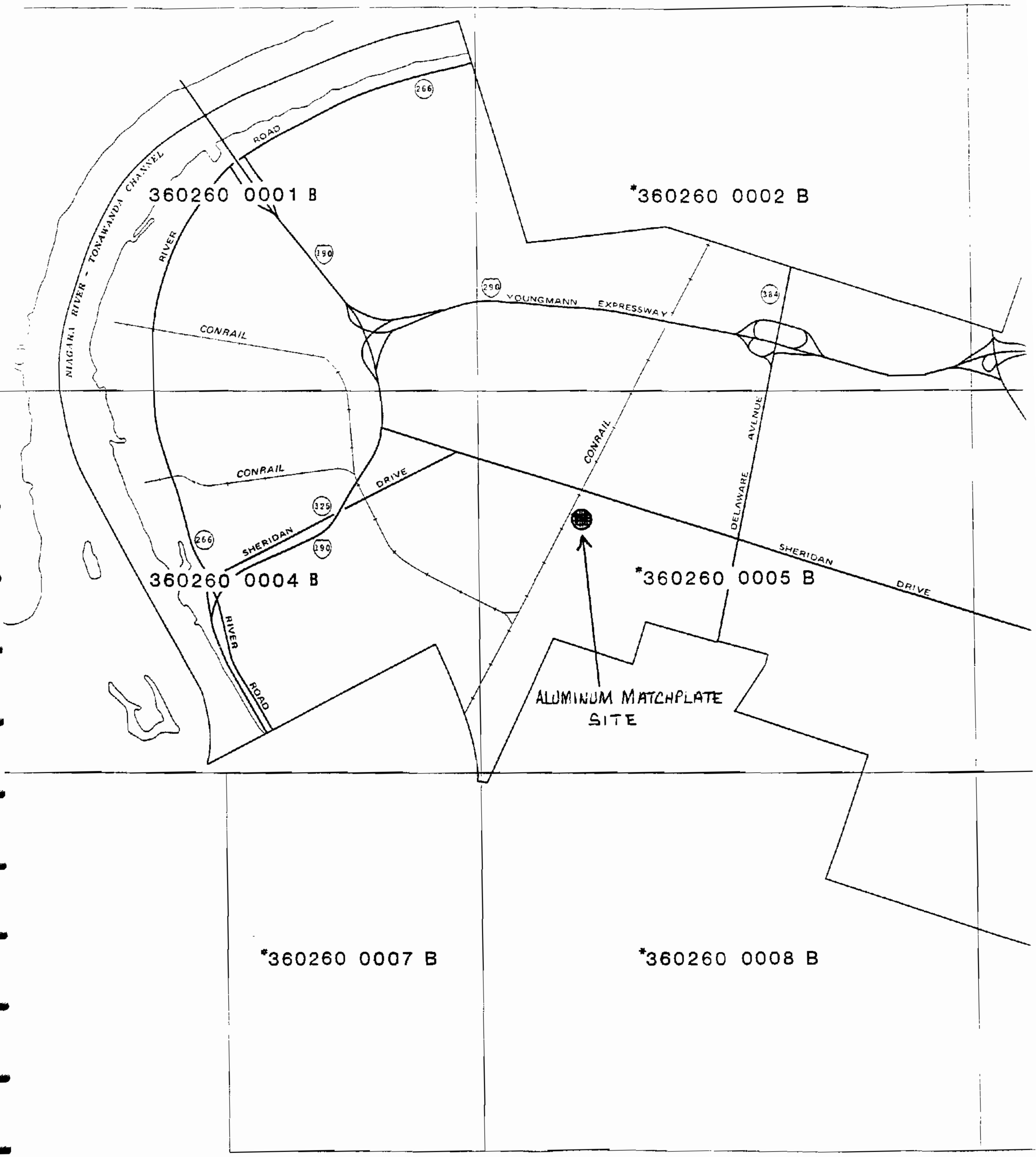
MAP INDEX

PANEL PRINTED: 1, 3, 4

COMMUNITY-PANEL NUMBER
360260 0001- 0009

MAP REVISED:
NOVEMBER 12, 1982

Federal Emergency Management Agency



*PANEL NOT PRINTED - AREA IN ZONE C

A-4

Bureau of National Affairs, Inc., Washington, DC, New York State Water Laws, 1979.

Item: 6. Radioactivity.

a. Gross beta.

Specifications: Shall not exceed 1,000 picocuries per liter in the absence of Sr^{90} and alpha emitters.

b. Radium 226.

Specifications: Shall not exceed three picocuries per liter.

c. Strontium 90.

Specifications: Shall not exceed 10 picocuries per liter.

Note 1: With reference to certain toxic substances affecting fish life, the establishment of any single numerical standard for waters of New York State would be too restrictive. There are many waters, which because of poor buffering capacity and composition will require special study to determine safe concentrations of toxic substances. However, most of the nontrout waters near industrial areas in this State will have an alkalinity of 80 milligrams per liter or above. Without considering increased or decreased toxicity from possible combinations, the following may be considered as safe stream concentrations for certain substances to comply with the above standard for this type of water. Waters of lower alkalinity must be specifically considered since the toxic effect of most pollutants will be greatly increased.

Ammonia or ammonium compounds — Not greater than 2.0 milligrams per liter expressed as NH_3 at pH of 8.0 or above.

Cyanide — Not greater than 0.1 milligrams per liter expressed as CN.

Ferro- or ferricyanide — Not greater than 0.4 milligrams per liter expressed as $Fe(CN)6$.

Copper — Not greater than 0.2 milligrams per liter expressed as Cu.

Zinc — Not greater than 0.3 milligrams per liter expressed as Zn.

Cadmium — Not greater than 0.3 milligrams per liter expressed as Cd.

CLASS A

Best usage of waters. Source of water supply for drinking, culinary or food processing purposes and any other usages.

Conditions related to best usage of waters. The waters, if subjected to approved treatment equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to reduce naturally present impurities will meet New York State Department of Health drinking water standards and will be considered safe and satisfactory for drinking water purposes.

Quality Standards for Class A Waters

Item: 1. Coliform.

Specifications: The monthly median coliform value for 100 ml of sample shall not exceed 5,000 from a minimum of five examinations and provided that not more than 20 percent of the samples shall exceed a coliform value of 20,000 for 100 ml of sample and the monthly geometric mean fecal coliform value for 100 ml of sample shall not exceed 200 from a minimum of five examinations.

Item: 2. pH.

Specifications: Shall be between 6.5 and 8.5.

Item: 3. Total dissolved solids.

Specifications: Shall be kept as low as practicable to maintain the best usage of waters, but in no case shall it exceed 500 milligrams per liter.

Item: 4. Dissolved oxygen.

Specifications: For cold waers suitable for trout spawning, the DO concentration shall not less than 7.0 mg/l from other than natural conditions. For trout waters, the minimum daily average shall not be less than 6.0 mg/l. At no time shall the DO concentration be less than 5.0 mg/l. For nontrout waters, the minimum daily average shall not be less than 5.0 mg/l. At no time shall the DO concentration be less than 4.0 mg/l.

Item: 5. Phenolic compounds.

Specifications: Shall not be greater than 0.005 milligrams per liter (phenol).

Item: 6. Radioactivity.

a. Gross beta.

Specifications: Shall not exceed 1,000 picocuries per liter in the absence of Sr^{90} and alpha emitters.

b. Radium 226.

Specifications: Shall not exceed three picocuries per liter.

c. Strontium 90.

Specifications: Shall not exceed 10 picocuries per liter.

Note 1: Refer to note 1 under Class AA which is also applicable to Class A standards.

CLASS B

Best usage of waters. Primary contact recreation and any other uses except as a source of water supply for drinking, culinary or food processing purposes.

Quality Standards for Class B Waters

Item: 1. Coliform.

Specifications: The monthly median coliform value for 100 ml of sample shall not exceed 2,400 from a minimum of five examinations and provided that not more than 20 percent of the samples shall exceed a coliform value of 5,000 for 100 ml of sample and the monthly geometric mean fecal coliform value for 100 ml of sample shall not exceed 200 from a minimum of five examinations. This standard shall be met during all periods when disinfection is practiced.

Item: 2. pH.

Specifications: Shall be between 6.5 and 8.5.

Item: 3. Total dissolved solids.

Specifications: None at concentrations which will be detrimental to the growth and propagation of aquatic life. Waters having present levels less than 500 milligrams per liter shall be kept below this limit.

Item: 4. Dissolved oxygen.

Specifications: For cold waters suitable for trout spawning, the DO concentration shall not be less than 7.0 mg/l from other than natural conditions. For trout waters, the minimum daily average shall not be less than 6.0 mg/l. At no time shall the DO concentration be less than 5.0 mg/l. For nontrout waters, the minimum daily average shall not be less than 5.0 mg/l. At no time shall the DO concentration be less than 4.0 mg/l.

Note 1: Refer to note 1 under Class AA which is also applicable to Class B standards.

Item: 2. Dissolved oxygen.

Specifications: Shall not be less than 5.0 mg/l at any time.

Item: 3. Toxic wastes and deleterious substances.

Specifications: None in amounts that will interfere with use for primary contact recreation or that will be injurious to edible fish or shellfish or the culture or propagation thereof, or which in any manner shall adversely affect the flavor, color, odor or sanitary condition thereof, or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.

CLASS SC

Best usage of waters. The waters shall be suitable for fishing and all other uses except for primary contact recreation and for the taking of shellfish for market pruposes.

Quality Standards for Class SC Waters

Item: 1. Coliform

Specifications: The monthly geometric mean total coliform value for 100 ml of sample shall not exceed 10,000 and the monthly geometric mean fecal coliform value for 100 ml of sample shall not exceed 2,000 from a minimum of five examinations. This standard shall be met during all periods when disinfection in practiced.

Item: 2. Dissolved oxygen.

Specifications: Shall not be less than 5.0 mg/l at any time.

Item: 3. Toxic wastes and deleterious substances.

Specifications: None in amounts that will interfere with use for secondary contract recreation or that will be injurious to edible fish or shellfish or the culture or propagation thereof, or which in any manner shall adversely affect the flavor, color, odor or sanitary condition thereof or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.

CLASS SD

Best usage of waters. All waters not primarily for recreational purposes, shellfish culture or the development of fish life and because of natural or man-made conditions cannot meet the requirements of these uses.

Quality Standards for Class SD Waters

Item: 1. Dissolved oxygen.

Specifications: Shall not be less than 3.0 mg/l at any time.

Item: 2. Toxic wastes and deleterious substances.

Specifications: None alone or in combination with other substances or wastes in sufficient amounts to prevent survival of fish life or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.

PART 702

SPECIAL CLASSIFICATIONS AND STANDARDS

Section 702.1 Class A — Special (International boundary waters).

(GREAT LAKES WATER QUALITY AGREEMENT OF 1972)

Best usage of waters. Source of water supply for drinking, culinary or food processing purposes, primary contact recreation and other usages.

Conditions related to best usage. The waters, if subjected to approved treatment, equal to coagulation, sedimentation, filtration and disinfection with additional treatment, if necessary, to reduce naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

Quality Standards for Class A — Special Waters

(International Boundary Waters)

Item: 1. Coliform.

Specifications: The geometric mean of not less than five samples taken over not more than a 30-day period should not exceed 1,000 per 100 ml total coliform nor 200 per 100 ml fecal coliform.

Item: 2. Dissolved oxygen.

Specifications: In the rivers and upper waters of the lakes not less than 6.0 mg/l at any time. In hypolimnetic waters, it should be not less than necessary for the support of fish life, particularly cold water species.

Item: 3. Total dissolved solids.

Specifications: Should not exceed 200 milligrams per liter.

Item: 4. pH

Specifications: Should not be outside the range of 6.7 to 8.5.

Item: 5. Iron.

Specifications: Should not exceed 0.3 milligrams per liter as Fe.

Item: 6. Phosphorus

Specifications. Concentrations should be limited to the extent necessary to prevent nuisance growths of algae, weeds and slimes that are or may become injurious to any beneficial water use.

Item. 7. Radioactivity.

Specifications: Should be kept at the lowest practicable levels and in any event should be controlled to the extent necessary to prevent harmful effects on health.

Item: 8. Taste and odor-producing substances, toxic wastes and deleterious substances.

Specifications: None in amounts that will interfere with use for primary contact recreation or that will be injurious to the growth and propagation of fish, or which in any manner shall adversely affect the flavor, color or odor thereof or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.

Item: 9. Suspended, colloidal or settleable solids.

Specifications: None from sewage, industrial wastes or other wastes which will cause deposition or be deleterious for any best usage determined for the specific waters which are assigned to this class.

Item: 10. Oil and floating substances.

Specifications: No residue attributable to sewage, industrial wastes or other wastes nor visible oil film nor globules of grease.

Item: 11. Thermal discharges.

Specifications: (See Part 704 of this Title.)

To meet the water quality objectives referred to in the "Great Lakes Water Quality Agreement of 1972," the standards listed above shall be subject to revision from time to time after further hearings on due notice.

Note: Refer to note 1 under Class AA which is also applicable to Class A — Speical (International Boundary Waters) standards.

702.2 Class AA — Special (Lake Champlain drainage basin).

CLASS AA — SPECIAL

Best usage of waters. Any usage except for disposal of sewage, industrial wastes or other wastes.

Quality Standards for Class AA — Special Waters (Lake Champlain Drainage Basin)

Item: 1. Floating solids, settleable solids, oil, sludge deposits, toxic wastes, deleterious substances, colored or other wastes or heated liquids.

Specifications: None attributable to sewage, industrial waste or other wastes.

2. Sewage or waste effluents.

None into waters of this class.

702.3 Special classes and standards for the Lower Hudson River, Arthur Kill, Kill Van Kull, Harlem River, Raritan Bay and Lower East River drainage basins, New York Bay area, Nassau County including Long Island Sound, Suffolk County, Upper East River, Long Island Sound drainage basins, within Queens, Bronx and Westchester Counties and Jamaica Bay drainage basin within Kings and Queens Counties including a certain portion of Rockaway Inlet. (a) This section applies to the waters within the following areas, which constitute the Interstate Sanitation District:

(1) The drainage basin of the Lower Hudson River from the mouth to northern Westchester-Rockland county lines, except Saw Mill River and Sparkill Creek drainage basins.

(2) The drainage basins of Arthur Kill, Kill Van Kull, and Harlem River, and Raritan Bay.

(3) The drainage basin of Lower East River from the mouth to a line across East River north of Wards Island between Stony Point in Bronx County and Lawrence Point in Queens County.

(4) New York Bay including Gravesend Bay, Coney Island Creek, Atlantic Basin, Erie Basin, Gowanus Bay, Gowanus Canal, the Narrows and Atlantic Ocean waters off Coney Island lying westerly of a north-south line from Light Inlet at the southeasterly tip of Conel Island Peninsula to the south tip of Rockaway Point, thence along the jetty to Rockaway jetty light, thence due south to the New York-New Jersey boundary line.

(5) Nassau County including the waters of Long Island Sound between Nassau-Queens and Nassau-Suffolk county lines and the waters of Atlantic Ocean to the three mile limit between said county lines.

(6) The area within Suffolk County lying west of a north-south topographical limit line and its extensions to a point in Long Island Sound at the New York Connecticut State boundary line due north of Miller Place Beach and to Blue Point on the south mainland thence southward across Great South Bay to Water Island, thence three miles due south to a point in Atlantic Ocean at the south State boundary line.

(7) Certain tidal waters which are within the Upper East River and Long Island Sound drainage basins within Queens, Bronx and Westchester Counties.

(8) Jamaica Bay drainage basin within Kings and Queens Counties and including Rockaway Inlet east of a north-south line drawn from Light Inlet at the southeasterly tip of Coney Island peninsula near Manhattan Beach to the westerly shoreline west of Lookout Tower on Rockaway Point.

b. Said classes and standards of quality and purity applicable thereto are set forth hereinafter and designated Class I and Class II.

CLASS I

Best usage of waters. The waters shall be suitable for secondary contact recreation and any other usage except for primary contact recreation and shellfishing for market purposes.

Quality Standards for Class I Waters

Items: 1. Garbage, cinders, ashes, oils, sludge or other refuse.

Specificatins: None in any waters of the marine district as defined by Environmental Conservation Law (§17-0105).

Item: 2. Coliform.

Specifications: The monthly geometric mean total coliform value for 100 ml of sample shall not exceed 10,000 and the monthly geometric mean fecal coliform value for 100 ml of sample shall not exceed 2,000 from a minimum of five examinations. This standard shall be met during all periods when disinfection is practiced.

Item: 3. Dissolved oxygen.

Specifications: Shall not be less than 4.0 mg/l at any time.

Item: 4. pH.

Specifications: The normal range shall not be extended by more than 0.1 pH unit.

Item: 5. Turbidity.

Specifications: No increase except from natural sources that will cause a substantial visible contrast to natural conditions. In cases of naturally turbid waters, the contrast will be due to increased turbidity.

Item: 6. Color.

Specifications: None from man-made sources that will be detrimental to anticipated best usage of waters.

Item: 7. Taste and odor-producing substances, toxic wastes and deleterious substances.

Specifications: None in amounts that will interfere with use for secondary contact recreation or that will be injurious to edible fish or shellfish or the culture or propagation thereof, or which in any manner shall

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Lenz and Riecker, State of New York Official Compilation of Codes, Rules and Regulations, Title 6 NYCRR Conservation, published for the Department of State, 1967.

STATE OF NEW YORK

OFFICIAL COMPILATION

OF

CODES, RULES AND REGULATIONS

MARIO M. CUOMO
Governor

GAIL S. SHAFFER
Secretary of State

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Vol. C

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ARTICLE 8

Lake Erie — Niagara River Drainage Basin Series

837.4 Table I.

TABLE I

Classifications and Standards of Quality and Purity Which Are Assigned to All Surface Waters within the Lake Erie (East End) - Niagara River Drainage Basin; Erie, Niagara, Genesee, Orleans and Wyoming Counties, New York

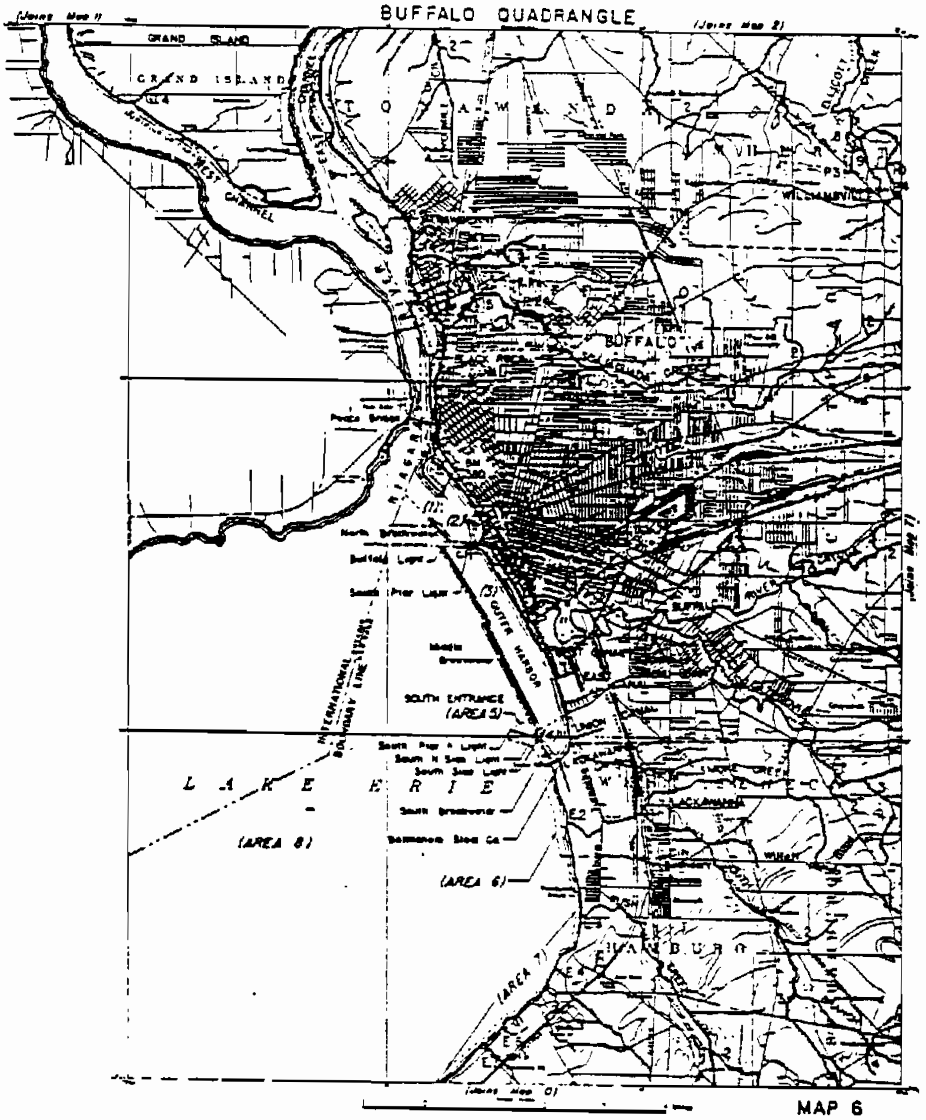
Item No.	Waters Index Number	Name	Description	Map Ref. No.	Class	Standards
1	0-158	Niagara River American side	Waters from international boundary to American shore between confluence with Lake Ontario and Lake Erie. Latter point is defined as a line running due west from south end of Bird Island ier to international boundary. These waters include all bays, arms, and inlets thereof, but not trib. streams or Black Rock Canal.	1,2,6	A-Special (inter-national boundary waters)	A-Special (inter-national boundary waters)
2	Black Rock Canal	Black Rock Canal	Waters east of Sqaw Island and Bird Island ier between canal locks and a line from south end of Bird Island ier to Buffalo harbor light #6.	6	C	C
3	0-158-1 and 2	Tributaries of Niagara River	Enter Niagara River from east in Town of Lewiston approximately 4.5 and 7.0 miles respectively from mouth.	1	C	C
4	0-158-3	Fish Creek	Enters Niagara River from east approximately 2.0 miles north of Niagara-Lewiston town line.	1,2	D	D
5	0-158-4 and P 1	Tributary of Niagara River	Enters Niagara River from east approximately 0.7 mile north of Niagara-Lewiston town line.	1	D	D

TABLE I (contd.)

Item No.	Waters Index Number	Name	Description	Map Ref. No.	Class	Standards
111	0-158-12-77-3 and trib. and 4 as shown on reference map	Tribs. of East Fork	Enter East Fork between Engine Creek, item no. 110, and source.	12	A	A(T)
112	0-158-12-78	Perry Brook	Enters Tonawanda Creek from south approximately 2.8 miles southwest of Johnsonburg.	12	A	A
113	0-185-12-79 and trib. and 80	Tribs. of Tonawanda Creek	Enter Tonawanda Creek between Perry Brook, item no. 112, and source.	12	A	A
114	0-158-13 and tribs. including P 22 as shown on reference map	Two Mile Creek	Enters Niagara River (East Channel) at Two Mile Creek Road in City of Tonawanda.	2,6	B	B
115	0-158-14 and tribs. as shown on reference map	Trib. of Niagara River	Enters Niagara River approximately opposite intersection of Ontario Street and Niagara Street, City of Buffalo.	6	D	D
116	0-158-15 portion as described including P 24 and P 25	Scajaquada Creek	Enters Niagara River approximately opposite intersection of Niagara Street and Tonawanda Street, City of Buffalo. Mouth to crossing of Main Street, City of Buffalo.	6	B	B

TABLE I (contd.)

Item No.	Waters Index Number	Name	Description	Map Ref. No.	Class	Standards
117	0-158-15 portion	Scajaquada Creek	From crossing of Main Street, City of Buffalo to trib. 4 which	6	D	D


BUFFALO QUADRANGLE
(Joins Map 1)
(Joins Map 2)
GRAND ISLAND
WEST CHANNEL
EAST CHANNEL
TONAWANDA
WILLIAMSVILLE
BUFFALO
Peace Bridge
NIAGARA RIVER
North Breakwater
Buffalo Light
South Pier Light
(1)
(2)
(3)
OUTER HARBOR
Middle Breakwater
SOUTH ENTRANCE (AREA 5)
INTERNATIONAL BOUNDARY LINE
South Pier A Light
South N Side Light
South Side Light
L A K E E R I E
South Breakwater
Bethlehem Steel Co.
(AREA 8)
(AREA 6)
(AREA 7)
LACKAWANNA
HAMBURG
(Joins Map 7)

MAP 6

A-6

New York State Department of Health, New York State Atlas of Community Water System Sources, 1982.

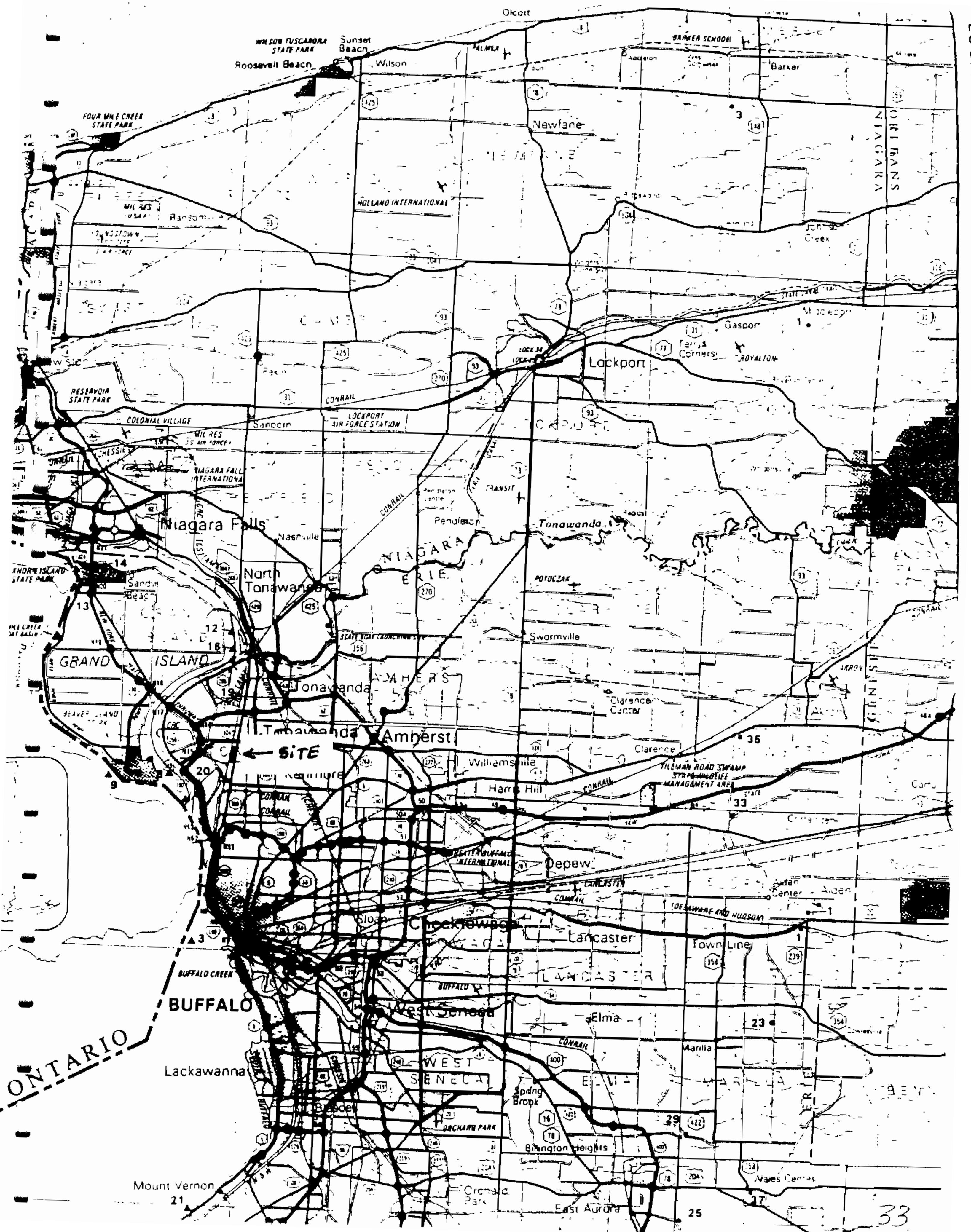
DEC - 5

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

ID NO	...MUNIT, ...R SYS...	OPULA...	SOU...
Municipal Community			
	Akron Village (See No 1 Wyoming Co, Page 10)	3640	
1	Alden Village	3060	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

NO	...UNITY SYST...	...RATIO	...OURCE
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
	North Tonawanda City (See No 16 Erie Co)	36000	
Non Municipal Community			
3	Country Estates Mobile Village	28	Wells


Olcott
WILSON TUSCARORA STATE PARK
Sunset Beach
Roosevelt Beach
Wilson
BARKER SCHOOL
Barker
FOUR MILE CREEK STATE PARK
Newfane
HOLLAND INTERNATIONAL
Ransomville
Johnson Creek
Gasport
Middleport
Terry's Corners
ROYALTON
Lockport
LOCK 34
Pekin
CONRAIL
LOCKPORT AIR FORCE STATION
RESERVOIR STATE PARK
COLONIAL VILLAGE
Sanborn
CHESSIE
NIAGARA FALLS INTERNATIONAL
TRANSIT
Pendleton
Tonawanda
Niagara Falls
Nashville
NIAGARA
ERIE
North Tonawanda
POTOCZAK
Sandy Beach
GRAND ISLAND
Swormville
Tonawanda
AMHERST
Clarence Center
Akron
SITE
Amherst
Kenmore
Williamsville
Clarence
TILLMAN ROAD SWAMP STATE WILDLIFE MANAGEMENT AREA
Harris Hill
GREATER BUFFALO INTERNATIONAL
Depew
Alden Center
Alden
LANCASTER
DELAWARE AND HUDSON
Sloan
Cheektowaga
Lancaster
Town Line
BUFFALO CREEK
BUFFALO
West Seneca
Elma
Marilla
ONTARIO
Lackawanna
WEST SENECA
ELMA
Spring Brook
ORCHARD PARK
Billington Heights
Wales Center
Mount Vernon
Orchard Park
East Aurora

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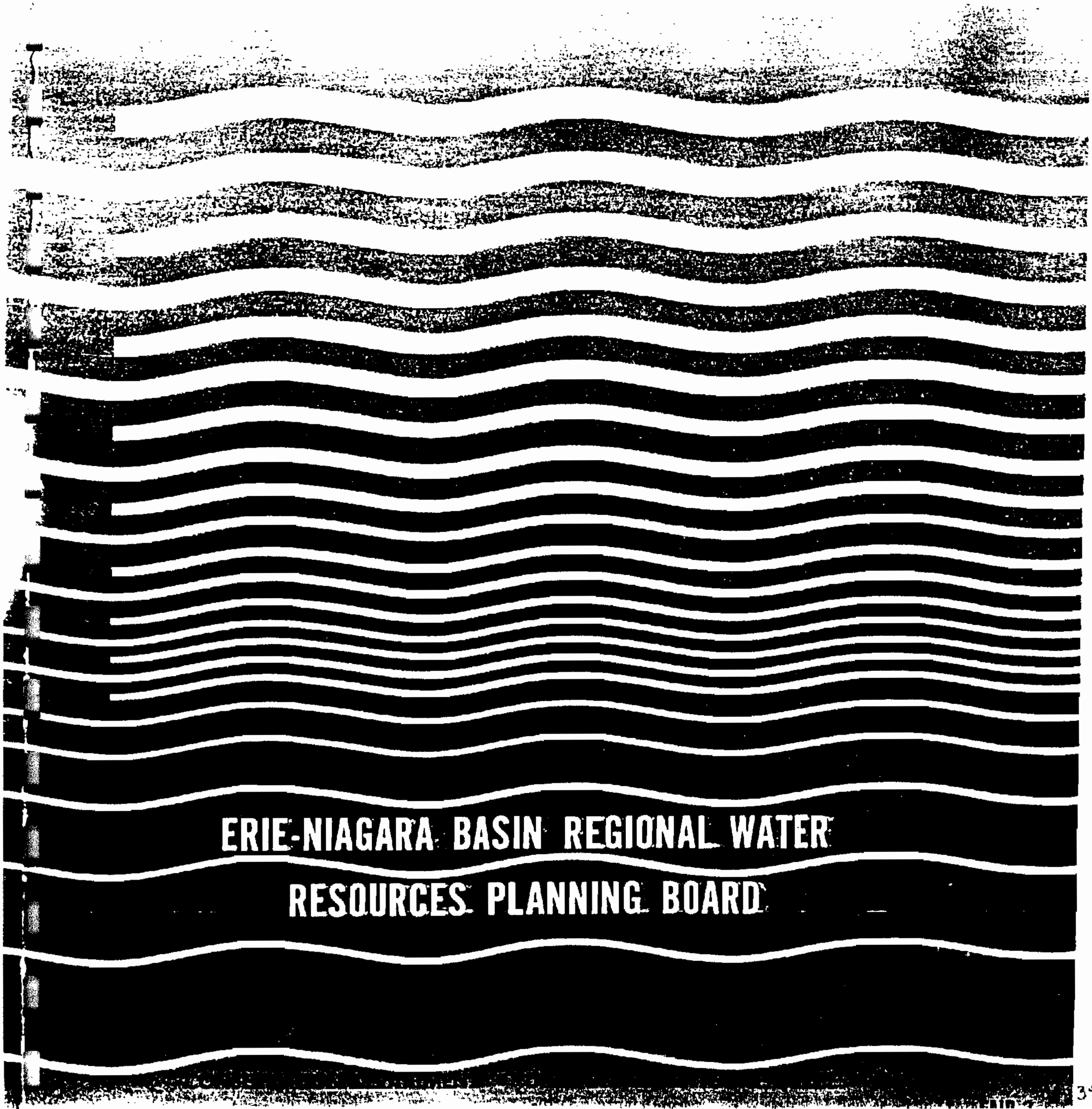
LaSala, A. M., Jr., Groundwater Resources of the Erie-Niagara Basin, New York, New York State Department of Conservation, Water Resources Commission, Albany, New York, 1968.

Erie-Niagara Basin

Ground-Water Resources



ERIE-NIAGARA BASIN REGIONAL WATER
RESOURCES PLANNING BOARD

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

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

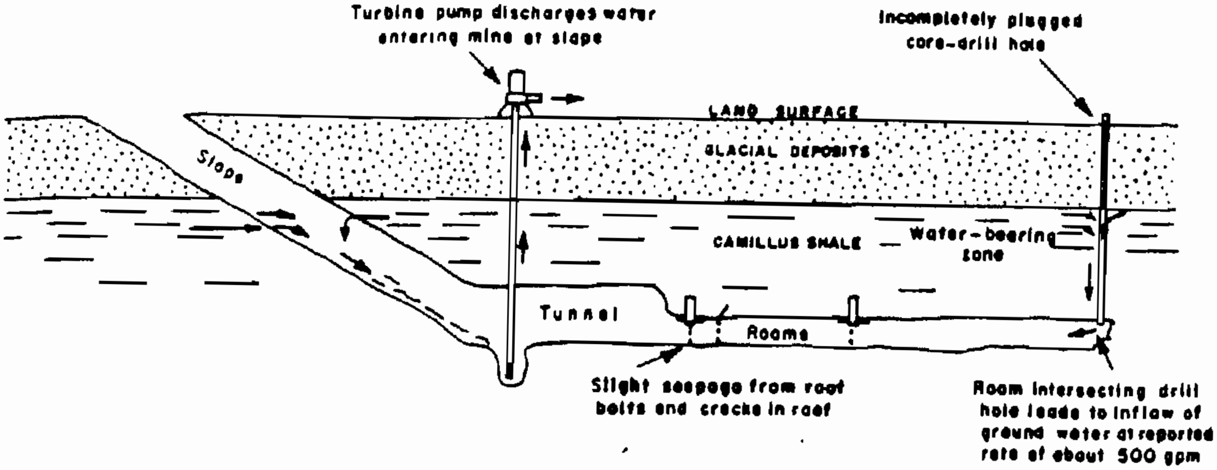


Figure 6.--Occurrence of ground water in the Camillus Shale at a gypsum mine near Clarence Center.

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.

Table 6.--Records of selected wells in the Erie-Niagara basin (Continued)

Well number	County	Owner	Year com-pleted	Type of well	Depth of well (feet)	Diameter (inches)	Depth to bedrock (feet)	Water-bearing material	Altitude above sea level (feet)	Water level: Below land surface (feet)	Water level: Date	Method of lift	Estimated pumpage or flow (gallons per day)	Use	Remarks
254-829-3	Erie	Village of Alden	1964	Drl	ra35	--	--	Sand and gravel	845	--	--	Tur	--	PS	Construction of well is reported to be similar to that of well 254-829-1; yield 220 gpm.
254-830-1	do.	W. and J. Fahringer	e1904	Drl	r1,150	8	--	Lockport Dolomite?	840	r350	8-63	Dw	--	C	Gas test well which yields a black brine used for mineral baths.
254-834-1	do.	G. Glase	1962	Drl	66.2	10	a7	Shale	770	p26.3	8-19-64	Jet	450	D	H_2S.
-2	do.	R. Mews	1961	Drl	52.9	6	a10	do.	765	7.1	8-19-64	Jet	200	D	Iron; H_2S; water-bearing zone at 25 feet; blasting charge fired at 20-25 ft to increase yield.
255-812-1	Genesee	Western New York Concrete Corp.	1957	Drl	85.9	8	--	Sand and gravel	965	2.4	7-17-63	--	--	A	Anal; screen, 8-inch diameter; 77.9-85.9 ft; pumping test 60 gpm, swl 3 ft, dd 42 ft (r).
-2	do.	do.	1957	Drl	81.4	8	--	do.	970	7.3	7-17-63	--	--	A	Yield about 50 gpm (r); Dw.
-3	do.	H. Earl	1944	Drl	38.5	6	--	do.	945	6.3	6-16-64	Sw	1,000	F	Iron.
255-848-1	Erie	Commodore Theater	--	Drl	r75	8	7	Limestone	640	8	1951	Tur	--	C	Air-conditioning use; pumping data, 130 gpm, dd 10 ft (r).
255-850-1	do.	Hegel Dairy	--	Drl	r90	8	20	do.	660	r,p20	1951	Tur	--	C	Pumping data, 180 gpm, dd 45 ft.
256-818-1	Genesee	B. Hegge	1959	Drl	45	6	a30	Shale	935	9.7	7-30-64	Jet	700	F	Yield 8 gpm (r).
256-822-1	do.	K. Skeet	1962	Drl	27.5	6	3	do.	890	7.3	7-30-64	Sw	300	D	Anal; H_2S.
256-831-1	Erie	Sieracki	1959	Drl	52.3	6	a40	do.	800	16.6	8-19-64	Jet	200	D	Anal.
256-835-1	do.	Huber	1964	Drl	68.5	6	--	do.	770	18.7	7-23-64	--	--	D	
-2	do.	C. Suess	1958	Drl	59	6	a34	Limestone	750	29.6	8-19-64	Jet	250	D	Anal.
256-844-1	do.	Twin Industries Corp., Aerospace Division	1951	Drl	r117	6	--	do.	715	--	--	Tur	--	U, I	Iron; H_2S; well is unused because quality of water has deteriorated, formerly supplied 150,000 gpd; yield about 285 gpm.
-2	do.	do.	1951	Drl	90	8	--	do.	715	r45	7- 3-64	--	--	U, I	
257-812-1	Genesee	E. Foster	1955	Drl	65	6	--	Sand and gravel	895	5.2	6-16-64	Jet	1,500	F	
-2	do.	W. Cook	1960	Drl	71.3	6	--	do.	895	5.2	6-16-64	Sw	150	D	Anal; iron.
253-817-1	do.	J. Penkazyck	1961	Drl	r52	--	--	Shale	920	--	--	Jet	--	D	Iron.
257-824-1	do.	Village of Corfu	1954	Drl	r39.3	12, 8	30	Sand and gravel; shale	850	6	1- 6-54	Tur	55,000	PS	Temp 49 B, 1-17-63; screen, 8-inch diameter, 100-slot from 34.3-39.3 ft; 12-inch diameter gravel pack from 32-39.3 ft; pumping rate 90 gpm; pumping test 100 gpm, swl 6 ft, dd 11 ft.
-2	do.	do.	1952	Drl	r36.6	12	32	do.	850	4	10-27-52	--	--	A	Pumping test, 110 gpm, swl 4 ft, dd 12 ft.
257-855-1	Erie	E. I. du Pont de Nemours & Co.	1925	Drl	r101	8	55	Camillus Shale	590	r30	1951	AL	--	A, I	Yield 125 gpm; 1 of 3 wells of the "north" well field, combined pumpage was 200,000 gpd.
-2	do.	do.	1925	Drl	r123	8	55	do.	590	r30	1951	AL	--	A, I	Yield 125 gpm; 1 of 7 wells of the "south" well field, combined pumpage was 1 mgd.
258-809-1	Genesee	D-AT-KA Milk Products Cooperative, Inc.	1958	Drl	r49.2	18, 10	--	Sand and gravel	900	26.5	8- 1-58	Tur	--	I	Screen, 10-inch diameter, 125-slot, from 41 to 49 ft, gravel packed, Cape May No. 5 gravel; pumping test, 456 gpm, swl 26.5 ft, dd 12.8 ft.
-2	do.	do.	1958	Drl	--	8	--	do.	900	22.2	5- 8-63	Tur	--	I	
258-813-1	do.	H. Loveland	--	Drl	11.7	3	--	Shale	900	8.1	6-26-63	--	--	A	
-2	do.	do.	--	Drl	33	6	--	do.	900	12.3	6-26-63	Sw	--	U	Anal, iron; temp 48.0.

Table 6.--Records of selected wells in the Erie-Niagara basin (Continued)

Well number	County	Owner	Year completed	Type of well	Depth of well (feet)	Diameter (inches)	Depth to bedrock (feet)	Water-bearing material	Altitude above sea level (feet)	Water level: Below land surface (feet)	Water level: Date	Method of lift	Estimated pumpage or flow (gallons per day)	Use	Remarks
258-815-1	Genesee	F. Peck	--	Dr	31	6	--	Shale	920	8.1	6-26-63	Sw	50	D	Anal, iron; temp 49.0; yield 12 gpm (r).
258-822-1	do.	E. Lewis	1964	Dr	41.6	6	41.6	Sand	870	9.1	8-19-64	Sw	400	Ag	Anal, H_2S; yield 11 gpm (r).
258-827-1	do.	E. Powanski	1952	Dr	36.5	6	e14	Limestone	835	31.3	8-19-64	Jet	250	D	H_2S; yield 7 gpm (r).
258-833-1	Erie	B. Fields	1960	Dr	62.6	6	e13	do.	775	p22.7	8-18-64	Sub	300	D	Anal.
258-837-1	do.	D. Bowman	1956	Dr	76.2	6	e22	do.	740	19.4	8-18-64	Jet	300	D	Do.
258-843-1	do.	W. Vose	--	Dr	62	8	--	Camillus Shale	615	Flow	--	--	5,000	A	Anal; H_2S; temp 50.8, 8-14-64; flows about 5 gpm at LS.
* 258-853-1	do.	Linde Div., Union Carbide Corp.	1944	Dr	r375	8	87	Camillus Shale and Lockport Dolomite	600	r,p115	1944	Tur	--	U	H_2S; drilled to 130-ft depth in 1943 and deepened in 1944; "black" water entering from Lockport Dolomite after deepening made well unusable; yield 3,000 gpm (r); pumping test, 1,090 gpm, dd 53 ft.
-2	do.	do.	1944	Dr	r375	8	86	do.	600	r,p82	1944	Tur	--	U	H_2S; drilled to 157-ft depth in 1943 and deepened in 1944; water obtained at 90 ft from a gypsiferous zone in Camillus Shale and "black" water at 312 ft from the Lockport Dolomite which was first penetrated at 288 ft; yield from upper water-bearing zone 90 gpm, dd 22 ft; lower zone was not tested.
* 258-855-1	do.	Dunlop Tire & Rubber Co.	1943	Dr	r137	12	69	Camillus Shale	590	p36	10-27-52	Tur	--	I	H_2S; pumping rate 1,000 gpm (r); pumping test 500 gpm, swl 36 ft, dd 17 ft; this well and well 258-855-2 yield a combined total of 600,000 gpd.
-2	do.	do.	1943	Dr	r139.7	--	71	do.	590	p54.3	7-16-64	Tur	--	I	H_2S; pumping rate about 1,000 gpm (r); pumping test 1,000 gpm, swl 36 ft, dd 26 ft, this well and well 258-855-1 yield a combined total of 600,000 gpd.
-3	do.	do.	1952	Dr	r120	--	--	do.	592	p39	10-27-52	Tur	--	I	H_2S; pumping test 1,500 gpm, swl 39 ft, dd 38 ft.
259-809-1	Genesee	O-AT-KA Milk Products Cooperative, Inc.	1963	Dr	r60	20, 16	--	Sand and gravel	890	r15	4-23-62	Tur	1,000,000	I	Anal, screen, 13 1/8-inch diameter, 10 ft of 60-slot, 10 ft of 125-slot, from 40-60 ft; pumping rate about 1,200 gpm (r); pumping test 680 gpm, swl 15 ft, dd 1.5 ft (r).
-2	do.	City of Batavia	1963	Dr	r69	16	--	do.	890	14.0	5- 8-63	Tur	--	PS	Anal, H_2S, screen, 16-inch telescope, 125-slot, 52.9-69 ft; pumping rate 1,000 gpm.
-3	do.	do.	1962	Dr	54.1	8	--	do.	850	11.7	5- 6-63	--	--	T	Depth 61 ft (r), screen, 6-inch diameter, 100-slot, from 51-61 ft; pumping test 235 gpm, swl 18.3 ft, dd 0.5 ft (r); Ow.
-4	do.	O-AT-KA Milk Products Cooperative, Inc.	1961	Dr	52.2	8	--	do.	890	p13.0	5- 7-63	--	--	T	
-5	do.	City of Batavia	1962	Dr	60.2	8	--	do.	890	13.7	5- 8-63	--	400,000	T	Depth 70 ft (r); screen, 6-inch diameter, 100-slot, from 60-70 ft; pumping test (r), 235-159 gpm, swl 18.5 ft, dd 8.5 ft after 24 hours discharge.
-6	do.	do.	1963	Dr	r75	16	--	do.	895	r14.2	5-27-63	Tur	--	PS	Screen, 16-inch diameter; test pumped at 1,000 gpm.
-7	do.	do.	1963	Dr	r60	8	--	do.	890	r13.7	2-15-62	--	400,000	I, T	H_2S (r); pumping test 200 gpm, swl 13.7 ft, dd 4.4 ft after 24 hours discharge.
259-817-1	do.	D. Beals	1960	Dr	r33	--	--	do.	865	r1	1960	Sw	100	D	Anal; H_2S; yield 4 gpm (r).
259-818-1	do.	Bitterman Bros., Inc.	--	Dr	18.3	12, 6	--	do.	--	6.6	9-17-63	Sw	--	C, D	
259-820-1	do.	A. Winters	1960	Dr	22.6	6	--	Limestone	880	7.4	9-17-63	Sw	500	C, D	
259-822-1	do.	J. Daley	1956	Dr	70	6	--	Sand	900	27.1	8-19-64	Jet	200	D	Anal; H_2S.

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Donnelly Marketing Information Services, A Company of the Dun & Bradstreet Corporation, Current Estimated Total Population, September, 1990.

DONNELLEY MARKETING INFORMATION SERVICES
A COMPANY OF THE DUN & BRADSTREET CORP

DUNN GEOSCIENCE CORP

SEPTEMBER 6, 1990

AREANAME	AREADESC				POP90
RTE 242/RTE 16, MACHIAS, NY	Ring: 1 mile(s):	42.4078	78.4842		139
RTE 242/RTE 16, MACHIAS, NY	Ring: 2 mile(s):	42.4078	78.4842		2004
RTE 242/RTE 16, MACHIAS, NY	Ring: 3 mile(s):	42.4078	78.4842		2004
STRINGHAM RD S OF RTE 55, LAGRANGE, NY	Ring: 1 mile(s):	41.6633	73.7972		0
STRINGHAM RD S OF RTE 55, LAGRANGE, NY	Ring: 2 mile(s):	41.6633	73.7972		4758
STRINGHAM RD S OF RTE 55, LAGRANGE, NY	Ring: 3 mile(s):	41.6633	73.7972		12222
CRICKET HILL RD EAST OF RT 22, DOVER, NY	Ring: 1 mile(s):	41.6756	73.5711		2068
CRICKET HILL RD EAST OF RT 22, DOVER, NY	Ring: 2 mile(s):	41.6756	73.5711		4137
CRICKET HILL RD EAST OF RT 22, DOVER, NY	Ring: 3 mile(s):	41.6756	73.5711		7161
PINE HILL RD/RTE 44, PLEASANT VALLEY, NY	Ring: 1 mile(s):	41.7506	73.8078		2469
PINE HILL RD/RTE 44, PLEASANT VALLEY, NY	Ring: 2 mile(s):	41.7506	73.8078		2469
PINE HILL RD/RTE 44, PLEASANT VALLEY, NY	Ring: 3 mile(s):	41.7506	73.8078		6366
S ROBERTS RD/NEW RD, DUNKIRK, NY	Ring: 1 mile(s):	42.4736	79.3056		1987
S ROBERTS RD/NEW RD, DUNKIRK, NY	Ring: 2 mile(s):	42.4736	79.3056		14905
S ROBERTS RD/NEW RD, DUNKIRK, NY	Ring: 3 mile(s):	42.4736	79.3056		24419
WASHINGTON AVE/18TH ST, JAMESTOWN, NY	Ring: 1 mile(s):	42.1081	79.2456		11132
WASHINGTON AVE/18TH ST, JAMESTOWN, NY	Ring: 2 mile(s):	42.1081	79.2456		33672
WASHINGTON AVE/18TH ST, JAMESTOWN, NY	Ring: 3 mile(s):	42.1081	79.2456		40054
NE OF OBI RD/RTE 417, LITTLE GENESEE, NY	Ring: 1 mile(s):	42.0361	78.1931		0
NE OF OBI RD/RTE 417, LITTLE GENESEE, NY	Ring: 2 mile(s):	42.0361	78.1931		703
NE OF OBI RD/RTE 417, LITTLE GENESEE, NY	Ring: 3 mile(s):	42.0361	78.1931		2078
E NIAGARA ST/WALES AVE, TONAWANDA, NY	Ring: 1 mile(s):	43.0221	78.8595		16569
E NIAGARA ST/WALES AVE, TONAWANDA, NY	Ring: 2 mile(s):	43.0221	78.8595		45789
E NIAGARA ST/WALES AVE, TONAWANDA, NY	Ring: 3 mile(s):	43.0221	78.8595		94917
WALES AVE/FILLMORE AVE, TONAWANDA, NY	Ring: 1 mile(s):	43.0153	78.8595		15379
WALES AVE/FILLMORE AVE, TONAWANDA, NY	Ring: 2 mile(s):	43.0153	78.8595		51604
WALES AVE/FILLMORE AVE, TONAWANDA, NY	Ring: 3 mile(s):	43.0153	78.8595		100617
MILITARY RD/SAYRE AVE, BUFFALO, NY	Ring: 1 mile(s):	42.9473	78.8909		23669
MILITARY RD/SAYRE AVE, BUFFALO, NY	Ring: 2 mile(s):	42.9473	78.8909	ANACONDA	74062
MILITARY RD/SAYRE AVE, BUFFALO, NY	Ring: 3 mile(s):	42.9473	78.8909		157259
MILITARY RD/WHEELER ST, TONAWANDA, NY	Ring: 1 mile(s):	43.0025	78.8814		15508
MILITARY RD/WHEELER ST, TONAWANDA, NY	Ring: 2 mile(s):	43.0025	78.8814	spaulding	44353
MILITARY RD/WHEELER ST, TONAWANDA, NY	Ring: 3 mile(s):	43.0025	78.8814		97769
2250 MILITARY RD, TONAWANDA, NY	Ring: 1 mile(s):	42.9984	78.8822		14257
2250 MILITARY RD, TONAWANDA, NY	Ring: 2 mile(s):	42.9984	78.8822		46922
2250 MILITARY RD, TONAWANDA, NY	Ring: 3 mile(s):	42.9984	78.8822		106180
KENMORE AVE/I-190, TONAWANDA, NY	Ring: 1 mile(s):	42.9753	78.9108		2176
KENMORE AVE/I-190, TONAWANDA, NY	Ring: 2 mile(s):	42.9753	78.9108		30012
KENMORE AVE/I-190, TONAWANDA, NY	Ring: 3 mile(s):	42.9753	78.9108		81425
MILITARY RD/HAMPTON PKWY, TONAWANDA, NY	Ring: 1 mile(s):	42.9786	78.8856	ALUM - MTCHPLATE	14991

AREANAME AREANAME
AREADESC AREADESC
POP90 CUR EST TOTAL POPULATION

DUNN GEOSCIENCE CORP

SEPTEMBER 6, 1990

AREANAME	AREADESC	POP90
MILITARY RD/HAMPTON PKWY, TONAWANDA, NY	Ring: 2 mile(s): 42.9786 78.8856	59560
MILITARY RD/HAMPTON PKWY, TONAWANDA, NY	Ring: 3 mile(s): 42.9786 78.8856	128481
172 EATON ST, SPRINGVILLE, NY	Ring: 1 mile(s): 42.5144 78.6604	4588
172 EATON ST, SPRINGVILLE, NY	Ring: 2 mile(s): 42.5144 78.6604	5006
172 EATON ST, SPRINGVILLE, NY	Ring: 3 mile(s): 42.5144 78.6604	6991
HOPKINS ST/MARILLA ST, BUFFALO, NY	Ring: 1 mile(s): 42.8360 78.8326	12461
HOPKINS ST/MARILLA ST, BUFFALO, NY	Ring: 2 mile(s): 42.8360 78.8326	55717
HOPKINS ST/MARILLA ST, BUFFALO, NY	Ring: 3 mile(s): 42.8360 78.8326	91920

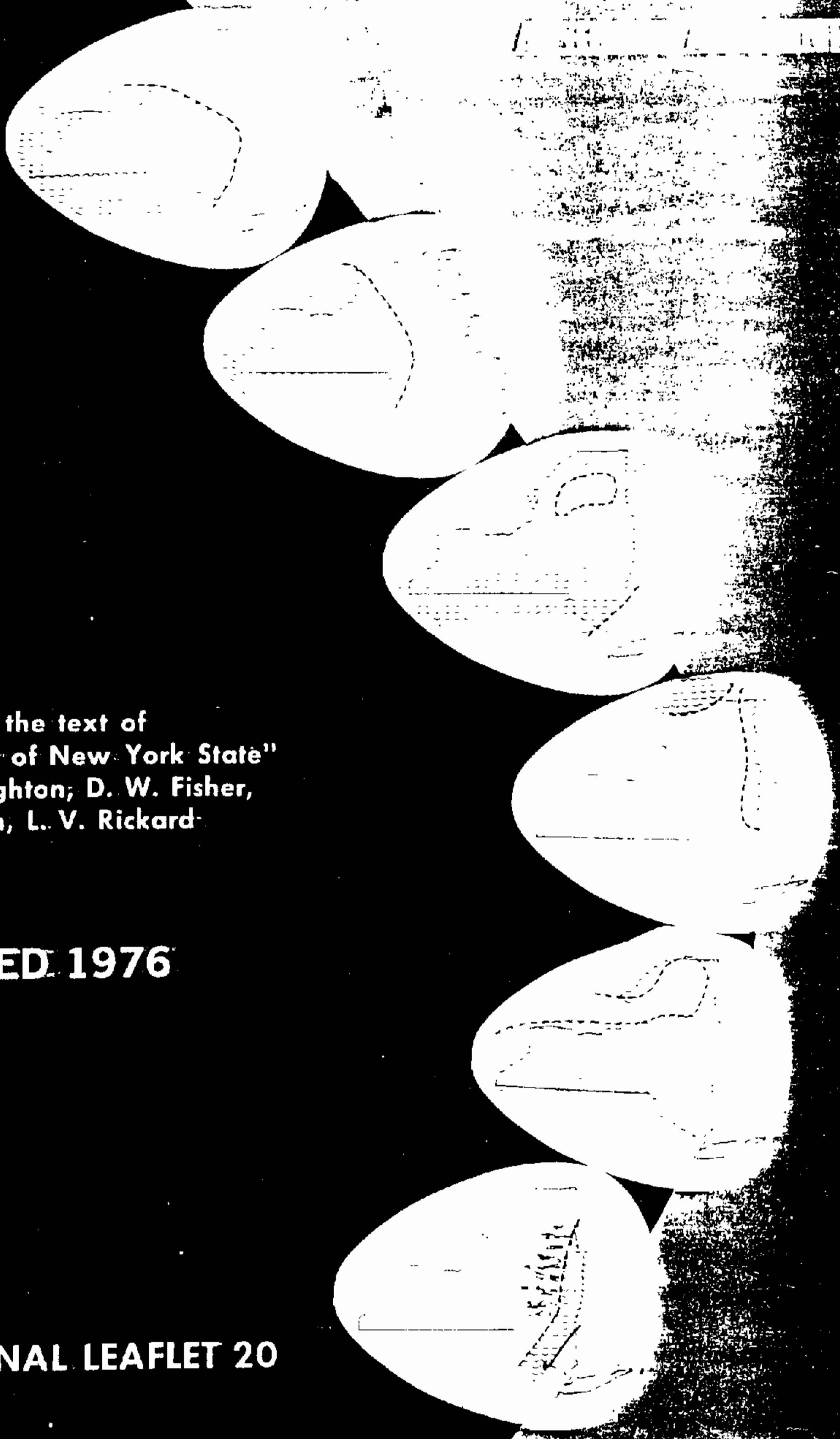
AREANAME : AREANAME
AREADESC . AREADESC
POP90 : CUR EST TOTAL POPULATION

45

A-9

Broughton, J. G., Fisher, D. W., Isachsen, Y. W., Rickard, L. V., Geology of New York State - A Short Account, Education Leaflet 20. The University of the State of New York/The State Education Department, NYS Museum and Science Service, Albany, New York, 1976.

Geology of New York



adapted from the text of
"Geologic Map of New York State"
by J. G. Broughton, D. W. Fisher,
Y. W. Isachsen, L. V. Rickard

REPRINTED 1976

EDUCATIONAL LEAFLET 20

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NEW YORK STATE MUSEUM AND SCIENCE SERVICE / ALBANY / 1966

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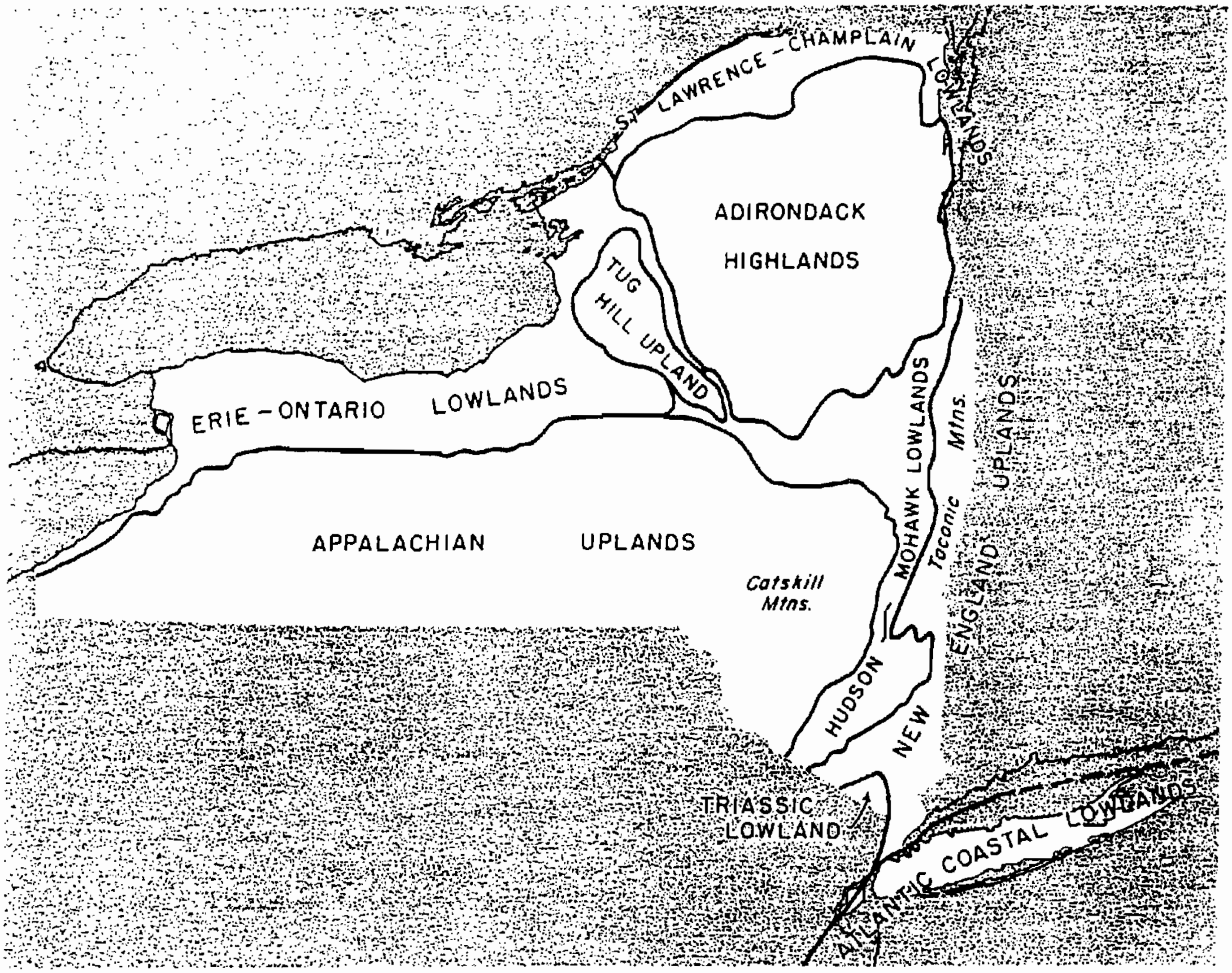

FIGURE 19. Physiographic provinces of New York, based on relief and geology (Modified after G. B. Cressey, 1952)

Cenozoic Era

PHYSIOGRAPHIC PROVINCES AND TERTIARY HISTORY

The physiographic provinces of New York are shown in figure 19. Modern landscapes of the State were shaped largely during the Cenozoic Era, the most recent 65 million years of geologic history. Although the overall features later would be modified and blurred by glaciation, the broad outlines of modern mountain, valley, and plain first were carved by the unrelenting rush of water to the earlier Cenozoic seas.

The long sequence of erosion presumably began with the arching of the Jurassic Fall Zone erosion surface in mid-Cretaceous time. As its eastern flank dipped beneath the encroaching Atlantic Ocean to receive Coastal Plain deposits, the axis domed sufficiently to initiate the sculpture of the Appalachians and Adirondacks. Few, if any of today's land forms can be traced so far back, however. Most researchers believe that all the exposed remnants of the dissected Fall Zone surface were obliterated by subsequent erosion.

South of New York, at least a partial record of Tertiary geology persists in the Coastal Plain deposits. In addition to a sedimentary record, datable igneous intrusions cut rocks of varying degrees of deformation in the western states. But in New York, no such tangible evidence of Cenozoic events exists. The Coastal Plains sediments derived from the long-continued degradation of New York and New England now rest on the Continental

Shelf, beneath many fathoms of water. Because of a relatively recent tilting of the coastline about a northwest-southeast axis near New York City, the Coastal Plain has been raised south of New York; east and north of the city, all but the Long Island Cretaceous has been depressed below sea level.

Since exposed Tertiary sedimentary deposits are absent in New York, its geological history must be reconstructed from the only data available, the present physiographic features of the State. In an area as small as New York, where climate does not vary significantly, land forms have been determined primarily by geology. Characteristic differences between the physiographic provinces have resulted from the ways in which rocks of differing lithologies and structures have reacted to the erosional force of the Cenozoic. Thus, while many authorities have classified New York's physiographic provinces in various ways, all are more or less in agreement as to the outlines of the major provinces; they differ mainly in the names applied to the provinces. Those used here were proposed by George B. Cressey (1952, personal communication, J.G.B.). From north to south, the physiographic provinces of New York are:

St. Lawrence-Champlain Lowlands

New York's northernmost province includes the St. Lawrence River Valley (northeast of the Thousand Islands), the low hills south of the river valley, and the Lake Champlain Valley (figure 19). The underlying rocks —Cambrian and Ordovician sandstones, dolomites, and limestones—dip gently away from the Adirondacks. Relief is approximately 100 feet. Streams draining the northern and eastern slopes of the Adirondacks flow across the province. The shoreline of Lake Champlain is largely controlled by north-south and east-west faults which have chopped the Paleozoic sandstones and carbonates into large blocks.

Adirondack Highlands

The highest mountains in New York occur in the Adirondack Highlands, especially in the High Peaks region; the High Peaks, in the east-central part of the province, are underlain by anorthosite, which is highly resistant to erosion. Two peaks—Mt. Marcy and Mt. Algonquin—are over 5,000 feet in elevation, and many exceed 4,000 feet. Average relief in the Adirondack Highlands is 2,000 feet. North, west, and south of the High Peaks area, elevations decrease gradually; east to the Champlain Lowland, the slope is more abrupt.

The Adirondacks are transected by long, northeast-southwest lineaments, representing shear zones or major faults. The lineaments frequently control drainage and the shape of land forms. Many lakes follow geologic contacts, or are confined to valleys along weak metasedimentary rocks. Because glacial deposits have clogged the normal radial drainage, lower areas are dotted with lakes, ponds, and swamps.

Tug Hill Upland

The Tug Hill, an isolated upland in the eastern part of the Erie-Ontario Lowlands, is probably the most desolate area of the State. Elevation is 1,800 to 2,000 feet, and relief is very low. The Tug Hill results from a resistant cap rock of Oswego Sandstone (an Ordovician sedimentary quartzite), resting on a thick series of sandy shales. These, in turn, overlie Trenton and Black River limestones, which form a flight of rock terraces along the west side of the Black River Valley. The low slope of the cap rock and the thin cover of glacial deposits have caused poor drainage and many swamps.

Erie-Ontario Lowlands

This province encompasses the relatively low, flat areas lying south of Lake Erie and Lake Ontario and extending up the Black River Valley. From the lake levels of 570 feet and 244 feet, respectively, the land rises gently eastward and southward. The maximum elevation (1,000-1,500 feet) occurs along the Portage Escarpment, the boundary with the Appalachian Uplands to the south. Particularly in the Ontario Lowland, east-west escarpments are formed by the Onondaga Limestone and Lockport Dolomite. (The Lockport is the cap rock of Niagara Falls and the falls of the Genesee River at Rochester.) The simple erosional topography has been modified substantially by glacial deposition of drumlin fields, recessional moraines, and shoreline deposits.

Hudson-Mohawk Lowlands

The general topography of the Hudson-Mohawk Lowlands resulted from erosion along outcrop belts of weak rocks. In the Mohawk Lowlands, the outcrop belts lie between the Adirondacks and the Helderberg Escarpment; for the Hudson, they lie between the Catskills and the metamorphosed shale hills of the Taconics. Most of the province has low elevation and relief. It is underlain primarily by Ordovician shales which have been exposed by the southward and westward stripping off of Silurian and Devonian limestones.

A-10

U. S. Department of Agriculture, Soil Conservation Survey, in cooperation with Cornell University, Soil Survey of Erie County, 1986.

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United States
Department of
Agriculture

Soil
Conservation
Service

In Cooperation with
the Cornell University
Agricultural
Experiment Station

Soil Survey of Erie County, New York

ERIE COUNTY, NEW YORK — SHEET NUMB

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 irrigation and a stone-free plow layer.

soil is also well suited to pasture and hay. grazing can restrict plant growth and cause the loss pasture seeding. Proper stocking, rotation of ses; yearly mowing, and deferment of grazing when il is wet are the main management concerns. ations of lime are needed for optimum growth of grasses.

potential of this soil for wood crops is good. Only ll acreage is wooded. There are few limitations for 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 orption fields, pollution of the water supply can occur ause of flooding and because the substratum is derately to rapidly permeable. Some areas are well ed to recreational uses, such as athletic fields that quire a gravel- and stone-free, nearly level site. This is an excellent source of topsoil.

This Tioga soil is in capability class I.

Uc—Udorthents, smoothed. These soils formed in eep manmade cuts or fills. Most of these areas are ear industrial sites, urban developments, or construction ites. These soils consist of various kinds of excavated earthy material that has been stockpiled for use as fill or topdressing, soil and rock material that has been trucked from other areas and leveled, or soil deposits that are left in areas that have been excavated or deeply scalped. Fill material is variable in composition, but loamy, earthy material is dominant. In some places, the fill is mixed with slag or cinders around abandoned railroad yards. In other places, the earthy fill contains up to 10 percent concrete or asphalt and other trashy wastes.

This map unit is mainly nearly level or gently sloping. Some areas are steeper, particularly at the edge of cuts and along the sides of mounded fill. The areas are variable in shape, depending mostly on ownership boundaries. 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, but in one of the more common profiles the surface layer is 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 brown 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

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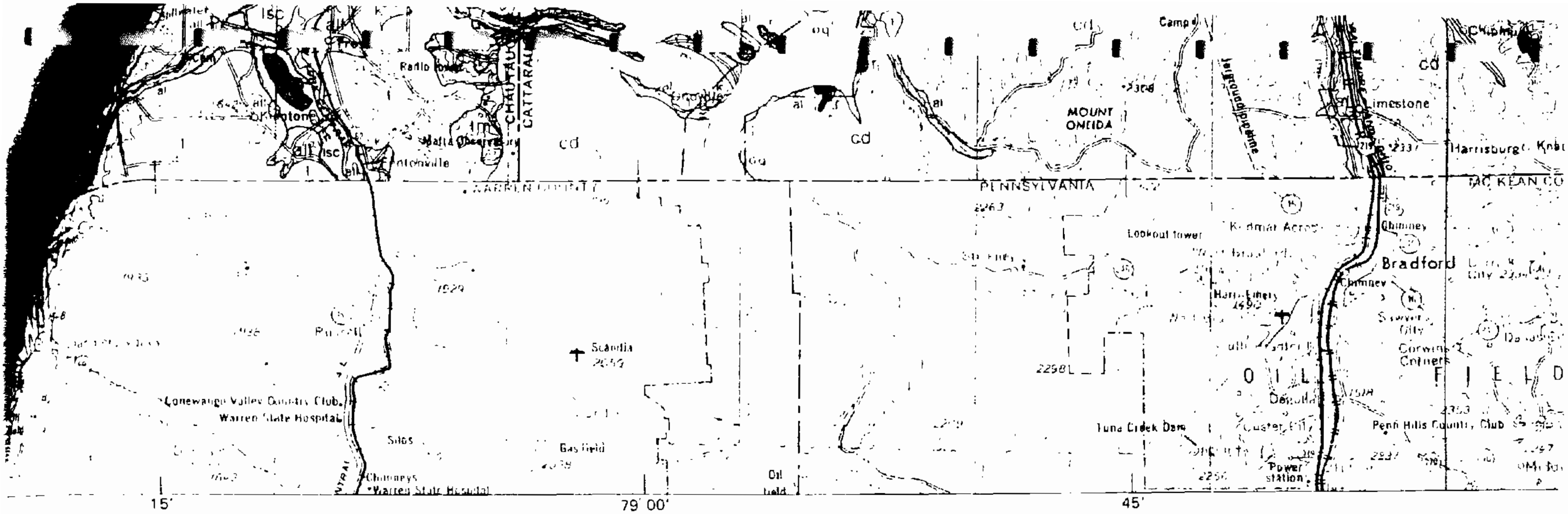
Cadwell, D. H., Surficial Geologic Map of New York, Niagara Sheet, 1988.



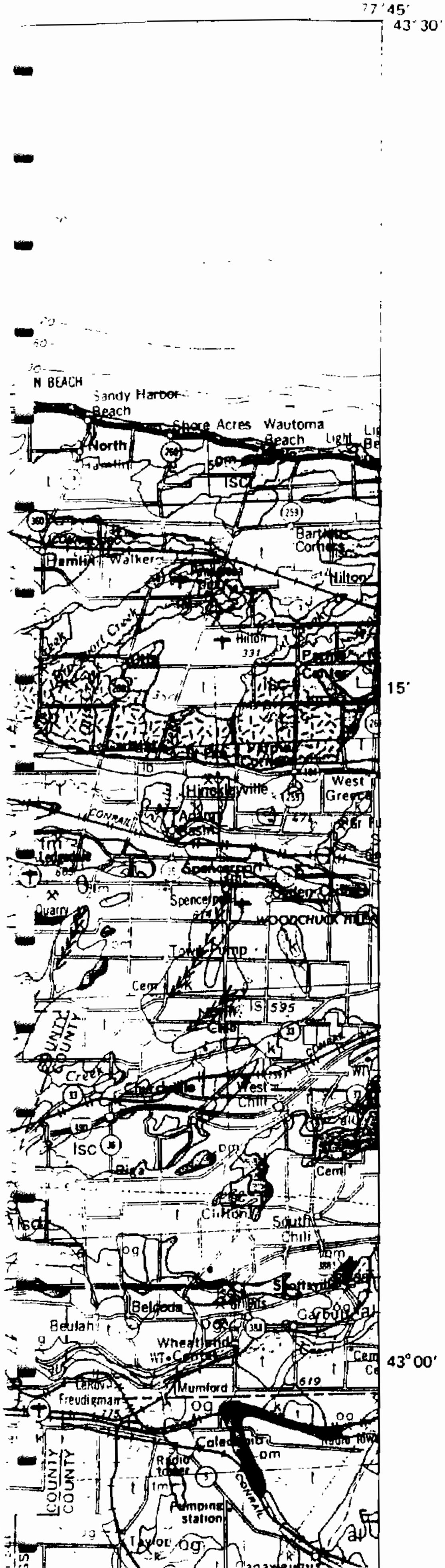
SURFICIAL GEOLOGIC MAP OF NEW YORK

NIAGARA SHEET

Compiled and Edited by Donald H. Cadwell

1988


BUFFALO
AMHERST
Williamsville
Grandyle Village
BEAVER IS ST PARK
Fort Erie
Crystal Beach
Point Abino
Port Colborne
Welland
Lighthouse
Woodlawn
Bay View
Athol Springs
Locksley Park
Mt Vernon
Wanakah
Clifton Heights
Pinehurst
Hamburg
Eden
Highland-on-the-Lake
Angola-on-the-Lake
EVANGOLA STATE PARK
Lotus Point
Seneca Shoal
Waverly Shoal
ONTARIO
NEW YORK
CANADA
UNITED STATES
CANADIAN NATIONAL
NEW YORK CENTRAL
QUEEN ELIZABETH WAY
C N ELECTRIFIED
Orchard Park
North Boston
Clarksburg
Langford
CATTARAUGUS
sand
rocky
mud
gravel
sand and mud
3
4
5
6



EXPLANATION

al	al — Recent deposits Generally confined to floodplains within a valley, oxidized, non-calcareous, fine sand to gravel, in larger valleys may be overlain by silt, subject to frequent flooding, thickness 1-10 meters.
alf	alf — Alluvial fan Fan shaped accumulations, poorly stratified silt, sand and boulders, at the foot of steep slopes, generally permeable.
co	co — Colluvium Mixture of sediments, deposited by mass wasting, thickness generally 1-5 meters.
cof	cof — Colluvial fan Fan shaped accumulation, mixture of sediments, at mouths of gullies, thickness generally 1-5 meters.
cd	cd — Colluvial diamicton Mixture of sediments, unique to region beyond Wisconsinan glacial limit, rebedded saprolite and glacial debris, may be old (Illinoian) drift, homogenized by varying degrees of colluviation, bedrock may sporadically crop out or be within 1-3 meters of the surface.
■	pm — Swamp deposits Peat-muck, organic silt and sand in poorly drained areas, un-oxidized, may overlay marl and lake silts, potential land instability, thickness generally 2-20 meters.
lb	lb — Lacustrine beach Generally well sorted sand and gravel, stratified, permeable and well drained, deposited at a lake shoreline, generally non-calcareous, may have wave-winnowed lag gravel, thickness variable (1-5 meters).
ld	ld — Lacustrine delta Coarse to fine gravel and sand, stratified, generally well sorted, deposited at a lake shoreline, thickness variable (3-15 meters).
▨	lsc — Lacustrine silt and clay Generally laminated silt and clay, deposited in proglacial lakes, generally calcareous, potential land instability, thickness variable (up to 100 meters); stipple overprint where bedrock is within 1-3 meters of the surface.
ls	ls — Lacustrine sand Sand deposits associated with large bodies of water, generally a near-shore deposit or near a sand source, well sorted, stratified, generally quartz sand, thickness variable (2-20 meters).

A-12

Geologic Map of New York, Niagara Sheet, 1970.

GEOLOGIC MAP OF NEW YORK

1970

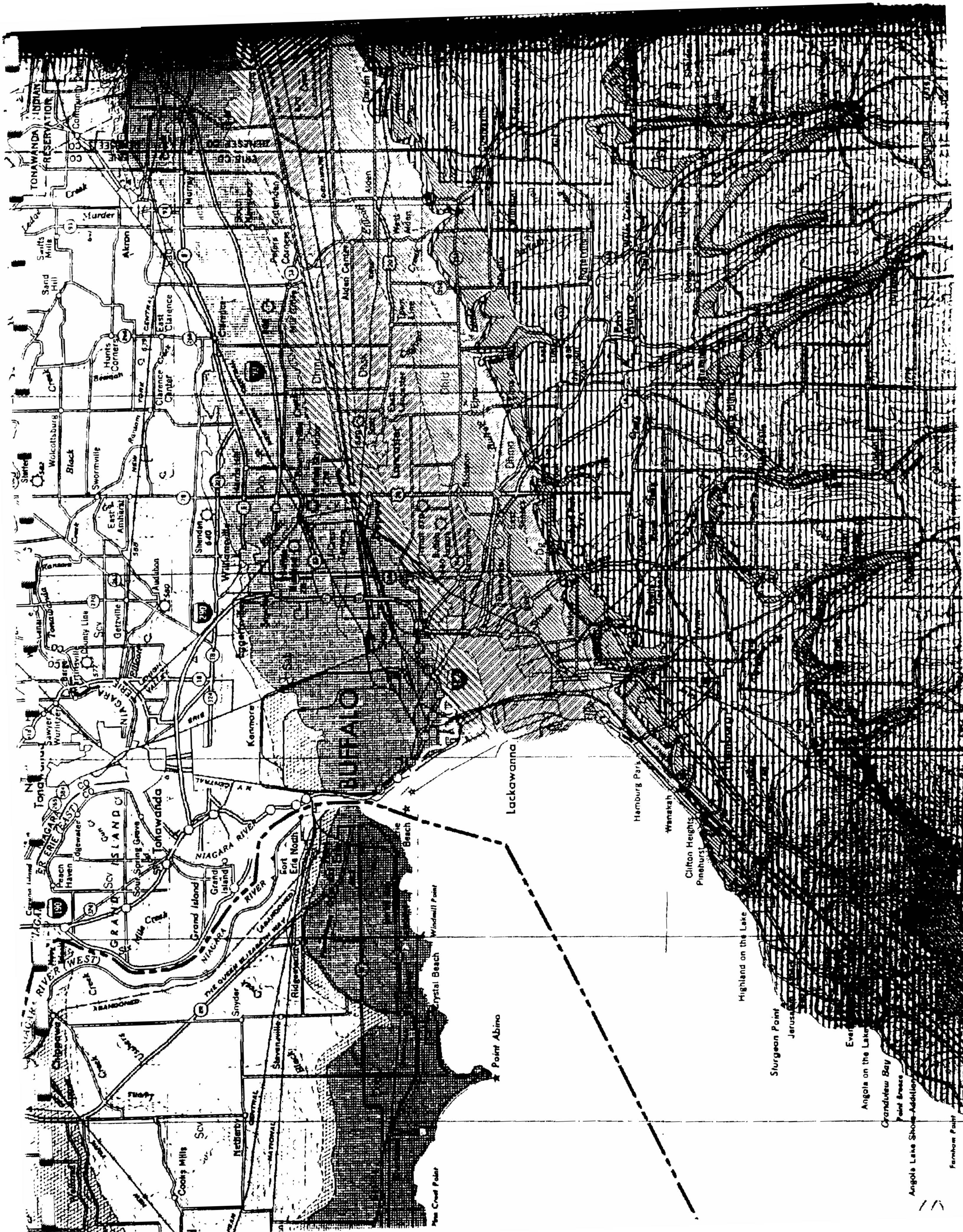
Niagara Sheet

Scale 1:250,000

5 0 5 10 15 Statute Miles 20

5 0 5 10 15 20 25 Kilometers 30

CONTOUR INTERVAL 100 FEET



TONAWANDA INDIAN RESERVATION
GENESEE CO
ERIE CO
Murder Creek
Swifts Mills
Akron
Sand Hill
Hunts Corners
Clarence Center
East Clarence
Clarence
Wolcottsburg
Black Creek
Swormville
East Amherst
Getzville
Audubon
Sheridan
Williamsville
Tonawanda Creek
County Line
Sawyer
Wurlitzer
Kenmore
BUFFALO
Lackawanna
Hamburg Park
Wanakah
Clifton Heights
Pinehurst
Highland on the Lake
Sturgeon Point
Angola on the Lake
Grandview Bay
Point Breeze
Angola Lake Shore Addition
Farnham Point
North Tonawanda
Tonawanda
GRAND ISLAND
Grand Island
Edgewater
Beach
Peach Haven
Sour Spring Grove
Six Mile Creek
NIAGARA RIVER
NIAGARA RIVER (EAST)
NIAGARA RIVER (WEST)
ERIE
Fort Erie North
Windmill Point
Crystal Beach
Ridgeway
Point Abino
Snyder
Stevensville
Chippawa
Cooks Mills
Netherby
Pine Crest Point
ABANDONED
Alden
Alden Center
West Alden
Lancaster
Cheektowaga
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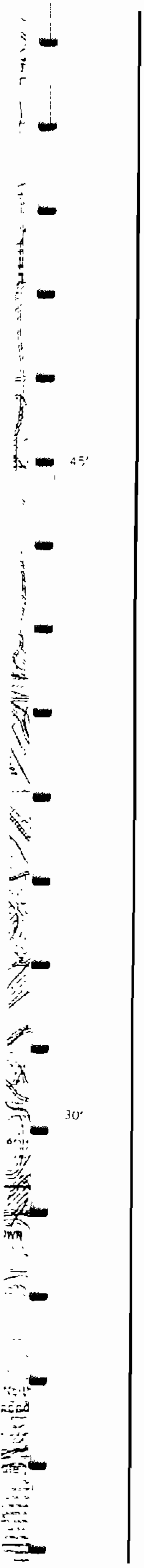

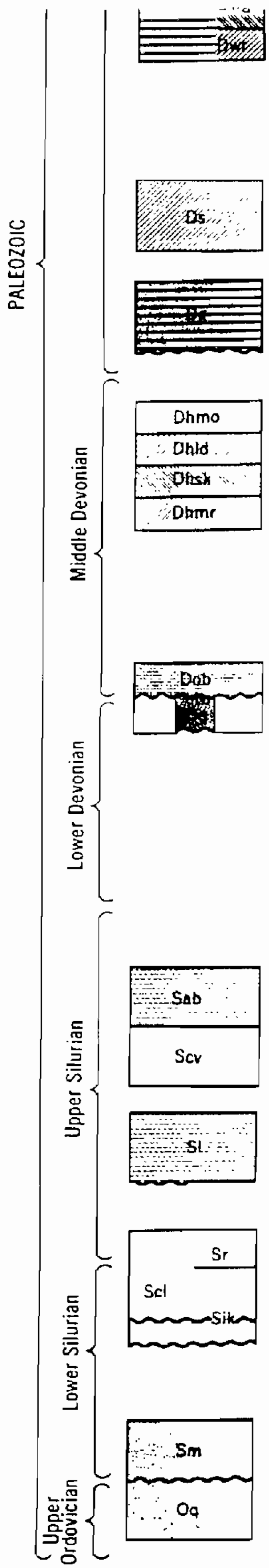

	Roricks Glen Shale; upper Beers Hill Shale; Grimes Siltstone.
Dwr	lower Beers Hill Shale; Dunn Hill, Millport, and Moreland Shales.

SONYEA GROUP
50-200 ft. (15-60 m.)

Ds	Cashaqua and Middlesex Shales.

GENESEE GROUP
10-150 ft. (3-45 m.)

Dg	West River Shale; Genundewa Limestone; Penn Yan and Geneseo Shales; North Evans Limestone.

HAMILTON GROUP
200-500 ft. (60-150 m.)

Dhmo	Moscow Formation—Windom and Kashong Shales, Menteth Limestone Members.
Dhld	Ludlowville Formation—Deep Run Shale, Tichenor Limestone, Wanakah and Ledyard Shales, Centerfield Limestone Members.
Dhsk	Skaneateles Formation—Levanna Shale, Stafford Limestone Members.
Dhmr	Marcellus Formation—Oatka Creek Shale Member.

ONONDAGA AND BOIS BLANC LIMESTONES
150 ft. (45 m.)

Dob	In New York: Onondaga Limestone—Seneca, Morehouse (cherty), and Clarence Limestone Members, Edgecliff cherty Limestone Member, local coral bioherms; Bois Blanc Limestone—sandy, thin, discontinuous. In Ontario: Dundee Limestone; Lucas Formation—dolostone, limestone (Anderdon); Amherstburg Formation—limestone, dolostone, sandstone (Sylvania); Bois Blanc Formation—dolostone, limestone, sandstone (Springvale).
Do	Oriskany Sandstone.

AKRON DOLOSTONE AND SALINA GROUP
400-700 ft. (120-210 m.)

Sab	Akron Dolostone; Bertie Formation—dolostone, shale.
Scv	Camillus, Syracuse, and Vernon Formations—shale, dolostone, salt, and gypsum.

LOCKPORT GROUP
150-200 ft. (45-60 m.)

Sl	Guelph, Oak Orchard, Eramosa, and Goat Island Dolostones; Gasport Limestone—local bioherms.

CLINTON GROUP
100-150 ft. (30-45 m.)

Scl	Decew Dolostone; Rochester Shale; Irondequoit and Merriton Limestones.
Sr	Decew Dolostone; Rochester Shale.
Sik	Irondequoit Limestone; Rockway Oolostone; Hickory Corners Limestone; Neahga Shale; Kodak Sandstone.

MEDINA GROUP AND QUEENSTON FORMATION
800 ft. (250 m.)

Sm	Thorold Sandstone; Grimsby Formation—sandstone, shale; Power Glen and Cabot Head Shales; Whirlpool Sandstone.
Oq	Queenston Shale.

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Buehler, E. J., and Tesmer, I. H., Geology of Erie County, Buffalo Society of Natural Science, Vol. 21, No. 3, 1963.

GEOLOGY

OF

ERIE COUNTY

New York

By

Edward J. Buehler
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BUFFALO SOCIETY OF NATURAL SCIENCES
BULLETIN

Vol. 21. No. 3 Buffalo. 1963

Camil
Gray shale containing

Detailed Stratigraphy and Paleontology

Silurian System

UPPER SILURIAN (CAYUGAN) SERIES

SALINA GROUP

TYPE REFERENCE: Dana (1863, pp. 246-251).

TYPE LOCALITY: Vicinity of Syracuse, New York, formerly known as Salina.

TERMINOLOGY: Approximately the same as the "Onondaga salt group" of early writers. The Salina Group included three formations: the Vernon Shale (oldest), Syracuse Formation, and Camillus Shale. Only the Camillus is seen in western New York. See Fisher (1960).

AGE: Late Silurian (Cayugan).

THICKNESS: In western New York, the Salina Group is about 400 feet thick, but this unit increases considerably in thickness to the east.

LITHOLOGY: The Salina Group in Erie County is largely shale but considerable amounts of gypsum and anhydrite are also present.

PROMINENT OUTCROPS: Outcrops are rare in Erie County. The uppermost portion can be seen at the base of Akron Falls.

CONTACTS: The lower contact is not exposed near Erie County and the contact with the overlying Bertie Formation is difficult to define precisely.

ECONOMIC GEOLOGY: The Camillus Shale of the Salina Group is a source of gypsum and anhydrite in Erie County. To the east, the Salina Group also includes salt beds.

PALEONTOLOGY: No fossils have been reported from the Salina Group of Erie County.

CAMILLUS SHALE

TYPE REFERENCE: Clarke (1903, pp. 18-19).

TYPE LOCALITY: Village of Camillus, Onondaga County, New York; Baldwinsville quadrangle.

Terminology: See Alling (1928) and Leutze (1954).

Age and Correlation: Late Silurian (Cayugan). Equivalent to lower part of Brayman Shale in eastern New York.

Thickness: Approximately 400 feet.

Lithology: The Camillus varies from thin-bedded shale to massive mudstone. The color is gray or brownish gray but some beds show a tinge of red or green. According to Alling (1928, pp. 24-26), the Camillus at the type locality is a massive gray magnesian-lime mudrock. Gypsum and anhydrite are present in Erie County.

It is probable that during much of Late Silurian time the northeastern United States was a desert basin. Salt and gypsum were precipitated by evaporation of the shrinking inland Salina Sea.

Prominent Outcrops: The Camillus Shale extends across Erie County in an east-west trending belt approximately six to eight miles wide. This belt is largely lowland in which outcrops are rare. The top of the formation is exposed at Akron Falls (pl. 6, upper). A small section can be seen in the valley of Murder Creek north of Akron. Houghton (1914, pp. 7-8), Luther (1906, p. 8) and others report outcrops on Grand Island but these could not be located.

Contacts: The lower contact of the Camillus Shale is not exposed near Erie County. The contact with the overlying Bertie Formation is difficult to define.

Economic Geology: The Camillus Shale is an important source of gypsum. National Gypsum Company has a mine at Clarence Center, Certain-Teed Company at Akron, and United States Gypsum Company at Oakfield in neighboring Genesee County.

Paleontology: No fossils have been reported from the Camillus Shale of Erie County. Apparently animal life could not survive in the "dead sea" environment of the time.

BERTIE FORMATION

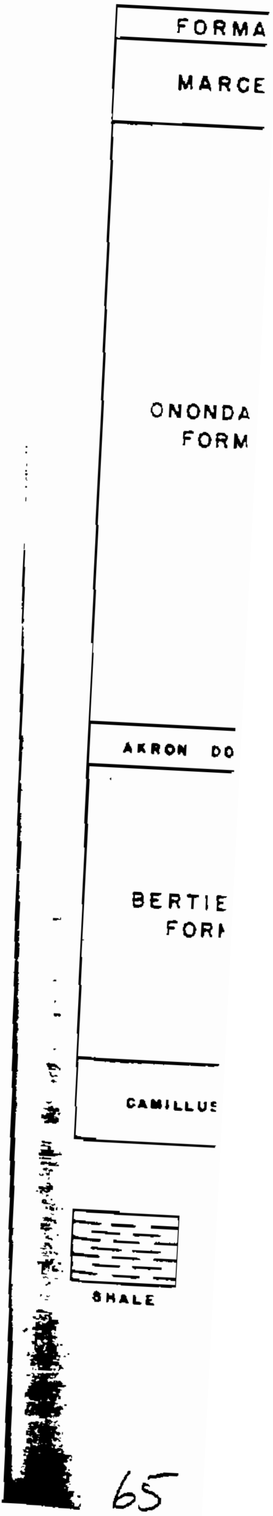
Type Reference: Chapman (1864, p. 190).

Type Locality: Bertie township, Welland County, Ontario, Canada.

Terminology: This unit is commonly called the Bertie Waterlime. Chadwick (1917) divided the Bertie into four units: the Oatka (oldest), Falkirk, Scajaquada, and Williamsville. The Williamsville Member was formerly called the "Buffalo cement bed" (see fig. 4).

Age and Correlation: Late Silurian (Cayugan). Equivalent to upper part of Brayman Shale in eastern New York.

Thickness: 50 - 60 feet total. Approximate figures for the members are Oatka 20 feet, Falkirk 20 feet, Scajaquada 8 feet, and Williamsville 6 feet.



Camillus
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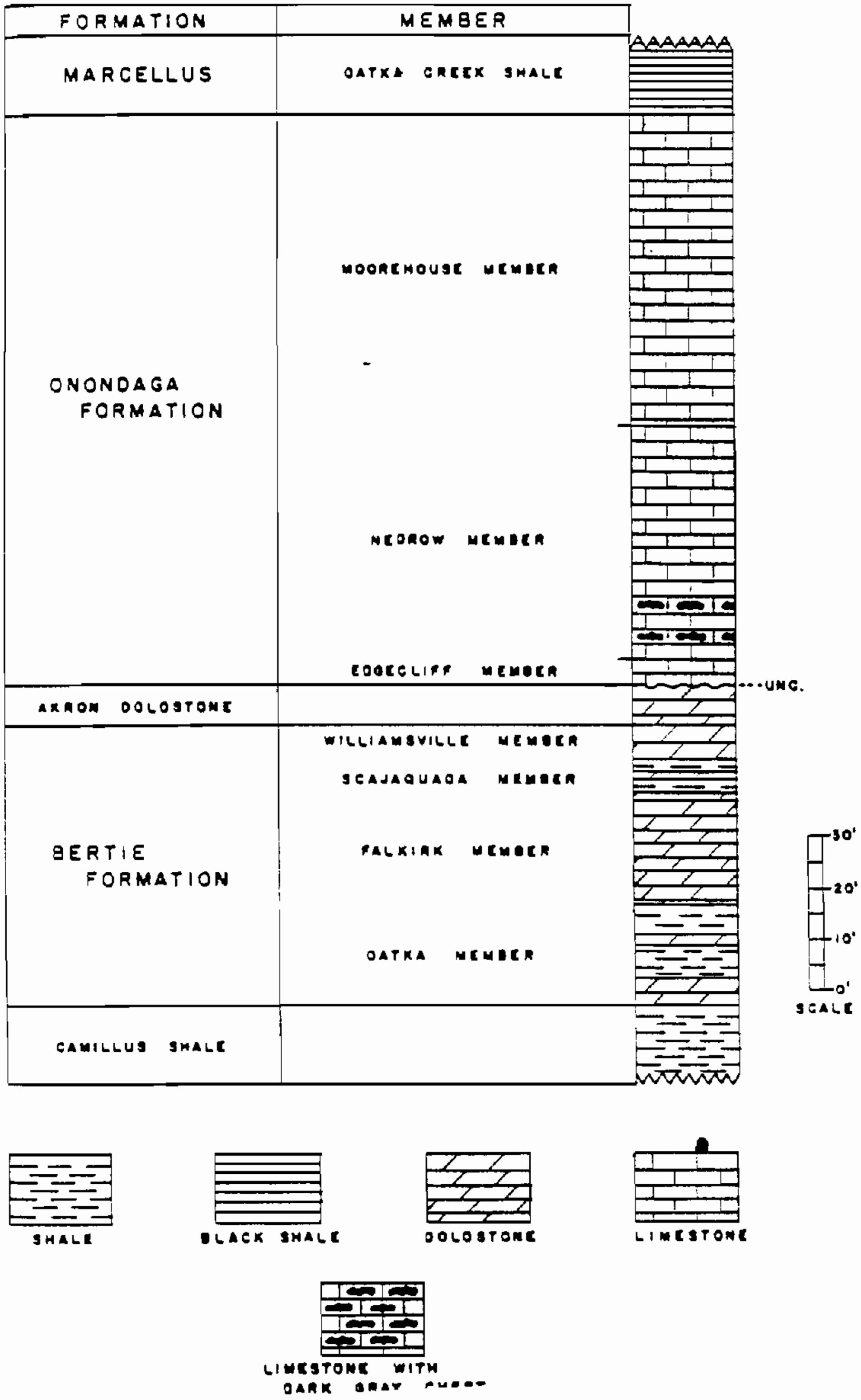
STRATIGRAPHIC COLUMN
BERTIE-ONONDAGA



A-14

Agency for Toxic Substances and Disease Registry, U. S. Public Health Service, Toxicological Profile for Phenol and Toxicological Profile for Pentachlorophenol, April, 1989.

PB90-181249

Toxicological Profile for Phenol

Clement Associates, Inc., Fairfax, VA

Prepared for:

Agency for Toxic Substances and Disease Registry, Atlanta, GA

Dec 89

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
NTIS®

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PB90-181249

Toxicological Profile for

PHENOL

Agency for Toxic Substances and Disease Registry
U.S. Public Health Service

PB90-181249

TOXICOLOGICAL PROFILE FOR
PHENOL

Prepared by:

Syracuse Research Corporation
Under Subcontract to:

Clement Associates, Inc.
Under Contract No. 205-88-0608

Prepared for:

Agency for Toxic Substances and Disease Registry (ATSDR)
U.S. Public Health Service

In collaboration with
U.S. Environmental Protection Agency (EPA)

December 1989

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SPRINGFIELD, VA. 22161

(Graedel 1978), but no data are available to determine the extent of exposure to phenol from these sources.

5.2.2 Water

The chronic anthropogenic sources of phenol in natural water include coal tar (Thurman 1982) and wastewater from industries that manufacture resins, plastics, fibers, adhesives, iron and steel, aluminum, leather, and rubber (EPA 1981), and effluents from synthetic fuel manufacturing (Parkhurst et al. 1979). Phenol also is released from paper pulp mills (Keith 1976) and wood treatment facilities (Goerlitz et al. 1985). Other releases of phenol result from commercial use of phenol and phenol-containing products, including slimicides, general disinfectants (Hawley 1981; Windholz et al. 1983), and medicinal preparations such as ointments, ear and nose drops, cold sore lotions, mouthwashes, gargles, toothache drops, analgesic rubs (Douglas 1972), throat lozenges (EPA 1980b), and antiseptic lotions (Musto et al. 1977). Two natural sources of phenol in aquatic media are animal wastes and decomposition of organic wastes (EPA 1980b). No data are available to determine the extent of exposure from these sources.

5.2.3 Soil

Phenol may be released to the soil during its manufacturing process, loading, and transport when spills occur, and when it leaches from hazardous waste sites and landfills. Generally, data on concentrations of phenol found in soil at sites other than hazardous waste sites are lacking. This may be due in part to a rapid rate of biodegradation and leaching (see Sections 5.3.1 and 5.3.2.3). Phenol has been found in the on-site soil of 99 of 951 National Priorities List hazardous waste sites (VIEW Database 1988). Phenol can be expected to be found in soils that receive continuous or consistent releases from a point source. Phenol that leaches through soil to groundwater spends at least some time in that soil as it travels to the groundwater. Phenol has been found in groundwater, mainly at or near hazardous waste sites.

5.3 ENVIRONMENTAL FATE

5.3.1 Transport and Partitioning

Phenol is released into the air and discharged into water from both manufacturing and use. Based on its high water solubility (see Table 3-2) and the fact that it has been detected in rainwater, some phenol may wash out of the atmosphere; however, it is probable that only limited amounts wash out because of the short atmospheric half-life of phenol. During the day, when photochemically produced hydroxyl radical concentrations are highest in the atmosphere, very little atmospheric transport of phenol will occur (Hendry and Kenley 1979).

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In water, neither volatilization nor sorption to sediments and suspended particulates is expected to be an important transport mechanism. Using the Henry's Law constant, a half-life of 88 days was calculated for evaporation from a model river 1 m deep with a current of 1 m/sec, and with a wind velocity of 3 m/sec (Lyman et al. 1982). The biological treatment of wastewater containing phenol has shown that less than 1% of phenol is removed by stripping (Kincannon et al. 1983; Petrasek et al. 1983).

Phenol has been reported in sediments at up to 608 ppm dry weight (EPA 1988c); however, it is not known whether the location of the site where this concentration was reported is at or near a point source of release, such as a hazardous waste dump. The average concentration (6.1 ppb dry weight) of the sediment concentration contained in the STORET database (EPA 1988c) and the concentration found in the Pacific Ocean near Los Angeles (10 ppb dry weight) are probably more representative of ambient sediment phenol concentrations. The concentrations of the overlying waters were not reported. The moderately low soil sorption partition coefficient (log K_{OC} 1.21-1.96) suggests that sorption to sediment will not be an important transport process. There is very little sorption of phenol onto aquifer materials (Ehrlich et al. 1982), suggesting that phenol sorption to sediments also may be minimal. Based on the soil adsorption coefficient, phenol released to soil is expected to leach to groundwater; however, the rate of phenol biodegradation in the soil may be so rapid, except in cases of large releases such as spills or continuous releases such as leaching from landfill sites, that the probability of groundwater contamination may be low (Ehrlich et al. 1982). Phenol has been detected in groundwater as a result of leaching through soil after a spill of phenol (Delfino and Dube 1976), from landfill sites (Clark and Piskin 1977), and from hazardous waste sites (Plumb 1987).

Phenol is not expected to bioconcentrate significantly in aquatic organisms. Reported bioconcentration factors (BCF) in fish for phenol include (organism, log BCF): goldfish, 0.28 (Kobayashi et al. 1979) and golden orfe, 1.3 (Freitag et al. 1984). Nonetheless, the detection of phenol in bottomfish from Commencement Bay in Tacoma, WA, shows that phenol can concentrate in aquatic organisms (Nicola et al. 1987).

Since the pKa of phenol is 9.686 at 20°C, it will exist in a partially dissociated state in water and moist soil; therefore, its transport in these media in the environment may be affected by the pH of the medium.

5.3.2 Transformation and Degradation

5.3.2.1 Air

Because phenol does not absorb light in the region of 290-330 nm (Sadtler 1960), it should not photodegrade directly in the atmosphere. The gas-phase reaction of phenol with photochemically produced hydroxyl radicals will likely be the major removal mechanism in the atmosphere. An estimated half-life for phenol for this reaction is 0.61 days (Hendry and Kenley 1979). The reaction of phenol with nitrate radicals during the night may constitute a significant removal process. This is based on a rate constant of 3.8×10^{-12} cm^3/molecule sec for this reaction, corresponding to a half-life of 15 minutes at an atmospheric concentration of 2×10^8 nitrate radicals per cm^3 (Atkinson et al. 1987). The reaction of phenol with nitrate radicals present in the atmosphere during smog episodes may decrease the half-life of phenol in polluted atmospheres. The above data indicate that phenol has a short half-life in the atmosphere, probably less than 1 day.

5.3.2.2 Water

Because phenol does not absorb light in the region of 290-330 nm (Sadtler Index 1960), it should not photodegrade directly in surface waters. As a class, phenols react relatively rapidly in sunlit natural water via reaction with photochemically produced hydroxyl radicals and peroxyl radicals; typical half-lives for hydroxyl and peroxyl radical reactions are on the order of 100 and 19.2 hours of sunlight, respectively (Mill and Mabey 1985). The estimated half-life for the reaction of phenol with photochemically produced singlet oxygen in sunlit surface waters contaminated by humic substances is 83 days (assuming Switzerland summer sunlight and a singlet oxygen concentration of 4×10^{-14} M) (Scully and Hoigne 1987).

Phenol is readily biodegradable in natural water, provided the concentration is not high enough to cause significant inhibition. Complete degradation in less than 1 day has been reported in water from three lakes; the rates of degradation increase with increasing concentration of phenol and increasing trophic levels of water, and are affected by the concentration of organic and inorganic nutrients in the water (Rubin and Alexander 1983). Complete removal of phenol in river water has been reported after 2 days at 20°C and after 4 days at 4°C (Ludzack and Ettinger 1960). The degradation of phenol is somewhat slower in salt water, and a half-life of 9 days has been reported in an estuarine river (Lee and Ryan 1979). Rapid degradation of phenol also has been reported in various sewage and water treatment processes. Removal in aerobic activated sludge reactors is frequently >90% with retention of 8 hours (Stover and Kincannon 1983). A concentration of 800 ppm phenol has been reported to affect a 50% inhibition of aerobic activated sludge respiration rates (compared with controls) in the Organization for Economic Cooperation and Development (OECD) Activated Sludge, Respiration Inhibition Test (Klecka et al. 1985). Partial reduction of oxygen uptake versus controls has been noted at concentrations as low as 50 ppm in aerobic reactors using industrial wastewater seed and activated sludge seed (Davis et al. 1981). Utilization is also very high in anaerobic reactors, although acclimation periods are longer and degradation usually takes about 2 weeks (Healy and Young 1978; Boyd et al. 1983).

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PB90-182163

TOXICOLOGICAL PROFILE FOR PENTACHLOROPHENOL

(U.S.) Environmental Protection Agency
Washington, DC

Dec 89

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
NTIS

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While the evidence presented in the literature cited above suggests that phenol can be rapidly and virtually completely degraded under both natural water and sewage treatment plant conditions, monitoring data presented in Section 5.4 below indicate that phenol, despite this apparent biodegradability, is still present in the environment. This suggests that the exact conditions under which phenol is rapidly degraded are not present in all instances. In some situations, the concentration of phenol may be too high or the necessary populations of microorganisms may not be present in sufficient concentration for significant biodegradation to occur. An alternate explanation for the presence of phenol in the environment is that the input rate to the environment may be faster than the removal rate; hence, the compound may be degraded continually, but would still be detected.

5.3.2.3 Soil

Available data indicate that phenol will biodegrade in soil under both aerobic and anaerobic soil conditions. Degradation in soil is completed in 2-5 days even in subsurface soils (Baker and Mayfield 1980). Phenol may, however, persist in soil for much longer periods at locations such as waste sites where phenol is repeatedly or consistently released to the soil (VIEW Database 1989). Mineralization in an alkaline, para-brown soil under aerobic conditions was 45.5%, 48%, and 65% after 3, 7, and 70 days, respectively (Haider et al. 1974). Half-lives for degradation of low concentrations of phenol in two silt loam soils were 2.70 and 3.51 hours, respectively (Scott et al. 1983). Plants have been shown to be capable of metabolizing phenol readily (Cataldo et al. 1987).

The evidence presented in the literature cited above suggests that phenol can be rapidly and virtually completely degraded in soil under both aerobic and anaerobic conditions.

5.4 LEVELS MONITORED OR ESTIMATED IN THE ENVIRONMENT

5.4.1. Air

There are very little monitoring data concerning the presence of phenol in ambient air. Phenol was found at a median concentration of 30 parts per trillion (ppt) in seven samples from one U.S. urban/suburban site in 1974 and at an overall median concentration of 5000 ppt in 83 samples from seven source dominated sites between 1974 and 1978 (Brodzinsky and Singh 1982). The individual medians of the seven source sites ranged from 520-44,000 ppt (Brodzinsky and Singh 1982). During a smog episode in West Covina, CA, in July, 1973, phenol concentrations in the particulate phase ranged from 60-350 ng/m^3, with a mean concentration of 200 ng/m^3 (Cronn et al. 1977). Phenol was detected, but not quantified, in air above the Niagara River in September, 1982 (Hoff and Chan 1987). Phenol was found at approximately 4000 ng/m^3 in the ambient air near a fishmeal factory in Japan (Hoshika et al. 1981).

TOXICOLOGICAL PROFILE FOR
PENTACHLOROPHENOL

Prepared by:

Clement Associates
Under Contract No. 205-88-0608

Prepared for:

Agency for Toxic Substances and Disease Registry
U.S. Public Health Service

In collaboration with

U.S. Environmental Protection Agency

December 1989

In surface waters, pentachlorophenol undergoes biotransformation and photolysis. Hydrolysis, oxidation, and volatilization do not significantly affect surface water concentrations.

Adsorption of pentachlorophenol in soils is pH dependent. Adsorption decreases in neutral and basic soils, and is strongest in acidic soils. Therefore, the compound is most mobile in neutral to basic mineral soils and least mobile in acidic organic soils. Biodegradation is a significant process under both aerobic and anaerobic conditions. Volatilization and photolysis do not appear to be important transport and transformation processes for pentachlorophenol in soils.

5.3.1 Transport and Partitioning

A vapor pressure of 0.00011 mm Hg has been reported for pentachlorophenol; the vapor pressure of the salt or ionic form of this compound is expected to be much less. Therefore, volatilization of the solvated anionic form from an aqueous system is not considered to be a significant transport mechanism under ambient conditions. Pignatello et al. (1983) reported that volatilization loss of pentachlorophenol as vapor and aerosol from treated river water in outdoor man made channels was ≤0.006% of the initial test concentration. Volatilization of pentachlorophenol from soil is also not expected to be a major transport pathway. Kilzer at al. (1979) determined the volatilization rates of pentachlorophenol from water and three soil types under laboratory conditions. The volatilization rates, expressed as percent applied pentachlorophenol per mL evaporated water, from water, sand, loam and humus were 2.57%, 0.13%, 0.31%, and 0.10%, respectively, in the first hour after application of 50 ppb pentachlorophenol. During the second hour, the respective volatilization rates were 2.11%, 0.12%, 0.15%, and 0.12%.

Schellenberg et al. (1984) investigated the sorption of chlorinated phenols by natural sediments and aquifer materials. The authors demonstrated that sorption of pentachlorophenol was highly dependent on the organic content of the sorbent. An average Koc of 32,900 was measured for pentachlorophenol in lake sediment, river sediment and aquifer materials. Soil pH is the most important variable controlling the sorption of pentachlorophenol in soils, with the amount of material sorbed directly related to the organic content of the soil (Chang and Choi 1976). Pentachlorophenol is sorbed to soil or sediment under acidic conditions, but the compound is mobile under neutral or alkaline conditions (Kuwatsuka and Igaraski 1972). Maximum sorption has been reported at soil pHs of 4.6-5.1, with no sorption above pH 6.8 (Choi and Aomine 1974).

Pentachlorophenol can be leached from treated wood into surrounding soil. For example, Arsenault (1976) reported that pentachlorophenol migrated from the surface of utility poles to the adjacent soil, which had an average pentachlorophenol concentration of 654 ppm. However, mobility in soil was limited, as indicated by the average soil concentration of 3.4 ppm pentachlorophenol at a distance of 12 inches from the poles.

Veith et al. (1985) demonstrated that chemicals with a log K_{ow} value greater than 4.0 are likely to bioaccumulate in organisms and food chains. The log K_{ow} presented in Section 3 is 5.01, which suggests that pentachlorophenol will bioaccumulate to some degree. However, the extent of bioaccumulation will depend on the pH of the medium, since pentachlorophenol dissociates at higher ambient pH levels to the more water soluble pentachlorophenate anion. Bioaccumulation of pentachlorophenol in algae, aquatic invertebrates and fish with bioconcentration factors (BCFs) of up to 10,000 has been demonstrated. Representative BCFs are as follows: goldfish, 1,000; polychaete, 3,830; bluegill sunfish, 13; blue mussel, 324; and eastern oyster, 78 (EPA 1986). However, biomagnification of the compound in the food chain has not been observed.

5.3.2 Transformation and Degradation

5.3.2.1 Air

Atmospheric pentachlorophenol is probably photolyzed in the absence of water, although the mechanisms for this reaction are not well known (Crosby and Hamadad 1971; Gab et al. 1975). Photolysis of sorbed or film-state pentachlorophenol in the presence of oxygen has also been observed (Gab et al. 1975). The reaction products were similar to those found in aqueous photolysis.

No information was found regarding susceptibility of pentachlorophenol to free radical oxidation in the atmosphere. However, related compounds such as benzene, chlorobenzenes, and phenol have low reactivity with atmospheric hydroxy radicals; therefore, atmospheric oxidation of pentachlorophenol is not expected.

5.3.2.2 Water

Photolysis and biodegradation are believed to be the dominant transformation processes for pentachlorophenol in aquatic systems. Hydrolysis and oxidation are not important mechanisms for the removal of the compound from surface waters.

The molecular structure of pentachlorophenol is indicative of its stability to hydrolysis or oxidation (Callahan et al. 1979). Wong and Crosby (1981) reported no changes in pentachlorophenol concentration in dark controls during their study of pentachlorophenol photodecomposition in water. Pentachlorophenol apparently did not hydrolyze in aqueous solutions at pH 3.3 or 7.3 held at 26°C for up to 100 hours.

Wong and Crosby (1981) reported that pentachlorophenol in aqueous solutions was photolyzed under laboratory UV-light irradiation with estimated half-lives of about 100 hours at pH 3.3 and 3.5 hours at pH 7.3. Photolysis of pentachlorophenol in aqueous solution following exposure to sunlight was also rapid; in laboratory experiments, concentrations of pentachlorophenol in water were reduced from 9.3 ppm to 0.4 ppm in 24 hours and approached zero at the end of 48 hours (Arsenault 1976). In outdoor tests conducted with river water in man made channels, Pignatello et al. (1983) demonstrated that photolysis of pentachlorophenol was rapid at the water surface (half-life of 0.70 hours at 0.5 cm depth). However, photolysis was greatly attenuated with increasing depth of the water column (half-life 228 hours at 30 cm depth). Photolytic degradation accounted for a 5-28% decrease in the initial test concentration of the compound after 3 weeks.

Pentachlorophenol is biotransformed in aqueous systems by acclimated microoganisms. Liu et al. (1981) found that acclimated cultures of activated sludge bacteria transformed pentachlorophenol more rapidly under aerobic conditions (half-life 0.36 days) than under anaerobic conditions (half-life 192 days). Pignatello et al. (1983) reported that microbial transformation became the primary removal mechanism of pentachlorophenol added to river water in tests conducted in outdoor man made channels. After about a 3 week acclimation period, microbial transformation accounted for a 26-46% decline in the initial test concentration of pentachlorophenol. In a follow-up study utilizing the same type of outdoor tests, Pignatello et al. (1985) found that biotransformation accounted for a 55-74% decrease in the concentration of applied pentachlorophenol after a 3-5 week adaptation period. Biotransformation in the water column over sediments occurred at a greater rate under aerobic than under anaerobic conditions.

In a study using radiolabeled pentachlorophenol, Arsenault (1976) demonstrated that the compound was transformed to CO_2, water, and HCl in an activated sludge treatment plant. On a pilot-plant scale, the same investigator also showed that a waste stream from a wood preserving facility containing 23 mg/L of pentachlorophenol could be treated successfully to produce a final effluent concentration of 0.4 mg/L of pentachlorophenol.

In four simulated lentic environments, Boyle et al. (1980) tested the effects of dissolved oxygen, light, pH, and the presence of a hydrosoil (i.e., pond soil/sediment) on the transformation of pentachlorophenol. The persistence of pentachlorophenol was associated with three environmental variables: absence of light and hydrosoil; pH near or below pKa; and low oxygen concentration. Major reaction products were pentachloroanisole, 2,3,4,5-tetrachlorophenol, 2,3,4,6-tetrachlorophenol, and 2,3,5,6-tetrachlorophenol.

5.3.2.3 Soil

Biodegradation is considered to be the major transformation mechanism for pentachlorophenol in soil. Pentachlorophenol is metabolized rapidly by most acclimated microorganisms (Kaufman 1979). Several cultures which degrade pentachlorophenol have been isolated from soil. Kirsch and Etzel (1973) obtained a mixed culture from a soil sampled from the grounds of a manufacturer of wood products, and continuous-flow enrichment provided an unidentified bacterium which metabolized pentachlorophenol as a sole source of organic carbon (Chu and Kirsch 1972). Edgehill and Finn (1983) added inocula of a strain of pentachlorophenol-acclimated Arthrobacter bacteria to soils in laboratory and enclosed outdoor tests. The soils were amended with 120-150 mg pentachlorophenol/L and 34 kg pentachlorophenol/hectare, respectively. In the laboratory test conducted in the dark at 30°C, the half-life of PCP in the inoculated samples was about 1 day, whereas the half-life in uninoculated samples was 12-14 days. Pentachlorophenol loss from the uninoculated control plots in the outdoor tests was 25% after 12 days at ambient temperatures (8°-16°C), while losses from the inoculated plots were 50%-85%. Watanabe (1973) isolated a pentachlorophenol-decomposing Pseudomonas species from soil perfused with pentachlorophenol solution which was able to grow on and biotransform pentachlorophenol; all five chlorine atoms were released. Pseudomonas biotransformed [^{14}C-]pentachlorophenol rapidly and released [$^{14}CO_2$] as well as the intermediate metabolites tetrachlorophenol and tetrachloro-hydroquinone. Chloranil and 2,6-dichlorohydroquinones have also been implicated as metabolic intermediates (Reiner et al. 1978). Several species of fungi have also been shown to transform pentachlorophenol (Cserjesi 1967; Cserjesi et al. 1972; Duncan and Deverall 1964).

The rate of pentachlorophenol transformation in laboratory tests is more rapid in soils with high organic content than in those with low organic content, and greater when moisture content is high and soil temperature approaches the optimum for microbial activity (Young and Carroll 1951). Half-lives are usually on the order of 2-4 weeks. Pentachlorophenol degraded in a paddy soil at 28°C with a half-life of about 3 weeks; reducing conditions increased the rate of reaction slightly (Ide et al. 1972).

Kuwatsuka and Igarashi (1975) confirmed these generalizations in ten different soil types. Pentachlorophenol biotransformation rates were higher under anaerobic (flooded) conditions than under aerobic (upland) conditions. It was shown that the half-life for pentachlorophenol under flooded conditions ranged from 10 to 70 days, while under upland conditions the range was 20 to 120 days, and the rate of reaction increased with the organic matter content. Pentachlorophenol transformation was assumed to proceed by both chemical and microbial means, based on the effects of sterilization, soil temperature, and nature of the reaction products, which included pentachlorophenol methyl ether (pentachloroanisole), 2,3,4,5-, 2,3,4,6-, and 2,3,5,6-tetrachlorophenol, and 2,3,5-, 2,3,6-, and 2,3,4-trichlorophenol (or 2,4,5-trichlorophenol).

5.3.2.4 Other Media

Pentachlorophenol is also volatilized from treated wood surfaces. Walls in a room treated with pentachlorophenol released the chemical into the air, with concentrations reaching 1 ng/m^3 on the first day after treatment and 160 ng/m^3 on the fourth day (Gebefugi et al. 1976). Pentachlorophenol is no longer used in the treatment of wood products intended for use in the interior of residences.

Laboratory studies were conducted to determine the effect of sunlight on the concentrations of pentachlorophenol and chlorinated dibenzo-p-dioxins (CDDs) in wood treated with pentachlorophenol (Lamparski et al. 1980). Although CDDs are known to be present in pentachlorophenol products as impurities, formation of octachlorodibenzo-p-dioxin (OCDD) as well as heptachlorodibenzo-p-dioxins (HpCDD) and hexachlorodibenzo-p-dioxins (HxCDD) was observed even when purified pentachlorophenol was irradiated. HxCDD and HpCDD were presumed to be degradation products of OCDD, not condensation products of tetrachlorophenol and pentachlorophenol. Evidence recently has been reported for the photolytic conversion of octa-CDD contaminant of PCP on soils to lower chlorinated CDDs, including 2,3,7,8-TCDD (Miller et al. 1988)

5.4 LEVELS MONITORED OR ESTIMATED IN THE ENVIRONMENT

As a result of its widespread past use by industry, the agricultural sector and the general public as a wood preservative, cooling-tower algicide and fungicide, herbicide, molluscicide, paint preservative, plywood and fiberboard waterproofing agent, and drilling mud and photographic solution biocide, pentachlorophenol is ubiquitous in the environment. Pentachlorophenol is now regulated as a restricted-use pesticide. The compound has been detected historically in indoor air, surface waters, groundwater, drinking water, soils, rainwater, and a variety of foodstuffs.

5.4.1 Air

Limited information is available on the levels of pentachlorophenol in ambient air. Scow et al. (1980) estimated atmospheric concentrations of pentachlorophenol using air models. A cumulative concentration estimate based on all emission sources was 0.15-136 ng/m^3. The lower range of this estimate is in general agreement with the upper range of air concentration estimates computed based on pentachlorophenol concentrations in rainwater in Hawaii (0.002-0.063 ng/m^3), where pentachlorophenol is used extensively as an herbicide and wood preservative.

Section 2

Documents Cited

DOCUMENTS CITED

B-1 Aluminum Match Plate Corporation, 1978, Operation Plan and Plant Process.

B-2 Letter from Richard P. Leonard, Calspan Corporation, to Matthew Van Voris, Aluminum Match Plate, October 9, 1978.

B-3 Memorandum to File, Erie County Department of Environment and Planning, from Ronald Koczaja, January 9, 1979.

B-4 Letter from Elmer A. Wetson, Aluminum Match Plate Corporation to Ronald D. Koczaja, Erie County Department of Environment and Planning, May 2, 1980.

B-5 Hazardous Waste Site Profile: Aluminum Match Plate #915005, Town of Tonawanda; Erie County Department of Environment and Planning, August 1982.

B-6 Letter and Map from Gordon Batcheller, Senior Wildlife Biologist, NYSDEC Region 9, to Sheldon S. Norzik, Recra Research, Inc., 12/19/85.

B-7 Dunn Engineering Co., Interview Forms.

B-1

Aluminum Match Plate Corporation, 1978, Operation Plan and Plant Process.

FRONTIER BRONZE
CORPORATION

ALUMINUM CASTINGS
NON-FERROUS CASTINGS

TRADE FRONTIER MARK

FRONTIER 40-E • ALUMINUM ALLOY
4870 PACKARD ROAD
NIAGARA FALLS, N.Y. 14304

ALUMINUM MATCH PLATE CORP.

OPERATION PLAN AND PLANT PROCESS

At the present time this plant is contained within two buildings as shown on the site plan marked as S1. As described previously this plant manufactures a variety of aluminum castings using the shell molding process and permanent mold process.
Clean ingot and casting returns are used as the raw material input for metal. The mold itself, into which the metal is poured, consists of 140 grit silica sand and a Phenolic Formaldahyde resin used to bond the sand into any desired shape. The molds are produced using various tooling and machines for this specific purpose. External heat is the catalyst for activating the bonding process.
Once the molds are asembled the molten metal is poured into the molds. After a cooling period the castings and molds go to a shakeout station. The shell sand, still in a bonded form, is broken away from the casting and is collected in a central location. At the present time this used shell sand cannot be recoated so it has no further value. When future technology discovers a method of reclaiming this sand and recoating it for continued use, I am sure we will follow such a procedure. Once enough used sand is collected a small company owned dump truck hauls this sand to the landfill location as shown on the site plan.
The actual procedure for operation of the landfill is very simple. Once enough material is dumped the material is graded to a level as desired. There are no specific procedures other than the only material dumped is used shell sand. As for compliance as setforth in 6 NYCRR 360.8 they are as follows:

Section 360.8
a) General Requirements

not runoff possible

← 1) By the very nature of this waste it is impossbile for the waste to enter surface or ground waters.

provisions for runoff (leach) used

OK 2) The landfill is located in a zoned first industrial area by the Town of Tonawanda.

← 3) Application for disposal of an industrial waste stream completed.

OK 4) Salvaging may be done when technically feasible in the future.

OK 5) Dumping is done only during normal working hours. (daylight)

no liner comply

← 6) No access controls are needed since the site is very small and used only by plant personnel.

N/7) All other refuse and plant waste is disposed of using alternate means.

OK 8) There are no such hazards.

OK 9) " " " roads.

OK 10) " " " safety hazards.

measured ← 11) There is no noise problems as specified.

OK 12) The plant fulfills these requirements.

[illegible] ← 13) Same as above.

OK 14) No burning is permitted.

OK 15) See Site Plan.

OK 16) Not applicable.

OK 17) Records consist of the volume of sand purchased and used during any given period.

to be determined by DEC ← 18) No reports are necessary.

OK 19) Compliance will result subject to approval by the department.

20) See USGS Map (Buffalo NW Quadrangle). There is no flood plain in the area.

b) Requirements for Specific Solid Waste Management Facilities

We are requesting that a variance for this section be granted. Justification for this waiver is as follows. We feel that since the Leachate Test proves that no hazard exists for this material and that the landfill has only one use (private) and is very small, this section should not apply to this landfill.

B-2

Letter from Richard P. Leonard, Calspan Corporation, to Matthew Van Voris, Aluminum Match Plate, October 9, 1978.

9 October 1978
RPL:hf-56

Mr. Matthew Van Voris
Aluminum Match Plate Company
1500 Military Road
P.O. Box 206
Kenmore, New York 14217

Dear Mr. Van Voris:

The foundry sand sample of 9/20/78 (P.O. 5058) was extracted according to the toxicant extractant procedure outlined in the enclosure to this letter. Phenol content of the elutriate measured 0.16 ppm. This amounts to 3.2 μg/g of sand leached. Although this sand does not appear to have a particularly high leaching rate under the conditions of the test, we cannot judge the potential for pollution of ground or surface waters. There may be attenuation of phenol by the soils of the disposal site before reaching ground or surface waters. The degree of attenuation could be ascertained by the installation of monitoring and sampling wells at the disposal site.

Please contact me if you have any questions regarding this analysis or further work.

.0032 × 10^{-3} g/[illegible] / g sand × 250 g sand = 0.8 × 10^{-3} g [illegible] → 0.8 mg/liter solution

Sincerely yours,

Richard P. Leonard

Richard P. Leonard, Head
Environ. Systems Analysis Section

cc: John Michalovic, Calspan
Milt Smith, Calspan

Enclosure

37
15578

RECEIVED
OCT [illegible] 1978
ALUM. MATCH PLATE CORP.

Calspan CORPORATION ADVANCED TECHNOLOGY CENTER
P.O. BOX [illegible] BUFFALO, NEW YORK 14225 TELEPHONE [illegible]
Cable CALSPAN · [illegible]

TOXICANT EXTRACTANT PROCEDURE USED ON FOUNDRY SAND - ALUMINUM PLATE COMPANY

The procedure used follows those proposed under Section 3001 of the 1976 Resource, Conservation and Recovery Act (RCRA) dated March 24, 1978. The sand was extracted according to the following procedure and the elutriate analyzed for phenol content.

(1) a sample of sand (62.5 g) was added to 500 ml deionized water
(water: sand = 8:1)

(2) this mixture was adjusted to pH 5.0 with 1:1 acetic acid

(3) the mixture was agitated for a 24 hour period while maintaining pH 4.9 - 5.2

(4) water was filtered to separate solids and deionized water added to give volume of 625 ml
(water: sand = 10:1)

(5) sand was reextracted as in steps 3 and 4

(6) total elutriate (1250 ml) was analyzed for phenol by standard methods

B-3

Memorandum to File, Erie County Department of Environment and Planning, from Ronald Koczaja, January 9, 1979.

COUNTY OF ERIE
DEPARTMENT OF ENVIRONMENT & PLANNING
DIVISION OF ENVIRONMENTAL CONTROL

MEMORANDUM

FROM Ronald Koczaja **DATE** January 9, 1979

TO File

SUBJECT Aluminum Matchplate - 1500 Military Road, Kenmore
On site solid waste disposal application

On January 5, 1979 the site proposed for the disposal of spent sand casting molds was inspected by the writer, accompanied by the plant superintendent, Mr. Westin. Approximately 30 tons of spent sand is generated a week. This material is placed in a dump truck (approx. 4 ton capacity) and then transferred to the dumping area at the rear of the building. When a sufficient number of loads have been transferred to the dump site the piles are leveled by the same truck which is equipped with a plow blade. The company is currently in the process of acquiring a small, tracked bulldozer.

The proposed site is approximately 1/3 acre in size and is adjacent to a completed disposal area. No final cover has been placed over the completed area. According to Mr. Westin the sites of the parking lot, completed dumping area, and proposed area were low lying marsh areas. The proposed area is currently being used and it did not appear that much of any pre-existing wetlands remain.

A drainage system is to be installed in the near future.at the rear of the building. Mr. Westin related that the dump site would be graded with a gentle slope towards this drainage system. Disposal of spent sand is desired to raise the level of the proposed site equal to that of the parking and completed disposal areas. While difficult to estimate, it appeared to the writer that this would require 3-4 feet of spent sand.

The spent castings, once dumped and graded, are in pieces approximately 2" X 2" X ½". No additional compaction is attempted other than what occurs during the dumping and grading activity.

The storm drain could provide a monitoring point for contaminated run off. In addition to the runoff that reaches the drain system, an appreciable amount would likely find its way into the drainage along the railroad right of way. Monitoring flow in the drain system would be beneficial in evaluating the concentrations of phenol leaching from the sand but not total amount.

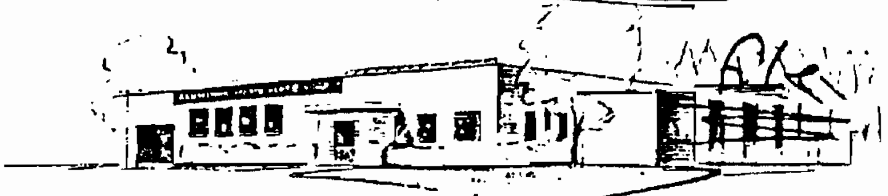
cc: Donald Campbell

RK/maa

B-4

Letter from Elmer A. Welson, Aluminum Match Plate Corporation to Ronald D. Koczaja, Erie County Department of Environment and Planning, May 2, 1980.

Don: If no info (letter) by 5/16 all El Westin on Paul Way



ALUMINUM MATCH PLATE CORPORATION

SUBSIDIARY OF FRONTIER BRONZE CORPORATION

1500 MILITARY ROAD • KENMORE, NEW YORK 14217
P.O. BOX 206 PHONE: (716) 873-7054

May 2, 1980

County of Erie
95 Franklin Street
Buffalo, New York 14202

Attention: Ronald D. Koczaja

Dear Mr. Koczaja:

This will confirm our telephone conversation this date with reference to our resin sand dump in the back of our building. We are making arrangements with Niagara Sanitation of Buffalo to haul all our waste sand out, and by next week we should have the dates that they are going to clean up the dump. They will give us a schedule of the weekly pick-up basis. As soon as we receive this information, we will contact you immediately.

If you have any further questions, please do not hesitate to contact us.

Very truly yours,

ALUMINUM MATCH PLATE CORPORATION

E A Westin

Elmer A. Westin

Plant Sup't.

EAW:lo

Dave Young – Niagara Falls – DEC permitted
57 tandem loads taken thus far est. of 10 loads
remaining as of 5/29/80 per Elmer A. Westin / RDK

AMP

93

B-5

Hazardous Waste Site Profile: Aluminum Match Plate #915005, Town of Tonawanda; Erie County Department of Environment and Planning, August 1982.

COUNTY OF ERIE
DEPARTMENT OF ENVIRONMENT AND PLANNING
DIVISION OF ENVIRONMENTAL CONTROL

* * * MEMORANDUM * * *

FROM: Anthony T. Voell DATE: 4/7/86

TO: Lawrence G. Clare, NYSDEC

RE: Aluminum Matchplate - Phase I Report
Site No. 915005

Attached are comments on the above site prepared by Thomas Hersey. I agree with the comments.

If you want to discuss them, please let me know.

Voell

ANTHONY T. VOELL, P.E.
Deputy Commissioner

ATV:jk
Attachments

cc: Thomas Hersey

Date: 5/14/91
To: Ms. Helen Mongillo
From: Mr. Jerry Miller

Enclosed is the information that you requested.

ecs (8/87)

[illegible]

[illegible]

COUNTY OF ERIE
DEPARTMENT OF ENVIRONMENT AND PLANNING
DIVISION OF ENVIRONMENTAL CONTROL

*** MEMORANDUM ***

M: Thomas R. Hersey DATE: 4/3/86

O: Anthony T. Voell

RE: Aluminum Matchplate - Phase I Report - Site No. 915005

Based on the information in the subject Phase I Report, no further study is recommended. There is no evidence that leads to an assumption the material on-site is hazardous. Four soil samples were collected from the disposal area and tested for mercury, phenol and iron by USGS in July 1982. Only iron was detected (8,200 ppm - 13,000 ppm). The contractor suggests that iron concentrations exceed background levels, however, no examples of iron concentrations in undisturbed soils were presented. Iron is not a listed hazardous waste. High levels of iron are often found in undisturbed soils of this region.

The HRS toxicity assessment is based upon the suspicion of phenol in the waste material. USGS soil samples show no sign of phenol. However, the results of an extraction tests conducted in 1978 by Calspan showed a concentration of 0.16 ppm in the extracted elutriant.

The tightness of soils in this region should prevent the phenol contamination from reaching groundwater before biodegradation has sufficiently reduced concentration to levels below groundwater guidelines of .001 mg/l.

An updated test may prove that concentrations have dropped since the criteria test in 1978. The USGS 1982 results showed no detectable amounts of phenol perhaps this is an indication that biodegradation has already taken place.

The 1.4 HRS score assessed this site reflects the relatively low danger which this site poses to the environment. An additional extraction test could be done to confirm the low potential impact of the waste material. Unless this test indicates significant levels of phenol this site should be dropped from the Hazardous Waste Site Registry. In August of 1982, this department (DEP) conducted an inspection and prepared a profile on the Aluminimum Matchplate site. This report was not included as one of the Phase I references. A copy is attached for the contractor's review.

Thomas R. Hersey
THOMAS R. HERSEY
Assistant Env. Quality Engineer

COUNTY OF ERIE
DEPARTMENT OF ENVIRONMENT & PLANNING
DIVISION OF ENVIRONMENTAL CONTROL

MEMORANDUM

TO Peter Buechi, NYSDEC DATE Sept. 22 , 1982
FROM Donald Campbell
SUBJECT Aluminum Match Plate # 915005.

Attached is your copy of the Profile Report for the subject company.

DONALD CAMPBELL, P.E.
Sr. Env. Quality Engineer

DC:rb

Attachment

ALUMINUM MATCH PLATE CO.

1500 MILITARY RD.

TONAWANDA, NEW YORK

SITE # 915005

Prepared by Erie County
Dept. Env. & Planning
AUGUST 1982

ALUMINUM MATCH PLATE CO.
1500 MILITARY RD.
TONAWANDA, N.Y.
Site # 915005

BACKGROUND

The Interagency Task Force in Volume III of Hazardous Waste Disposal Sites in New York State reported that spent sand casting molds were disposed of on company property. A NYSDEC Part 360 Landfill Permit (#15S37- expiration date 9/7/82) was issued to the site on September 7, 1979. The site was coded "F" indicating that no further action is required at this site.

GENERAL INFORMATION

Aluminum Match Plate is located in a developed area within the Town of Tonawanda. Within one (1) mile of the site is a mix of residential, commercial, and industrial land uses.

The firm was reported to have begun operation on Military Rd. during the 1940's. Since that time, spent casting molds were disposed of as a fill into lowlands adjacent to the plant. The boundaries of the area used for sand disposal are uncertain.

Although the firm has a permit to landfill on company grounds, sand has not been disposed of on site for the last two (2) years. Spent molds are now hauled for disposal to a Niagara County site. The area used for sand disposal behind the plant has been graded but no cover material has been applied.

LEACHING ANALYSIS

As part of the firm's landfill permit application, a sample of the spend sand casting material was subjected to the E.P. Toxicity extraction procedure. Phenol, the substance of conern, was found in the elutriate at a concentration of 0.16 ppm.

The groundwater quality standard (Title 6 Page 703) for Phenol is .001 mg/l. No direct relationship between the elutriate concentration and a groundwater standard can be drawn. The local groundwater was not evaluated for Phenol content. Because of low soil permeability, lack of groundwater as deep as 16 feet, the phenol contamination is not expected to affect groundwater. The phenol is expected to be contained and degraded.

According to the Quaternary Geology Report of E.H. Mueller 1977, soils in the area have been classified as Lake silt, sand and clay. Based on a USGS well located about one (1) mile away, bedrock is believed to be approximately sixty (60) feet deep. This site is not within a flood plain or wetlands area.

WATER SUPPLY

Soil investigation was performed by Empire Soils Investigations, Inc. at four (4) locations at the 1500 Military Road address. The borings ranged from 11.5 to 16.5 feet and no free water was found in any of the borings. These borings showed that the site is generally overlain by five (5) feet of foundry sand fill mixed with cinders, gravel, and organic material. Under the fill a mottled silt material with varying amounts of sand and gravel was encountered.

There are no known ground water drinking wells within one (1) mile of the site. Public water with the Niagara River as the source is supplied by the Town of Tonawanda.

CONCLUSION

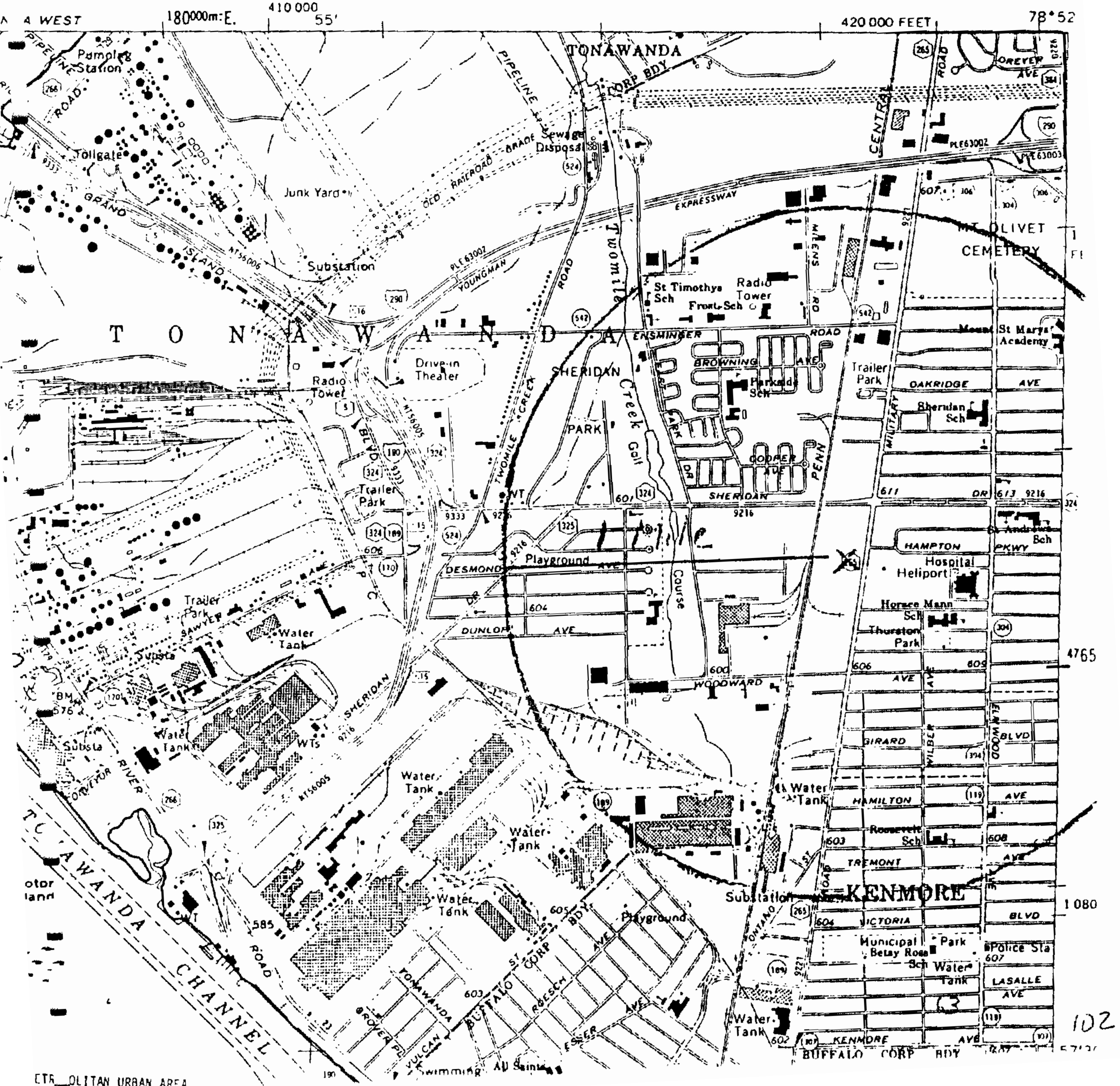
Spent casting sand molds were disposed of over an undefined area adjacent to the Aluminum Match Plate facility. The molds contain a phenolic binder and aluminum residues. The firm has a valid NYSDEC landfill permit although they do not actively fill on site any longer. A leaching potential test performed on a sand sample found an elutriate phenol concentration of 0.16 ppm.

RECOMMENDATIONS

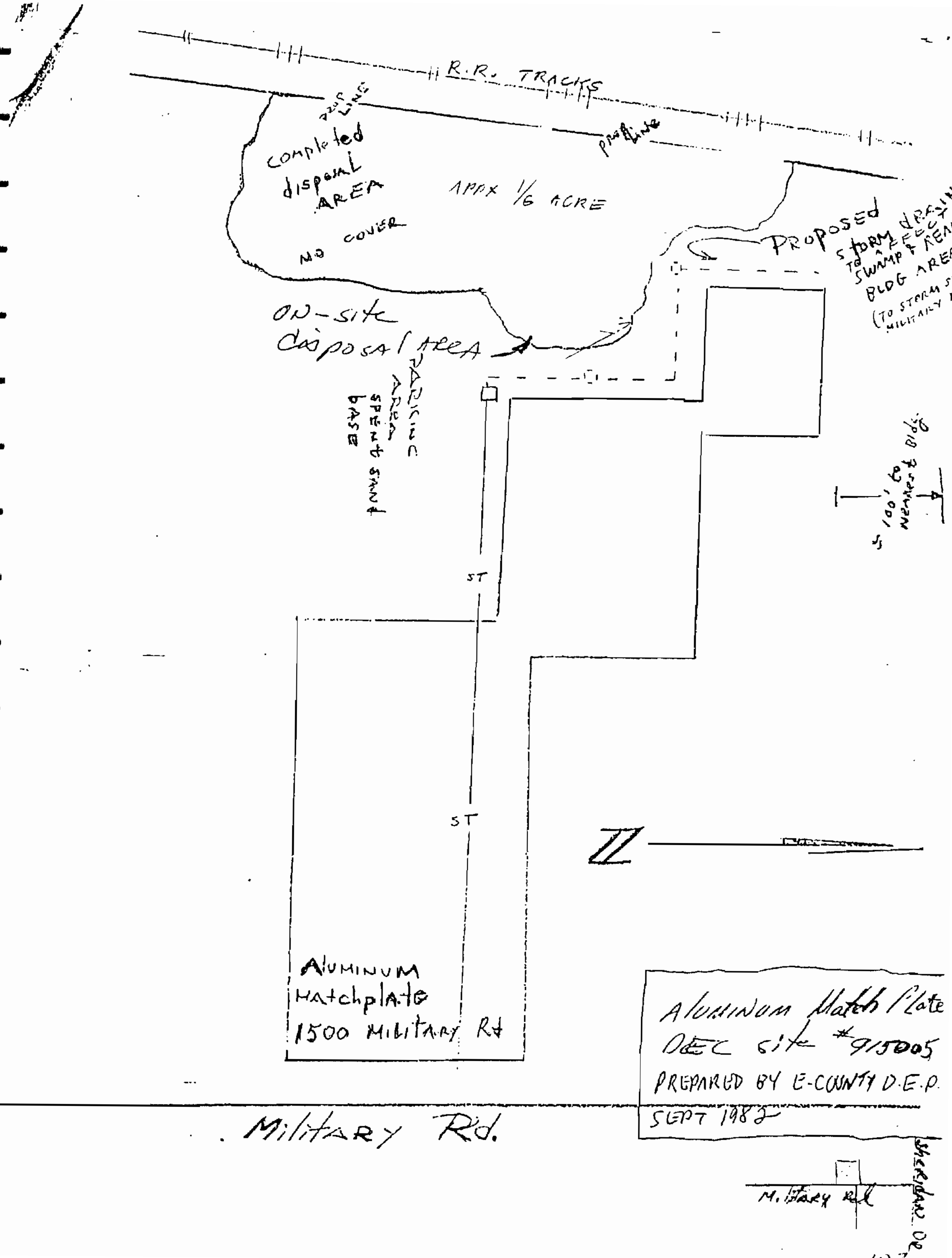
We agree with the Interagency Task Force's assessment of the site and its "F" classification along with its recommendation for no further investigative action.

Aluminum Match Plate Co
DEC site # 915005
Area within 1 mile of site

FLOODPLAIN OVERLAY
BUFFALO NW QUADRANGLE
NEW YORK–ONTARIO
7.5 MINUTE SERIES PLANIMETRIC
NW/4 BUFFALO 15' QUADRANGLE



102



Aluminum Match Plate
DEC site #915005
PREPARED BY E-COUNTY D.E.P.
SEPT 1982

B-6

Letter and Map from Gordon Batcheller, Senior Wildlife Biologist, NYSDEC Region 9, to Sheldon S. Norzik, Recra Research, Inc., 12/19/85.

New York State Department of Environmental Conservation
600 Delaware Avenue, Buffalo, NY 14202-1073 716/847-4550

Henry G. Williams
Commissioner

RECEIVED
DEC 19 1985
RECRA RESEARCH, INC.

December 18, 1985

Mr. Sheldon S. Nozik
RECRA Research, Inc.
4248 Ridge Lea Road
Amherst, NY 14226

Dear Mr. Nozik:

Tentative Erie County and final Niagara County freshwater wetlands are shown directly on your site maps for the Superfund sites you are studying. Please be sure to examine all the maps since I did not copy all wetland boundaries if a given area was shown on another map.

Also, our maps show only those wetlands which exceed 5 ha in size. We have no information compiled for wetlands less than 5 acres in size.

To my knowledge, we have no "critical habitats" within one mile of the sites in question. Further, I am not aware of endangered or threatened species occupying these sites.

If you need some specific information on the wetlands within your study area, you will need to come to Regional Headquarters to compile those data.

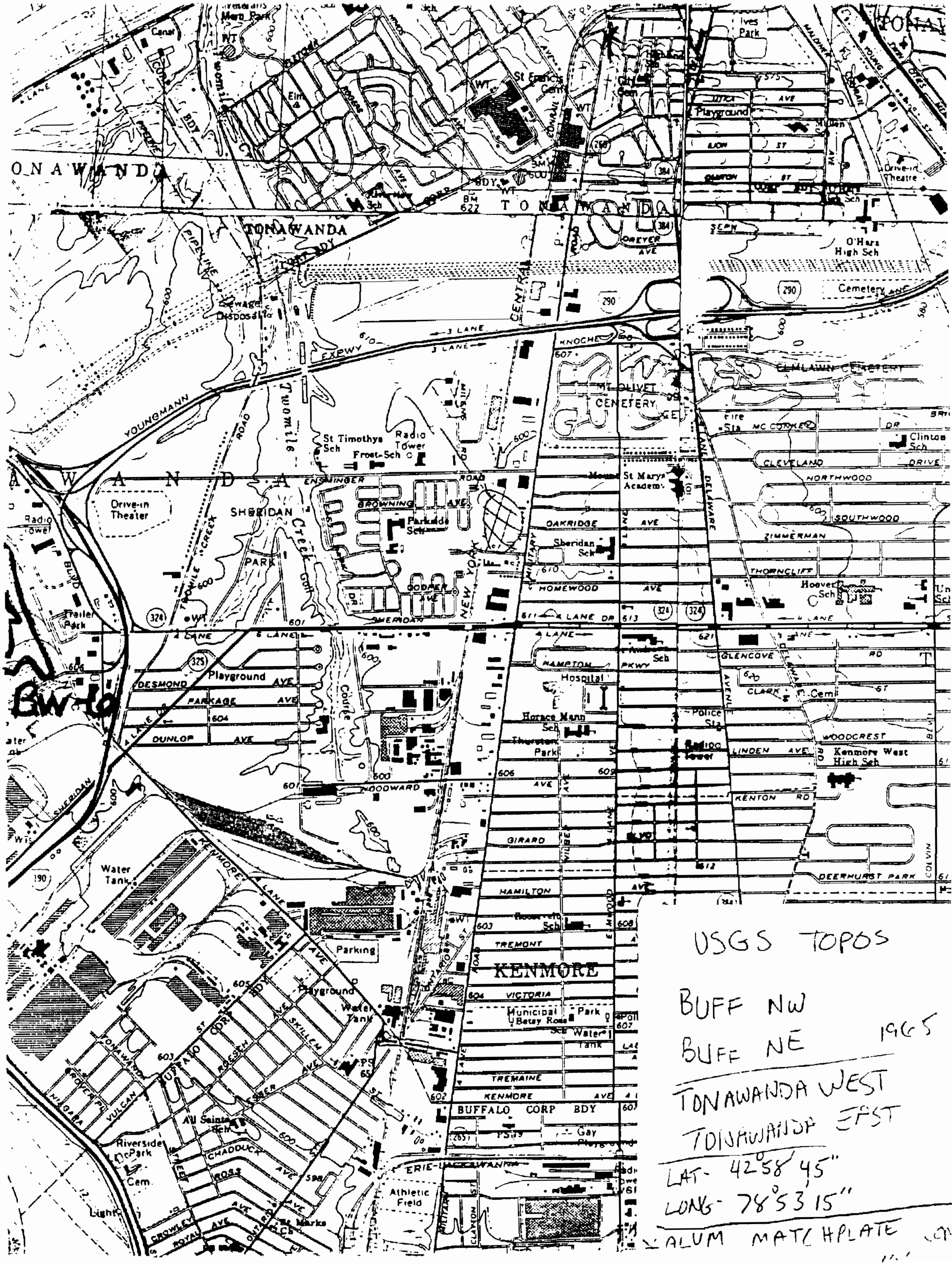
Sincerely,

Gordon Batcheller
Gordon R. Batcheller
Senior Wildlife Biologist
Region 9

GRB:ls

Enc.

cc: Mr. Pomeroy



USGS TOPOS

BUFF NW

BUFF NE 1965

TONAWANDA WEST

TONAWANDA EAST

LAT. 42°58'45"

LONG. 78°53'15"

ALUM MATCHPLATE

B-7

Dunn Engineering Co., Interview Forms.

Page ___ of ___

SITE INTERVIEW FORM

SITE: ALUMINUM MATCHPLATE **PROJECT NUMBER:** 00296-01690

DATE: 3.7.91 **TIME:** PM

INTERVIEWER (DUNN/TAMS): LESLIE E GRACZ

INTERVIEWEE (OF SITE): GREG G ECKER

NO. OF YEARS WORKING AT THE SITE: NA

DATES FROM: NA **TO:** NA

JOB RESPONSIBILITIES AT SITE: NA

INTERVIEW:

MR. ECKER IS A WILDLIFE REPRESENTATIVE FOR THE NYSDEC MR. ECKER ASSISTED MS GRACZ IN IDENTIFYING SIGNIFICANT WILDLIFE AND WETLAND AREAS. THERE ARE TWO AREAS WITHIN A THREE MILE RADIUS: SWIS-606 AND SWIS-003. LAST SEEN IN 1975 ON STRAWBERRY ISLAND, THE CARPIODES CYPRINUS OR QUILL BACK, IS AN UNPROTECTD ANIMAL. ON MOTOR ISLAND THE MOXOSTOMA VALENCIENNESI OR GREATER REDHORSE IS AN UNPROTECTED ANIMAL WHICH WAS NOT SEEN IN 1975. THERE ARE TWO WETLAND AREAS WITHIN A THREE MILE RADIUS: BW-6 LOCATED 1 3/4 MILES WEST OF THE ALUMINUM MATCHPLATE FACILITY AND BW-8 APPROXIMATELY 2 1/2 MILES NORTHWEST OF THE FACILITY. THE LISTED WETLAND ID'S ARE REGULATED AREAS LARGER THAN 12.4 ACRES, SMALLER WETLAND AREAS WHICH ARE NOT REGULATED MAY EXIST WITHIN THE THREE MILE RADIUS.

SIGNATURES:

INTERVIEWEE: Greg G. Ecker **DATE:** 3/27/91

INTERVIEWER: Leslie E Gracz **DATE:** 3.21.91