ND-2900 D1626

ENGINEERING INVESTIGATIONS AT INACTIVE HAZARDOUS WASTE SITES

PHASE I INVESTIGATION

DUSSAULT FOUNDRY, SITE NUMBER 932012
CITY OF LOCKPORT, NIAGARA COUNTY

June 1989

STATE OF NEW YORK
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1. EXECUTIVE SUMMARY

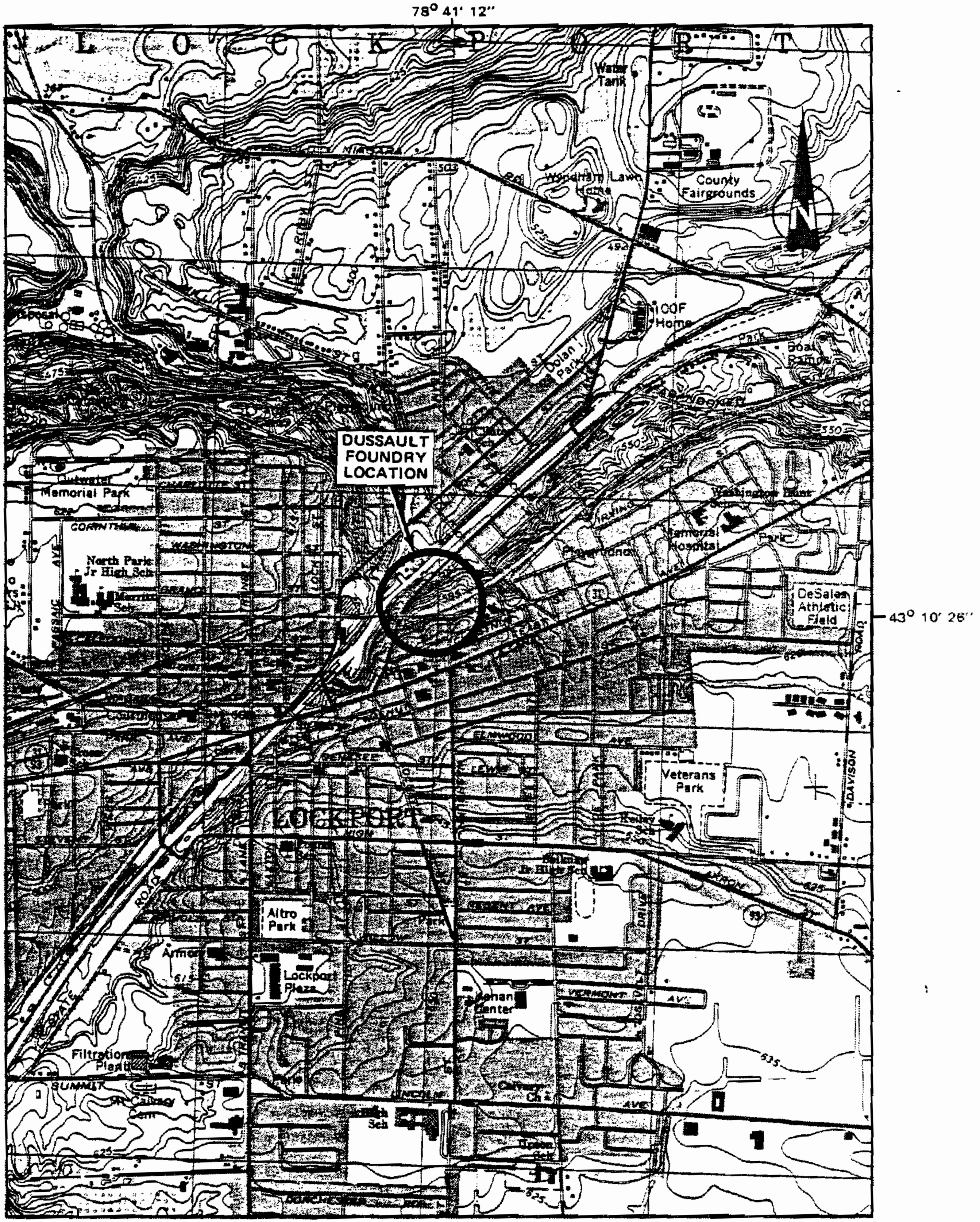
1.1 SITE BACKGROUND

The Dussault Foundry landfill is a private industrial landfill, approximately 1 acre in area on a 5-acre site operated by Dussault. This landfill was previously used to dispose of spent foundry sand. Phenols and semivolatile and volatile organics have been detected in the sand and soil on site following laboratory analysis. The sand fill is presently being removed and disposed of at the Niagara County landfill.

The site is located atop the Niagara Escarpment at the foot of Washburn Street in the City of Lockport, New York (see Figures 1-1 and 1-2). The site slopes generally toward the north and has an average elevation of 600 feet. The landfill area is approximately 30 feet higher than the surrounding terrain and is a result of dumping of fill material. A sand berm is situated on the edge of the escarpment, which has been subject to some rill erosion. No standing water was noted on site.

1.2 PHASE I EFFORTS

On June 4, 1987, Ecology and Environment, Inc., (E & E) conducted a site inspection in support of this investigation. Prior to the inspection, available state, federal, and municipal files were reviewed, and individuals having knowledge of the site were contacted. The site inspection consisted of a visual survey of the property that included:



SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangle, Lockport, N.Y., 1980.

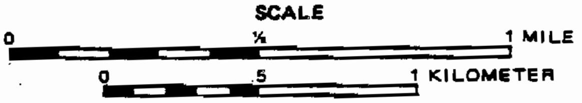
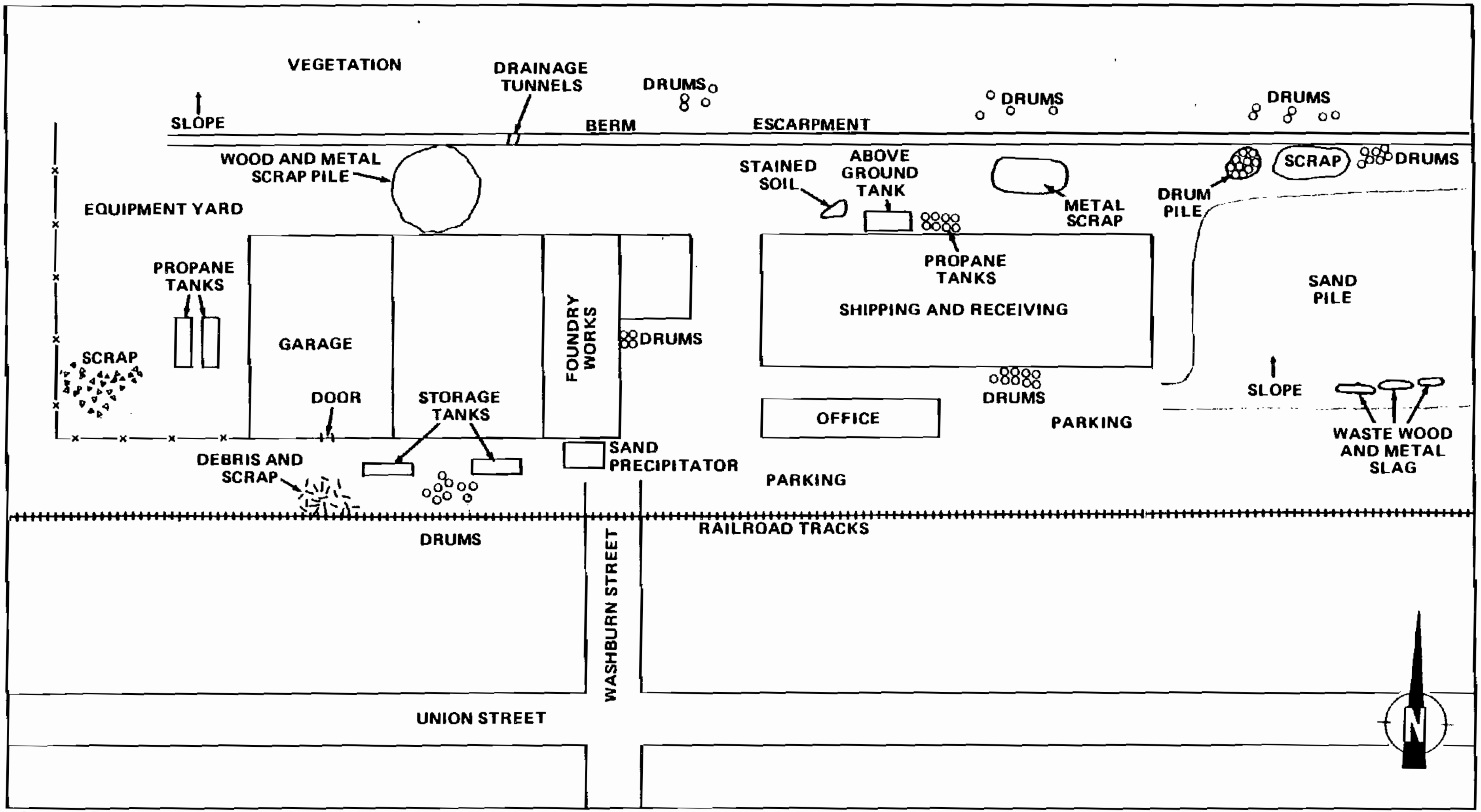


Figure 1—1 LOCATION MAP



SOURCE: Ecology and Environment, Inc. 1988.

NOT TO SCALE

Figure 1–2 SITE MAP - DUSSAULT FOUNDRY

- Overall site conditions;
- Condition of former waste disposal areas; and
- Current waste storage and handling methods.

1.3 ASSESSMENT

In general, the site appeared to be maintained in poor condition. Discarded and poorly stored metal 55-gallon drums were noted protruding from the fill area and scattered throughout the site. Foundry sand and scrap metal were not contained within the fill area, but were observed to be present throughout the site. Spilled fuel was noted near a storage tank.

1.4 HRS SCORE

A preliminary application of the Hazard Ranking System (HRS) was completed to quantify the risk associated with this site. A detailed environmental site assessment to fully evaluate the site was not conducted because the Phase I investigation is limited in scope. However, a preliminary HRS score was completed on the basis of the available data. It should be noted that without a full environmental assessment, an unrealistically low HRS score may result.

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

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

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

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

The preliminary HRS score was:

S_M = 7.19 (S_{GW} = 3.25; S_{SW} = 12.01; S_A = 0)
S_{FE} = 0
S_{DC} = 62.5

2. PURPOSE

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

3. SCOPE OF WORK

The Phase I effort involved:

- The review of available information from state, municipal, and private files;
- Interviews with individuals knowledgeable of the site; and
- A physical inspection of the site.

State files reviewed were maintained by the New York State Department of Environmental Conservation (NYSDEC) Region 9 in Buffalo, New York and Central Office in Albany, New York. County files reviewed were maintained by Niagara County Department of Health. Private files reviewed were maintained by Dussault Foundry at the Washburn Street, Lockport, facility. Items reviewed were:

- Disposal permit applications (NYSDEC); and
- Landfill closure plans.

Mr. Michael Hopkins of the Niagara County Health Department was contacted in person on May 1, 1987, to discuss information maintained in the county files. The county file on the facility contained a waste survey and sand testing reports. Mr. James Maxwell, president of Dussault Foundry, was contacted in person on June 4, 1987, to furnish background information and to accompany E & E personnel on a site inspection. He was able to furnish E & E personnel with a site map and background information on the history and ongoing processes on site.

No samples were collected by E & E although monitoring of air quality was performed using a HNu photoionizing organic vapor detector. Photographs were taken and are included in Appendix A. A physical inspection of the site and review of pertinent USGS 7.5 minute topographic maps was completed. A summary of agencies contacted, along with contact persons and addresses is found in Table 3-1.

Table 3-1

SOURCES CONTACTED FOR THE NYSDEC PHASE I INVESTIGATION AT DUSSAULT FOUNDRY

New York State Department of Environmental Conservation, Region 9
600 Delaware Avenue, Buffalo, New York 14202
Telephone Number: (716) 847-4600

- Division of Hazardous Waste Remediation
  Contact: Lawrence Clare, Ahmed Tayyebi
  Date Contacted: May 8, 1987
  Information: Current landfill activity and status

- Division of Regulatory Affairs
  Contact: Paul Eismann
  Date Contacted: May 8, 1987 and June 2, 1987
  Information: Permits; wetlands information

- Division of Environmental Enforcement
  Contact: Joann Gould
  Date Contacted: May 6, 1987
  Information: Enforcement actions

- Division of Water
  Contact: Rebecca Anderson
  Date Contacted: June 2, 1987
  Information: Floodplain locations

- Bureau of Wildlife
  Contact: James R. Snider
  Date Contacted: June 2, 1987
  Information: Critical habitat locations

New York State Department of Environmental Conservation, Central Office, Division of Hazardous Waste Remediation
50 Wolf Road, Albany, New York 12233
Telephone Number: (518)457-9538
Contact: Ray Lupe, Tom Reynolds
Date Contacted: June 23, 1987
Information: File search for site history, correspondence, background information

New York State Department of Health
Corning Tower
The Governor Nelson A. Rockefeller Empire State Plaza
Albany, New York 12237
Telephone Number: (518) 458-6310
Contact: Lani Rafferty
Date Contacted: April 5, 6, 1989
Information: File search for site history, correspondence, background information

New York State Department of Health, Regional Toxic Program Office
584 Delaware Avenue, Buffalo, New York 14202
Telephone Number: (716)847-4365
Contact: Linda Rusin, Cameron O'Connor
Dates Contacted: May 5, 1987, June 4, 1987, April 13, 1989
Information: Contact with NYSDOH on May 5, 1987, indicated that files were being transferred from Albany to Buffalo so the files were not accessible. Further correspondence in June 1987 indicated that the office was newly established and file information was extremely limited; therefore, the county health departments were visited in lieu of NYSDOH. NYSDOH files were searched on April 13, 1989.

Table 3-1
(Cont'd)

Niagara County Health Department
10th and East Falls Street, Niagara Falls, New York 14302
Telephone Number: (716) 284-3128
Contact: Michael Hopkins, Paul Dicky
Dates Contacted: May 1, 1987 and May 5, 1987
Information: Inspection and profile reports, violation citations, correspondence

Lockport Water Department
Lockport Municipal Building, Lockport, New York 14094
Telephone Number; (716) 439-6678
Contact: James McCann
Date Contacted: June 10, 1987
Information: Details of the drinking water supply in the City and Town of Lockport

Dussault Foundry
Washburn Street, Lockport, New York 14094
Telephone Number: (716) 433-3851
Contact: James Maxwell
Date Contacted: June 4, 1987
Information: Site history, background information

USEPA
Federal Plaza, New York, New York
Telephone Number: (212) 264-8677
Contact: Carol Peterson, Ben Conetta
Date Contacted: June 20, 1987
Information: Preliminary assessment, site inspection, and sample analysis results

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4. SITE ASSESSMENT

4.1 SITE HISTORY

Dussault Foundry is located along the edge of the Niagara Escarpment on Washburn Street in the City of Lockport, New York. The company has been operating a foundry at the facility since 1914. The primary area of concern is a stockpile of approximately 10,000 cubic yards located immediately east of the foundry buildings. The sand is now being removed to the Niagara County landfill.

Foundry sand is created when clean, dry Lake Michigan sand, 55 to 60 mesh, has been impregnated with resins to form molds and cores for foundry operations. These sands account for nearly all foundry waste, and where practical, the sand can be recycled a number of times, significantly reducing the total of landfill waste leaving the foundry. Dussault recycles approximately 90% of all sand used during normal foundry operations. The weekly addition of approximately 15 to 20 tons of clean sand to recycled sand balances the foundry sand requirements. Conversely, a similar amount of sand is discarded from molding processes. However, prior to November 1985, Dussault Foundry disposed of this sand as fill on the project site and in areas adjacent to the foundry.

The following items outline the actions taken concerning the landfill area for foundry sand at the Dussault Foundry.

- In February 1981, Dussault hired Advanced Environmental Systems to perform a waste survey of the foundry. Sand samples were analyzed using the EP Toxicity extraction procedures and tested for metals and phenols, and the results confirmed the presence of phenols in the sand (0.66 ppm and 0.1 ppm) (Rakoczynski 1981).

- In March 1981, Dussault filed an application for Approval to Construct a Solid Waste Management Facility, which was not approved.

- In January 1984, Dussault submitted an Industrial Chemical Survey to NYSDEC. This survey confirmed that Browning Ferris Industries was removing waste from this facility.

- In September 1984, Dussault submitted a Hazardous Waste Disposal Questionnaire to NYSDEC stating that only non-hazardous sand was disposed of on site.

- In March 1985, NYSDEC notified the foundry that Dussault was listed in the NYSDEC Division of Solid and Hazardous Waste registry as a suspected hazardous site (Goddard 1985).

- In July 1985, Dussault hired Advanced Environmental Systems to analyze foundry sand using EP Toxicity test procedures. Phenols were also found to be present at levels of 0.3 ppm and 0.34 ppm (Borzynski 1985).

- In November 1985, the Niagara County landfill in Lockport was contracted to accept foundry sand waste, to be transported by Farley Trucking (Mitrey 1985).

- In March 1986, Niagara County applied to NYSDEC for the Disposal of an Industrial Waste Stream from Dussault. The permit was approved for the disposal of foundry sand at the Niagara County landfill.

- In September 1986, Dussault applied for a Waste Transportation Permit. The permit was issued but has since expired.

- In October 1986, Wendel Engineers prepared for Dussault a closure plan for the sand storage area.

- In December 1986, Dussault was cited by NYSDEC for operating a landfill without a permit and ordered Dussault to close the landfill (Spagnoli 1986).

- In January 1987, a USEPA collected 10 soil samples at several locations on the Dussault Foundry grounds. Several samples confirmed the presence of semivolatile organic compounds and in one sample volatile organic compounds were detected (Bielen 1987).

- In June 1987, a site inspection was conducted by E & E personnel in conjunction with NYSDEC Phase I investigations.

4.2 SITE TOPOGRAPHY

This site is located on the Ontario Plain and is situated on the Niagara Escarpment in the City of Lockport, New York. The site is located in an industrial and residential northern area of the City of Lockport. The site is approximately 1 acre in size and is bounded on the west by Ohio Street and the south by Conrail tracks. The escarpment presents the most topographic relief in the area, running in an east to west direction and rising approximately 75 feet at this location. The area south of the escarpment is characterized by very low relief, except in its eastern part where small knobby hills and long low ridges rise above the former lake plain. The area to the north of the escarpment is generally flat with little relief and slopes gently toward Lake Ontario, approximately 12 miles to the north. Site elevation is approximately 600 feet above sea level. The site is not in a floodplain, and the nearest wetland is approximately 4,000 feet to the north.

The Gulf Wilderness Park, which is used for recreational hiking, is located approximately 2 miles east of the site.

The Erie Canal is approximately 500 feet to the north of the site and flows to the east through the City of Lockport. The Niagara River is approximately 18 miles to the west. A tributary of Eighteen Mile Creek is located approximately 400 feet north of this site and flows north from the Erie Canal to Lake Ontario. The tributary receives discharge from an underground conduit that carries water from the southern part of the City of Lockport. This conduit is part of the city's storm sewer system. During periods of high precipitation, storm water and sanitary wastewater flow into this tributary via the conduit (Rakoczynski 1981).

4.3 SITE HYDROLOGY

4.3.1 Regional Geology and Hydrology

The geology of the Lockport area is well understood because of its simplicity and because of the excellent exposures of bedrock along the Niagara River gorge and the Niagara Escarpment.

The overburden in the Lockport area is relatively thin and consists of three types of unconsolidated deposits. The lowermost layer is glacial till and regolith, an unsorted mixture of boulders, clay, and sand deposited by glaciers, which directly overlies the bedrock. This is overlain by clays, silts, and fine sands of lacustrine origin which comprise the surface soils throughout most of the region. In isolated spots, sand and gravel deposits are found above the lacustrine soils. These were deposited by glacial melt streams and by wave action of the larger ancestors of the Great Lakes.

The bedrock in the Lockport area consists of nearly flat-lying sedimentary rocks, including dolostone, shale, limestone, and sandstone units. The several beds of bedrock slope southward approximately 30 feet per mile.

The entire region south of the Niagara escarpment, and extending almost to Erie County, is directly underlain by the Lockport Dolostone. The Clinton and Albion groups underlie the Lockport but crop out only along the escarpment and in the gorge of the Niagara River. These units are underlain by the Queenston shale. This unit is the uppermost bedrock unit under the plain north of the escarpment.

Groundwater in the Lockport area occurs in both the unconsolidated deposits and in the bedrock. The bedrock, specifically the Lockport Dolostone, is, however, the principal source of groundwater in the Lockport area. Three types of bedrock openings contain the groundwater: bedding joints, vertical joints, and solution cavities.

The bedding joints, which transmit most of the water in the Lockport, are fractures along prominent bedding planes which have been widened up to 1/8 inch by solution of the rocks. These joints extend several miles thus constituting effective water conduits.

The vertical joints are generally too short and sparse to account for significant groundwater storage and transmission, except in the top 10-25 feet of bedrock. Solution cavities, formed when gypsum is dissolved, are also not important components of the aquifer. Although they increase the storage capacity of the aquifer, they are isolated and do not contribute to groundwater transmission.

Two distinct sets of groundwater conditions exist in the Lockport Dolostone. The first is the upper 10 to 25 feet of the bedrock. This region is highly fractured resulting in moderate permeabilities. In some areas in the region, a confining layer of clay above this zone can produce artesian groundwater conditions. The second class of groundwater conditions is found deeper in the bedrock, where at least seven different permeable zones have been identified. These zones are surrounded by impermeable bedrock and are not likely hydraulically connected (Johnston 1964).

4.3.2 Site Hydrogeology

The soils at the site are of the Hilton-Ovid-Ontario association. These soils consist of deep well-drained to somewhat poorly drained soils having a medium-textured or moderately fine-textured subsoil. Natural drainage is a limitation in the wetter areas. Slope and erosion are concerns, mainly near the Niagara escarpment. The site is located in an elevated area and is expected to be somewhat better drained than other areas having the same association. Soil permeability ranges from 0.20 to 6.3 inches per hour (Higgins *et al*. 1972).

Little specific information on hydrology is available for this site. There are no wells on site and no known wells in the immediate vicinity. The presence of glacial deposits may impede downward flow of groundwater but there is insufficient data to adequately assess the hydraulic gradients and dominant flow patterns at this site.

The Lockport Dolostone is expected to be encountered between 5 and 10 feet below the land surface. Groundwater is likely to occur within the first encountered fracture or solutioning zone. Flow is expected to be in a northerly direction, toward the Erie Canal, approximately 500 feet to the north. This shallow water is probably hydraulically connected to the canal water.

The permeability of Lockport Dolostone depends on fracturing, weathering, and solutioning of the rock beneath the site.

To determine more accurately the site hydrogeology, extensive subsurface investigating would have to be performed, including installation of monitoring wells and up- and downstream sampling of the Erie Canal. This is not recommended until it is determined whether any hazardous waste has been present on site.

4.3.3 Hydraulic Connections

The Lockport can be divided into two zones on the basis of water-transmitting properties. The upper 10 to 25 feet of rock is a moderately permeable zone that contains relatively abundant bedding planes and vertical joints enlarged by dissolution of dolomite and abundant solution cavities left by dissolution of gypsum. These zones are more than likely hydraulically connected. The remainder of the formation contains low to moderately permeable bedding planes of which as many as seven may be major water-bearing zones that are surrounded by fine-grained crystalline dolomite. These zones are probably not hydraulically connected.

4.4 SITE CONTAMINATION

Advanced Environmental Systems, Inc., analyzed the waste sand pile for Dussault Foundry on two occasions using EP Toxicity extraction procedures. Levels of phenols in the leachate were found at 0.66 ppm and 0.01 ppm in 1981, and 0.31 ppm and 0.344 ppm in 1985 (Rakoczynski 1981; Borzynski 1985).

NUS Corporation, an EPA subcontractor, performed soil sampling at various locations on site during January 1987. Analytical results indicate the presence of various semivolatile and volatile organic compounds in the soil (Bielen 1987).

During the site inspection, E & E personnel observed and photographed approximately 75 55-gallon drums stored and disposed of on site. The majority of the drums appeared to be empty; however, this fact was not verified during the inspection. Some of the drums observed were in the fill piles. Air monitoring with a photoionization detector was performed while on site, and readings above background were observed near a 250-gallon kerosene storage tank and in an area between the shipping building and the foundry works. These readings reached a peak reading of 55 ppm.

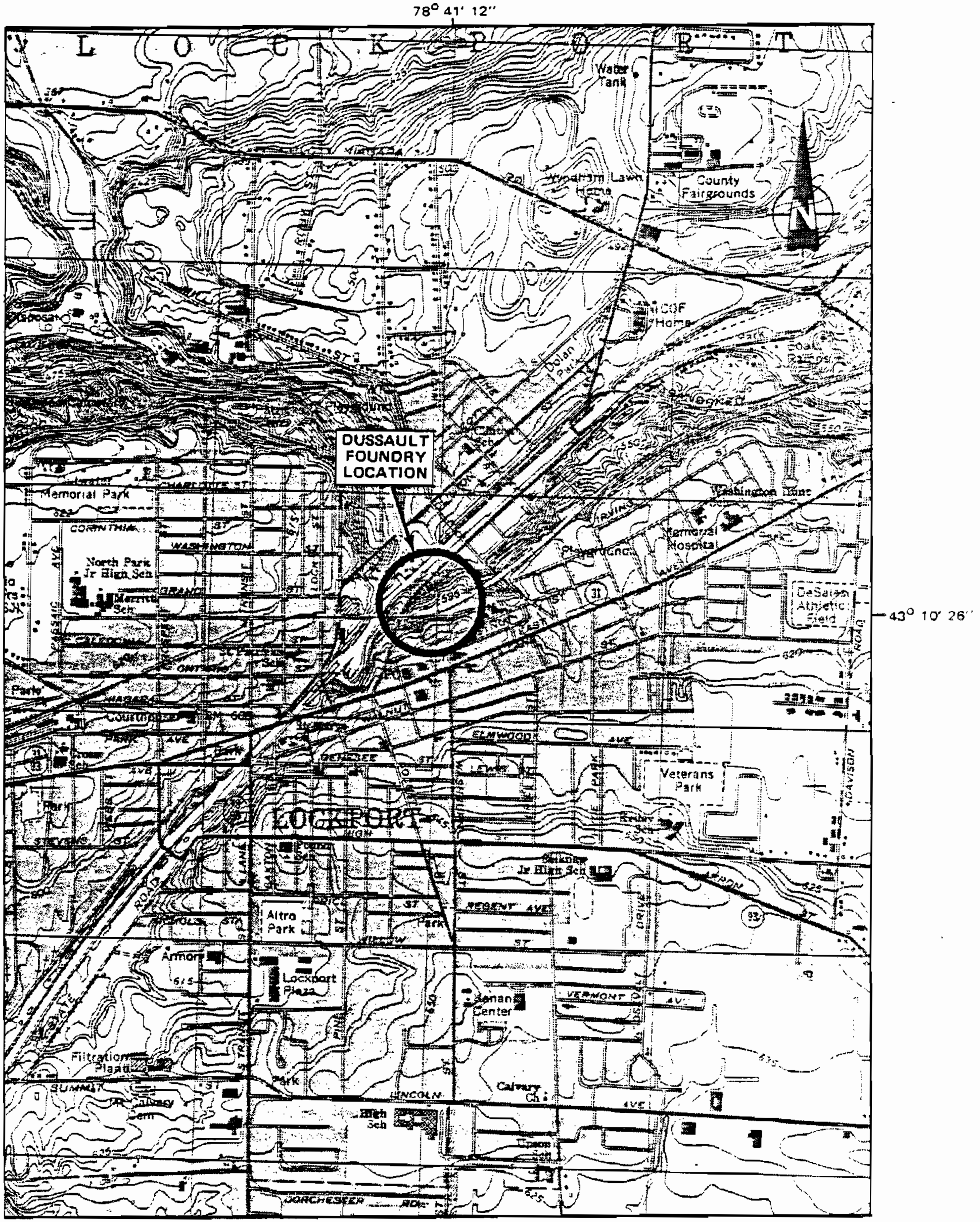
5. PRELIMINARY APPLICATION OF THE HAZARD RANKING SYSTEM

5.1 NARRATIVE SUMMARY

The Dussault Foundry landfill site covers approximately 1 acre, and is located on the foundry property in the City of Lockport, Niagara County, New York. The total population within 3 miles of the site is approximately 36,000 people. The site is located on the Niagara Escarpment approximately 500 feet from the Erie Canal. The principal source of groundwater in the area is the Lockport Dolostone. The foundry operated the landfill to dispose of foundry sand until December 24, 1986, when NYSDEC cited the foundry for operating a solid waste management facility without a permit. Since that time, the foundry has contracted to have the spent sand transported to the Niagara County landfill. Removal of the material is expected to be completed by October 1987.

According to a waste survey report prepared for Advanced Environmental Systems, Inc. by Waste Resource Associates, dated February 20, 1981, approximately 20,000 cubic yards of spent sand containing 0.01 to 0.66 ppm phenol was stockpiled on location (Rakoczynski 1981). Disposal was accomplished by piling the sand directly on the land surface. At the time of E & E's site inspection, the stockpile consisted of approximately 10,000 cubic yards since the sand was being removed to the Niagara County landfill.

Analytical results from foundry sand and soil samples collected from the foundry grounds have determined that semivolatile and volatile organic compounds are present on site.



SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangle, Lockport, N.Y., 1980.

SCALE

0 ½ 1 MILE

0 .5 1 KILOMETER

Figure 5—1 LOCATION MAP

FIGURE 1

HRS COVER SHEET

Facility Name: Dussault Foundry

Location: 2 Washburn Street, Lockport, New York

EPA Region: II

Person(s) in Charge of Facility: Mr. James Maxwell, President

42 O'Brien Drive

Lockport, New York

Name of Reviewer: Dennis Sutton

Date: June 22, 1987

General Description of the Facility:

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

This facility is a foundry that generates spent foundry sand contaminated with phenols. In the past, this sand was stored on site and at one time the volume of sand amounted to approximately 20,000 cubic yards. This sand is presently being removed to an approved landfill. Noted on site, in addition to the foundry sand, were numerous 55-gallon drums that may or may not have contained isopropyl alcohol, phenolic resins, catalyst compounds, curing chemicals, and paints and thinners that are also used at the foundry. Little site specific information is known about groundwater and air routes of contamination.

Scores: S_M = 7.19 (S_{gw} = 3.25 S_{sw} = 12.01 S_a = 0)

S_{FE} = 0

S_{DC} = 62.5

D1626

Ground Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1 Observed Release	[✓ 0] 45	1	0	45	3.1
If observed release is given a score of 45, proceed to line 4. If observed release is given a score of 0, proceed to line 2.					
2 Route Characteristics					3.2
Depth to Aquifer of Concern	0 1 [✓ 2] 3	2	4	6	
Net Precipitation	0 [✓ 1] 2 3	1	1	3	
Permeability of the Unsaturated Zone	0 [✓ 1] 2 3	1	1	3	
Physical State	0 1 2 [✓ 3]	1	3	3	
	Total Route Characteristics Score		9	15	
3 Containment	0 1 2 [✓ 3]	1	3	3	3.3
4 Waste Characteristics					3.4
Toxicity/Persistence	0 3 6 9 12 [✓ 15] 18	1	15	18	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 [✓ 8]	1	8	8	
	Total Waste Characteristics Score		23	26	
5 Targets					3.5
Ground Water Use	0 [✓ 1] 2 3	3	3	9	
Distance to Nearest Well/Population Served	[✓ 0] 4 6 8 10 12 16 18 20 24 30 32 35 40	1	0	40	
	Total Targets Score		3	49	
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			1,863	57,330	
7 Divide line 6 by 57,330 and multiply by 100			S_{gw} = 3.25		

FIGURE 2
GROUND WATER ROUTE WORK SHEET

Surface Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1 Observed Release	[✓ 0] 45	1	0	45	4.1
If observed release is given a value of 45, proceed to line 4. If observed release is given a value of 0, proceed to line 2.					
2 Route Characteristics					4.2
Facility Slope and Intervening Terrain	0 1 2 [✓ 3]	1	3	3	
1-yr. 24-hr. Rainfall	0 1 [✓ 2] 3	1	2	3	
Distance to Nearest Surface Water	0 1 2 [✓ 3]	2	6	6	
Physical State	0 1 2 [✓ 3]	1	3	3	
	Total Route Characteristics Score		14	15	
3 Containment	0 1 2 [✓ 3]	1	3	3	4.3
4 Waste Characteristics					4.4
Toxicity/Persistence	0 3 6 9 12 [✓ 15] 18	1	15	18	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 [✓ 8]	1	8	8	
	Total Waste Characteristics Score		23	26	
5 Targets					4.5
Surface Water Use	0 1 [✓ 2] 3	3	6	9	
Distance to a Sensitive Environment	0 [✓ 1] 2 3	2	2	6	
Population Served/Distance to Water Intake Downstream	[✓ 0] 4 6 8 10 12 16 18 20 24 30 32 35 40	1	0	40	
	Total Targets Score		8	55	
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			7,728	64,350	
7 Divide line 6 by 64,350 and multiply by 100		S_{sw} =	12.01		

FIGURE 7
SURFACE WATER ROUTE WORK SHEET

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

FIGURE 9
AIR ROUTE WORK SHEET

	S	S^2
Groundwater Route Score (S_{gw})	3.25	10.56
Surface Water Route Score (S_{sw})	12.01	144.24
Air Route Score (S_a)	0	0
$S_{gw}^2 + S_{sw}^2 + S_a^2$	▨	154.80
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$	▨	12.44
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} \Big/ 1.73 = S_M =$	▨	7.19

FIGURE 10
WORKSHEET FOR COMPUTING S_M

Fire and Explosion Work Sheet Not scored.

Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
$\boxed{1}$ Containment	1 3	1		3	7.1
$\boxed{2}$ Waste Characteristics					7.2
Direct Evidence	0 3	1		3	
Ignitability	0 1 2 3	1		3	
Reactivity	0 1 2 3	1		3	
Incompatibility	0 1 2 3	1		3	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
	Total Waste Characteristics Score			20	
$\boxed{3}$ Targets					7.3
Distance to Nearest Population	0 1 2 3 4 5	1		5	
Distance to Nearest Building	0 1 2 3	1		3	
Distance to Sensitive Environment	0 1 2 3	1		3	
Land Use	0 1 2 3	1		3	
Population Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Buildings Within 2-Mile Radius	0 1 2 3 4 5	1		5	
	Total Targets Score			24	
$\boxed{4}$ Multiply $\boxed{1}$ x $\boxed{2}$ x $\boxed{3}$				1,440	

$\boxed{5}$ Divide line $\boxed{4}$ by 1,440 and multiply by 100 S_{FE} = 0

FIGURE 11
FIRE AND EXPLOSION WORK SHEET

Direct Contact Work Sheet

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
$\boxed{1}$ Observed Incident	[✓ 0] 45	1	0	45	8.1
If line $\boxed{1}$ is 45, proceed to line $\boxed{4}$ If line $\boxed{1}$ is 0, proceed to line $\boxed{2}$					
$\boxed{2}$ Accessibility	0 1 2 [✓ 3]	1	3	3	8.2
$\boxed{3}$ Containment	0 [✓ 15]	1	15	15	8.3
$\boxed{4}$ Waste Characteristics Toxicity	0 1 2 [✓ 3]	5	15	15	8.4
$\boxed{5}$ Targets					8.5
Population Within a 1-Mile Radius	0 1 2 3 4 [✓ 5]	4	20	20	
Distance to a Critical Habitat	[✓ 0] 1 2 3.	4	0	12	
Total Targets Score			·20	32	
$\boxed{6}$ If line $\boxed{1}$ is 45, multiply $\boxed{1}$ x $\boxed{4}$ x $\boxed{5}$ If line $\boxed{1}$ is 0, multiply $\boxed{2}$ x $\boxed{3}$ x $\boxed{4}$ x $\boxed{5}$			13500	21,600	
$\boxed{7}$ Divide line $\boxed{6}$ by 21,600 and multiply by 100	S_{DC} = 62.5				

FIGURE 12
DIRECT CONTACT WORK SHEET

DOCUMENTATION RECORDS
FOR
HAZARD RANKING SYSTEM

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

Facility Name: Dussault Foundry

Location: 2 Washburn Street, Lockport, New York

Date Scored: June 1987

Person Scoring: Dennis Sutton

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

New York State DEC files, Region 9, Buffalo, NY
Niagara County Health Dept. files, Niagara Falls, NY
USEPA, Region II files

Factors Not Scored Due to Insufficient Information:

Comments or Qualifications:

Although the groundwater route has been scored, this score should be considered preliminary since it is believed that a more accurate score could be given after groundwater parameters are more thoroughly investigated.

GROUNDWATER ROUTE

1. OBSERVED RELEASE

Contaminants detected (3 maximum):

None observed

Rationale for attributing the contaminants to the facility:

* * *

2. ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

Lockport Dolostone
Ref. No. 5

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

Approximately 21 ft.
Ref. No. 5

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

Unknown. Assuming that waste has not been buried, the depth would be approximately 21 feet.
Ref. No. 5

Net Precipitation

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

31 inches/year
Ref. No. 1

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

27 inches/year
Ref. No. 1

Net precipitation (subtract the above figures):

4 inches/year

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

Hilton-Ovid-Ontario
Silt, loess, clay
Ref. No. 4

Permeability associated with soil type:

10^{-5} to 10^{-7} cm/sec
Ref. Nos. 2, 7

Physical State

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

Solid, unconsolidated or unstabilized and liquid
Ref. Nos. 2, 7

* * *

3. CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

None in place
Ref. No. 2

Method with highest score:

Piles uncovered, no liner in place
Ref. No. 1

4. WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Semivolatile and volatile organic compounds
Ref. No. 14

Compound with highest score:

Phenanthrene
Ref. No. 11

Hazardous Waste Quantity

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

Approximately 10,000 cubic yards of foundry sand (0.05% phenol)
Approximately 75 drums (55 gal.)--most appeared empty; however, this fact was not verified. Labels not visible.
Ref. Nos. 2, 7

Basis of estimating and/or computing waste quantity:

Based on foundry records and on-site inspection

* * *

5. TARGETS

Groundwater Use

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

The aquifer of concern is not used within a 3-mile radius of the site, but it is usable.
Ref. Nos. 5, 6

Distance to Nearest Well

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

NA
Ref. No. 6

Distance to above well or building:

NA

Population Served by Groundwater Wells Within a 3-Mile Radius

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

0
Ref. No. 6

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

0
Ref. No. 6

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

0
Ref. No. 6

SURFACE WATER ROUTE

1. OBSERVED RELEASE

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

None observed

Rationale for attributing the contaminants to the facility:

NA

* * *

2. ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:

19%
Ref. No. 13

Name/description of nearest downslope surface water:

Erie Canal
Ref. No. 13

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

19%
Ref. No. 13

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

No
Ref. No. 13

Is the facility completely surrounded by areas of higher elevation?

No
Ref. No. 13

1-Year 24-Hour Rainfall in Inches

2.1 in.
Ref. No. 1

Distance to Nearest Downslope Surface Water

500 ft.
Ref. No. 13

Physical State of Waste

Solid and liquid
Ref. Nos. 2, 7

* * *

3. CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

None
Ref. Nos. 2, 7

Method with highest score:

Piles uncovered, no liner
Ref. No. 1

4. WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Semivolatile and volatile organic compounds in soil
Ref. No. 14

Compound with highest score:

Phenanthrene
Ref. No. 11

Hazardous Waste Quantity

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

Approximately 10,000 cubic yards of foundry sand (0.05% phenol)
Approximately 75 drums (55 gallon)
Ref. Nos. 2, 7

Basis of estimating and/or computing waste quantity:

Based on foundry records and an on-site inspection

* * *

5. TARGETS

Surface Water Use

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

Recreation
Ref. Nos. 2, 6

Is there tidal influence?

No
Ref. No. 13

Distance to a Sensitive Environment

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

NA
Ref. No. 9

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

3,075 ft.
Ref. No. 9

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

NA
Ref. No. 10

Population Served by Surface Water

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

0
Ref. Nos. 8, 16

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

NA

Total population served:

NA

Name/description of nearest of above water bodies:

NA

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

NA

AIR ROUTE

1. OBSERVED RELEASE

Contaminants detected:
An HNU reading of 55 ppm was detected at ground surface in a one-foot diameter area of stained soil near an above-ground storage tank containing kerosene. Although an elevated reading was obtained, this was not scored as an observed air release because no readings above background were obtained in the breathing zone.

Date and location of detection of contaminants:

June 4, 1987
Stained soil near an above-ground tank containing kerosene. Reading taken close to ground surface.

Methods used to detect the contaminants:

HNu

Rationale for attributing the contaminants to the site:

NA

* * *

2. WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:
NA

Most incompatible pair of compounds:
NA

Toxicity

Most toxic compound:
Phenanthrene
Ref. No. 11

Hazardous Waste Quantity

Total quantity of hazardous waste:
Approximately 10,000 cubic yards of foundry sand (0.05% phenol)
Approximately 75 drums (55 gal.)--most appeared empty; however, this fact was not verified. Labels were not visible.

Basis of estimating and/or computing waste quantity:

Based on foundry records and on-site inspection.

* * *

3. TARGETS

Population Within 4-Mile Radius

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

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

16,231
Ref. No. 3

Distance to a Sensitive Environment

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

NA

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

3,075 feet
Ref. No. 9

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

NA
Ref. No. 10

Land Use

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

500 feet
Ref. No. 13

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

NA
Ref. No. 13

Distance to residential area, if 2 miles or less:

500 feet
Ref. No. 13

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

4,000 feet
Ref. No. 4

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

4,000 feet
Ref. No. 4

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

Yes - Union Station
Ref. No. 15

FIRE AND EXPLOSION

Section not scored. Site has not been declared a fire hazard by a fire marshall. Ref. No. 6.

1. CONTAINMENT

Hazardous substances present:

Type of containment, if applicable

* * *

2. WASTE CHARACTERISTICS

Direct Evidence

Type of instrument and measurements:

NA

Ignitability

Compound used:

NA

Reactivity

Most reactive compound:

NA

Incompatibility

Most incompatible pair of compounds:

NA

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility:

Approximately 10,000 cubic yards of foundry sand (0.05% phenol)
Approximately 75 55-gallon drums
Ref. No. 2

Basis of estimating and/or computing waste quantity:

On site inspection
Dussault Foundry records

* * *

3. TARGETS

Distance to Nearest Population

50 ft.
Ref. Nos. 2, 13

Distance to Nearest Building

50 ft.
Ref. No. 2

Distance to a Sensitive Environment

Distance to wetlands:

3,075 ft.
Ref. No. 9

Distance to critical habitat:

NA
Ref. No. 10

Land Use

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

200 ft.
Ref. No. 13

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

NA
Ref. No. 13

Distance to residential area, if 2 miles or less:

500 ft.
Ref. No. 13

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

4,000 ft.
Ref. No. 4

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

4,000 ft.
Ref. No. 4

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

Yes - Union Station
Ref. No. 15

Population Within 2-Mile Radius

29,020
Ref. No. 3

Buildings Within 2-Mile Radius

11,381
Ref. No. 3

DIRECT CONTACT

1. OBSERVED INCIDENT

Date, location, and pertinent details of incident:

None observed

* * *

2. ACCESSIBILITY

Describe type of barrier(s):

No barriers in place
Ref. No. 2

* * *

3. CONTAINMENT

Type of containment, if applicable:

No containment
Ref. Nos. 2, 7

* * *

4. WASTE CHARACTERISTICS

Toxicity

Compounds evaluated:

Semivolatile and volatile organics
Ref. No. 14

Compound with highest score:

Phenanthrene
Ref. No. 11

* * *

5. TARGETS

Population within one-mile radius

16,231
Ref. No. 3

Distance to critical habitat (of endangered species)

NA
Ref. No. 10

REFERENCES

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

Reference Number	Description of the Reference
1	Barrett, K.W., S.S. Chang, S.A. Hans, A.M. Platt, 1982, Uncontrolled Hazardous Waste Site Ranking System Users Manual, MITRE Corporation. Document Location, Ecology and Environment, Inc., Buffalo, NY.
2	Ecology and Environment, Inc., June 1987, Site inspection logbook and photo log. Document Location, Ecology and Environment, Inc., Buffalo, NY.
3	Graphical Exposure Modeling System, June 1987, Environmental Protection Agency, Office of Pesticides and Toxic Substances, Federal Plaza, New York, New York. Document Location, Ecology and Environment, Inc., Buffalo, NY.
4	Higgins, B.A., P.S. Puglia, R.P. Leanard, T.D. Yoakun, W.A. Wirtz, 1972; Soil Survey of Niagara County, New York, USDA Soil Conservation Service. Document Location, Ecology and Environment, Inc., Buffalo, NY.
5	Johnston, Richard H., 1964, Groundwater in the Niagara Falls Area, New York, State of New York Conservation Department, Water Resource Commission, Bulletin GW-53. Document Location, Ecology and Environment, Inc., Buffalo, NY.
6	Hopkins, Michael, June 1987, personal communication, Niagara County Health Department, Niagara Falls, New York. Document Location, Ecology and Environment, Inc., Buffalo, NY.
7	Maxwell, James, June 1987, personal communication, President, Dussault Foundry, Lockport, New York. Document Location, Ecology and Environment, Inc., Buffalo, NY.
8	McCann, James, June 1987, personal communication, Lockport Water Department, Lockport, New York. Document Location, Ecology and Environment, Inc., Buffalo, NY.
9	New York State Department of Environmental Conservation (NYSDEC), wetlands maps, Document Location: Region 9 NYSDEC offices, Buffalo, New York.
10	Snider, James, wildlife biologist, personal communication, June 1987, NYSDEC Region 9, Buffalo, New York. Document Location, Ecology and Environment, Inc., Buffalo, NY.
11	Sax, N. Irving, 1979, Dangerous Properties of Industrial Materials, Sixth Edition. Document Location, Ecology and Environment, Inc., Buffalo, NY.
12	Miller, T.S., W.M. Kappel, 1987, The Effect of Niagara Power Project on Groundwater Flow in the Upper Part of the Lockport Dolomite, Niagara Falls Area, USGS Survey Report 86-4130. Document Location, Ecology and Environment, Inc., Buffalo, NY.
13	USGS 7.5 minute topographical map, 1980, Lockport, NY quad. Document Location, Ecology and Environment, Inc., Buffalo, NY.

Reference Number	Description of the Reference
14	EPA Laboratory analysis results from soil samples at Dussault Foundry, USEPA Region II, New York, New York. Document Location, Ecology and Environment, Inc., Buffalo, NY.
15	Murtagh, W.J. 1976, National Register of Historic Places, USDI National Park Service, Washington, D.C. Document Location, Ecology and Environment, Inc., Buffalo, NY.
16	Burmaster, John, September 1987, personal communication, Niagara County Water Department, Niagara Falls, New York. Document location: Ecology and Environment, Inc., Buffalo, New York.

D1626

REFERENCE NO. 1

Uncontrolled Hazardous Waste Site Ranking System

A Users Manual

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

August 1982

MTR-82W111

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

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

3 202 : - .36

TABLE 2

PERMEABILITY OF GEOLOGIC MATERIALS*

Type of Material	Approximate Range of Hydraulic Conductivity	Assigned Value
Clay, compact till, shale; unfractured metamorphic and igneous rocks	$<10^{-7}$ cm/sec	0
Silt, loess, silty clays, silty loams, clay loams; less permeable limestone, dolomites, and sandstone; moderately permeable till	$10^{-5} - 10^{-7}$ cm/sec	1
Fine sand and silty sand; sandy loams; loamy sands; moderately permeable limestone, dolomites, and sandstone (no karst); moderately fractured igneous and metamorphic rocks, some coarse till	$10^{-3} - 10^{-5}$ cm/sec	2
Gravel, sand; highly fractured igneous and metamorphic rocks; permeable basalt and lavas; karst limestone and dolomite	$>10^{-3}$ cm/sec	3

*Derived from:

Davis, S. N., Porosity and Permeability of Natural Materials in Flow-Through Porous Media, R.J.M. DeWest ed., Academic Press, New York, 1969

Freeze, R.A. and J.A. Cherry, Groundwater, Prentice-Hall, Inc., New York, 1979

REFERENCE NO. 2

6/4/87

Dussault Foundry Site
Lockport, New York
Phase I DEC investigation

0842 Arrive on site, Washburn Ave
E+E Personnel: D. Sutton - T. Leader
S. Nickerson - Safety

Weather: Sunny and Warm,
high cloud cover, 75°F, little
wind 0-5 mph from the east

0845 prepare to meet with
plant personnel, prepare
Hnu for monitoring.

09^{00} Meet c̄ Jim Maxwell and
discuss plant history and
inspection procedure

DSutton 6/4/87

6/4/87

0934 Mr Maxwell must attend a meeting - E+C personnel will do walk through inspection and return to speak to Mr Maxwell for further plant operations information.

0952 - proceed to foundry grounds

10^{12} noted 24 drums in low area at east end of sand berm in landfill area

10^{23} waste area contains drums, metal scrap, sand, wood scrap

1025 ~~a.~~ On the whole the entire grounds of the foundry contains some cover of the foundry sand

10^{30} reading of soil at above ground tank is 55 ppm

D Sutton 6/4/87

1040 - ambient air readings of 1.2 ppm on HNu between foundry buildings near office trailer

* noted fire hydrant near building 2

10^{45} 0.6 HNu reading near rail road tracks - ambient air

1100 proceed to Mr Maxwell's office to ~~ask~~ review files and further discussion

11^{30} review files and photocopy material

1200 left site.

D Sutton 6/4/87

ADDENDUM: JON NICKERSON NOTES OF SITE:

- WASTES DEPOSITED IN LANDFILL FROM 1914 → PRESENT
- DRY LAKE MICHIGAN SAND, 55-60 MESH
- CURRENTLY TAKING I Z TO NIAGARA CO. LANDFILL

- Close Residence ≈ 100 yds East of East end of Landfill
- Empty Drums (23) on side of Building; HNU inside one drum: 3ppm above BKGRD
- HNU as enter Site (Landfill) 0.2ppm
- No HNU reading on surface of Landfill sand; No HNU when agitated sand exposed
- Drums in front of Building #2: Isopropyl Alcohol (Labeled as Flammable Liquid, N.O.S.) UN 1325
- Dusts everywhere; <u>Not</u> confined to L.F. Area
- Propane tanks (26) outside
- Stained Soil by ~~Diesel~~ (JM) Kerosene Tank (≈ 100 gal)

During interview w/ Mr. Jim Maxwell:

Raw materials: 1) Isopropyl Alcohol, used as a thinner; 1000 gal/month, consumed by burning

2) Red oxide from paint; 55 gal/mo

3) Phenolic Resin; used as a Binder

4) Catalyst (Phenolic compounds)

- Uses the Hemi-Kure System, by National Chemical

- Toluenesulfonic Acid (TSA) used, ≈ 10,000 gal/month
- Paint Thinner: Xylene in miscellaneous quantities; put in ~~[illegible]~~ drum bin when used
- Hydraulic fluids used
- BFI does hauling of some wastes
- Enforcement Actions: DEC since (1981) also one incident in 1978
- Permits: None Held
- Does have a 2000 gal Isopropyl Alcohol tank on site

Jon [illegible] 6/4/97

see photolog in back of book

note: 1) site is not fenced, sand is accessable to all who enter foundry property

2) no liner below sand pile is evident drums + sand are placed directly on ground surface

3) Erie Canal is approximately 500 feet north of this site and is used by boaters and for fishing

4) other businesses are located in the
nearby vicinity, Closest is
approx 500 ft south of foundry -
Auto repair shop.
5) residential area is approx 500 feet
northeast of site, homes located
near the base of the escarpment

6/4/87 Photo Log

0958 Roll 1 frame 3
J. Nickerson - photo of drum
pile outside office trailer
next to foundry building
on south side of foundry near
east end of grounds

1000 frame 4-7 - panorama
of fill area. east to north
showing sand piles, removal
area, current dump containing
Tires, drums, slag, metal waste
wood scraps, surrounded
by wooded area

10^{05} no readings on HNU
proceed east along fill area

1009 frame 8 - looking east on
remaining portion of landfill

1012 at end of landfill area
a dump of 55 gallon drums (24)
are noted lying in a low area

6/4/87

10^{15} photo #9 shows the dump
looking NE from top of
sand berm. drums thrown over
escarpment

10^{17}
frame #10 photo of 55 gal drum on
east end of sand berm

10^{20} frame #11 shot of drum pile and
stained soil at west end of fill
area, approx 45 drums
some with & some with
out bungs

10^{22} frame #12 - looking east - along
foundry building ~~room~~ showing
scrap and foundry sand

10^{24} frame #13 - photo showing
about 250 gal ground storage tank and 26
propane bottles on north side
of foundry bldg.

6/4/87

10³⁵ frame 14 - photo showing culvert in hillside on north edge of property showing migration of stormwater offsite

1038 frame 15 - photo showing drums stored on east end of central foundry Building contain isopropyl alcohol

1040 frame 16 - precipitator with sand + dust in driveway area between foundry buildings

10⁴⁴ frame 17 photo showing waste piles, sand, drums, dumpster, storage tanks on south side of foundry Bldgs near west end of grounds - photo taken near RR tracks that run near facility

10⁴⁵ frame 18 - same as above

6/4/87

1050
frame 19 - showing west end of foundry grounds, alledged former fill area now closed, photo shows metal scrap and propane tanks.

1100
frame 20 - looking north at south side of building showing drums of many different materials inside garage door, stained soil + sand

REFERENCE NO. 3

GSC-TR8705

DRAFT

GRAPHICAL EXPOSURE MODELING SYSTEM

(GEMS)

USER'S GUIDE

VOLUME 1. CORE MANUAL

Prepared for:

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

Prepared by:

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

Submitted: February, 1987

1. INTRODUCTION

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

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

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

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

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

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

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

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

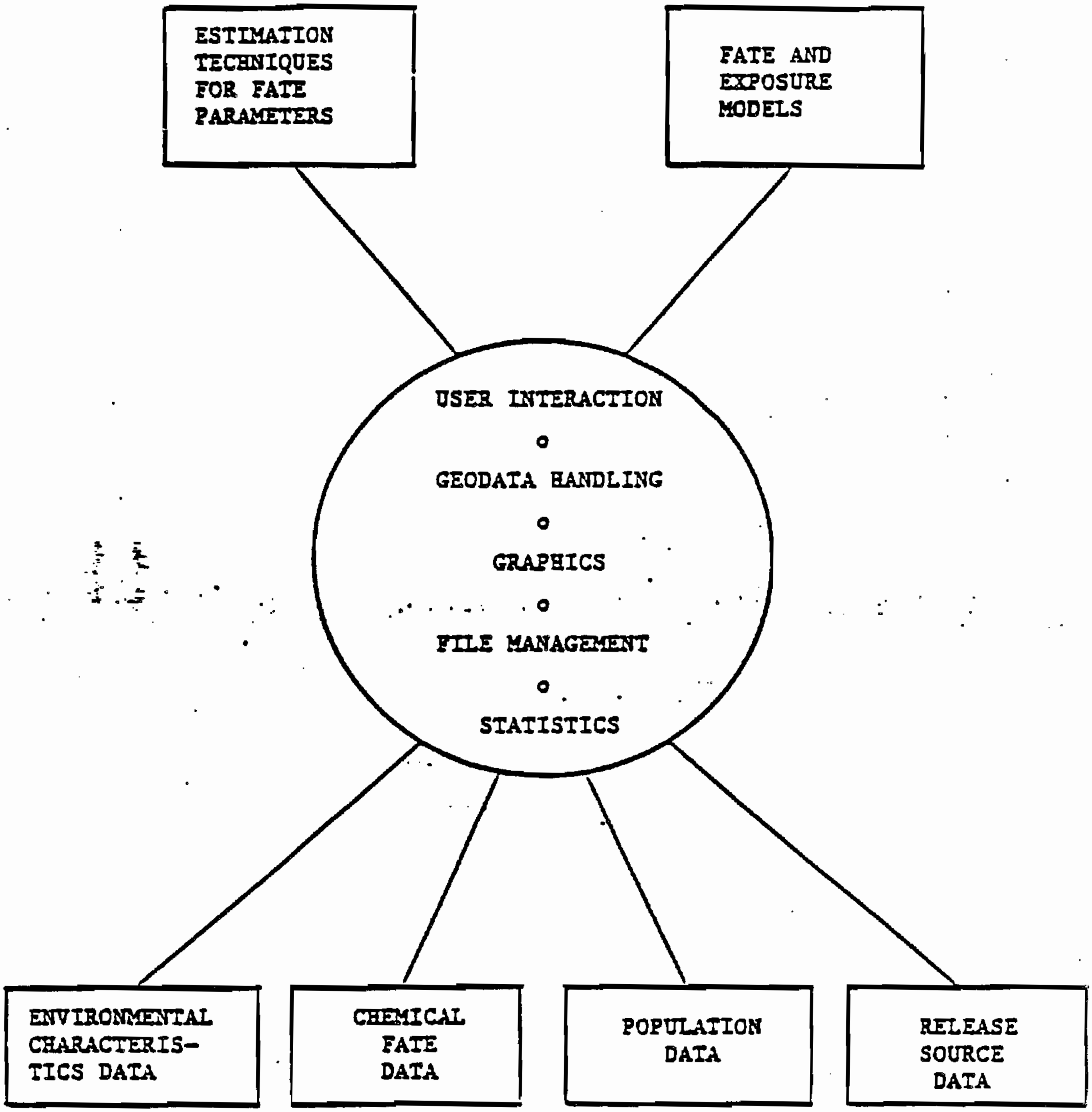


FIGURE 1-1. Components of the Graphical Exposure Modeling System (GEMS)

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

Volume 1: Core-Manual

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

Volume 2: Modeling

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

Volume 3: Graphics and Geodata Handling

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

Volume 4: Data Manipulation

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

Volume 5: Estimation

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

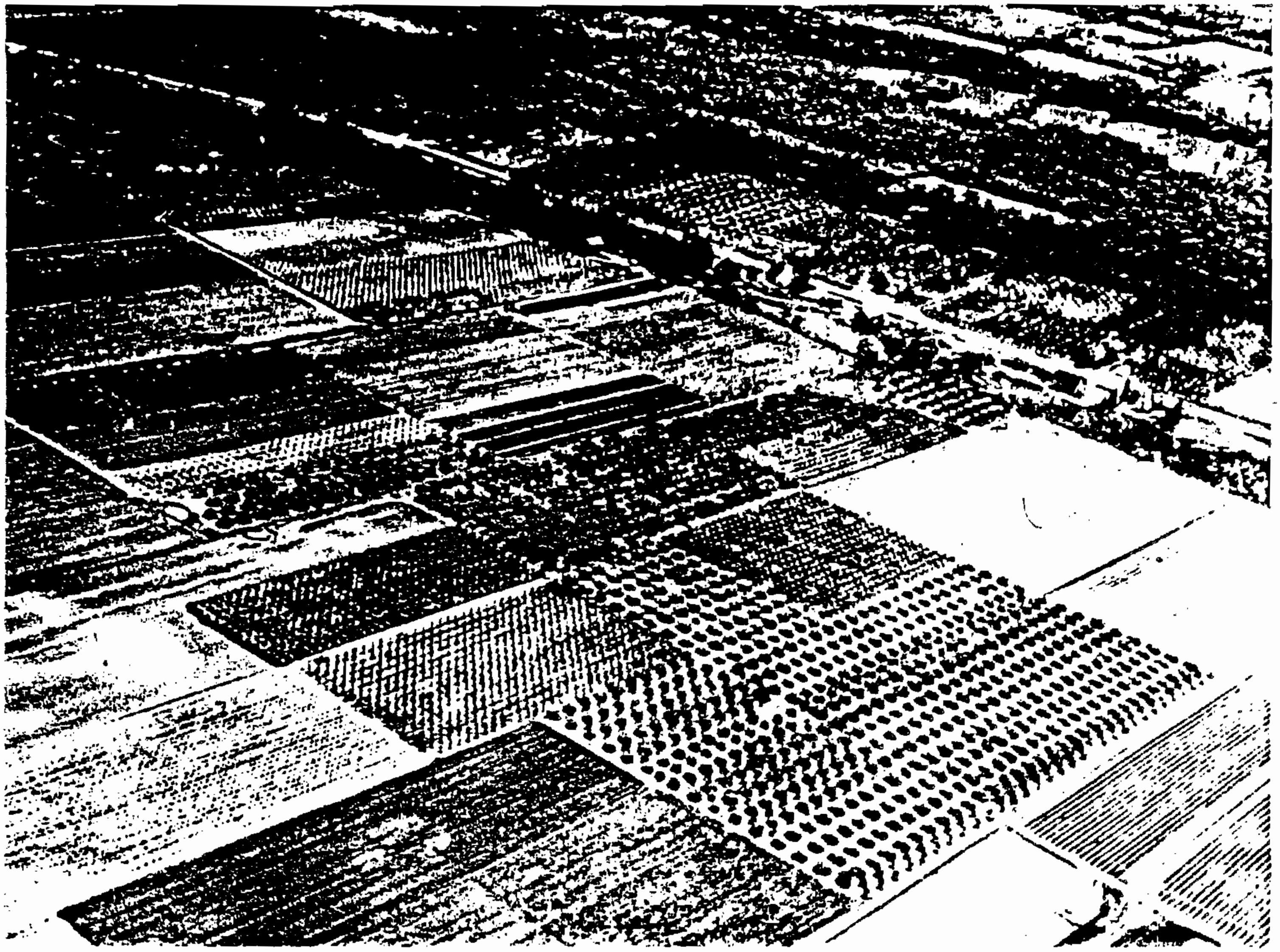
Volume 6: Statistics

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

REFERENCE NO. 4

SOIL SURVEY OF

Niagara County, New York



United States Department of Agriculture
Soil Conservation Service
In cooperation with
Cornell University Agricultural Experiment Station

Issued October 1972

Natural drainage and slow permeability are the two most limiting factors for community development. Sanitary sewers and an adequate drainage system are needed. Because the soils in most of this association are underlain by firm glacial till, bearing strength and soil stability are generally favorable for foundations.

About 75 percent of the association is open land. The remaining 25 percent is scattered farm woodlots or idle land that is reverting to forest. Openland wildlife is plentiful in many areas. Pheasants and rabbits are the most commonly hunted wildlife species. The potential for wetland wildlife is good. Many dug-out ponds are in this association. Marsh occurs in the northern part of Hartland. Recreation consists mostly of hunting and fishing. Scenic areas are few.

2. Hilton-Ovid-Ontario association

Deep, well-drained to somewhat poorly drained soils having a medium-textured or moderately fine textured subsoil

This association occurs in nearly level to strongly sloping areas in which till deposits are dominant (fig. 3). One continuous area occupies the central part of the county. The association crosses the county in a general east-west direction. A limestone escarpment is prominent, and there is a sandy delta in an area that begins near the city of Lockport and extends eastward to the village of Gasport.

The Hilton-Ovid-Ontario association occupies about 15 percent of the county. About 24 percent of this association is Hilton soils, 14 percent is Ovid soils, 7 percent is Ontario soils, and the remaining 55 percent is soils of minor extent.

The Hilton soils are deep, moderately well drained, and medium textured. They have a gravelly loam or silt loam surface layer, have a heavy loam or silt loam subsoil, and are underlain by calcareous loamy glacial till. In some areas limestone bedrock is at a depth of 3 1/2 to 6 feet. These areas have large stones above the bedrock in many places. Hilton soils are nearly level or gently sloping. They commonly are at intermediate elevations on the glacial till plain. In a few places, they are on fairly large lateral moraines or small drumlins.

The Ovid soils are deep and somewhat poorly drained, and they have a moderately fine textured subsoil. Typically, they have a silt loam surface layer, have a silty clay loam subsoil, and are underlain by heavy loam glacial till. They are nearly level to gently sloping and occur at a slightly lower elevation than the Hilton soils. In some places Ovid soils are along drainageways. Some areas of Ovid soils are underlain by limestone bedrock at a depth of 3 1/2 to 6 feet.

The Ontario soils are deep, well drained, and medium textured. Typically, they have a loam surface layer, have a heavy loam subsoil, and are underlain by calcareous loamy glacial till. Ontario soils are nearly level to strongly sloping. They occupy the higher elevations, such as the tops and sides of drumlins or lateral moraines. In places the Ontario soils have limestone bedrock at a depth of 3 1/2 to 6 feet. In these areas they are nearly level or gently sloping and contain some large stones.

The minor soils are mainly of the Appleton, Cazenovia, Cayuga, Churchville, Sun, and Arkport series. The Appleton and Cazenovia soils are intermingled with the major soils on the till plain. The Cayuga and Churchville soils are along the fringes of the till plain where lacustrine sediments cap the till. Sun soils are in depressions, and Arkport soils are mainly on the sandy delta between the city of Lockport and the village of Gasport. Also, Rock land occurs in small areas.

This association has a medium value for farming. In much of the area, farming competes with nonfarm uses. Most of the city of Lockport and the villages of Sanborn, Gasport, and Middleport are in this association. Many estate-type homes are near the limestone escarpment.

Dairying is the major farm use. In the sandy area along the escarpment between Lockport and Gasport, fruit growing is fairly intensive. The 1958 Conservation Needs Inventory indicates that about 50 percent of the association is cropland, 15 percent is forest or woodland, 10 percent is urbanized, and the remaining 25 percent is pasture and miscellaneous open land.

In places stones and bedrock are limitations for farming and urban development. Natural drainage is a limitation in the wetter areas. Slope and erosion are concerns, mainly near the escarpment. In many places installing artificial drainage is difficult because of stones and underlying bedrock.

This association has a high potential for dairying, raising livestock, and part-time farming. Stones and depth to bedrock are limitations to use locally. Lime needs generally are low. Vegetable growing is mostly restricted to the relatively stone-free, level or nearly level soils. Fruit is more susceptible to frost damage than in areas closer to Lake Ontario.

Wet areas, stones, and bedrock near the surface are the most limiting factors for urban development. Sanitary sewers are needed for concentrated housing developments. In many places underground installations are costly. Most soils in this association have adequate strength for building foundations. The association contains some of the most scenic sites for homes in the county.

This association contains five county parks and most of the Tuscarora Indian Reservation. Also, there are several municipal parks and playgrounds. Some of the most scenic views in the county are in this association. Especially near the scenic escarpment, there is a potential for more hiking, nature, and horseback-riding trails.

commonly adjacent to Claverack and Cosad soils in areas where the sandy cap is lacking. The somewhat poorly drained Niagara soils and their wetter and drier associates are scattered throughout the association where soils formed in silty deposits are intermingled with the coarser textured soils.

The soils in this association have a medium value for farming. The main crops are vegetables and fruit. The soils in part of the association are idle. Areas along Pletcher Road and near Ransomville are undergoing some community development. Woodland makes up a small part of the association.

Natural drainage and the complex soil pattern are the main concerns in planning land use. The soils generally are level, and many landowners do not have suitable outlets for drainage. The complex pattern of soils contributes to the problem of drainage. The sands are drained readily with tile, but the underlying silt and clay are not. A combination of tile and surface drainage would benefit many areas. Group drainage projects are needed to provide suitable outlets.

If drainage is adequate and land is leveled, the soils in this association have an excellent potential for vegetables. The soils are generally free of stones and easily tilled. The need for lime is moderate.

Natural drainage and slow permeability of the underlying fine-textured material are the principal limitations for community development. Sanitary sewers and an adequate drainage system are needed. Because the soils in most of this association formed in deep lake deposits, soil stability can be a problem where structures are heavy.

Most of this association is open land. The forested areas consist mostly of scattered farm woodlots. Some of the idle land is reverting to natural hardwoods. Openland wildlife is plentiful in many areas. Pheasants and rabbits are the most commonly hunted wildlife. Marsh and ponded areas have a potential for wetland wildlife. Recreation consists mostly of hunting and fishing. Scenic areas are few.

Areas Dominated by Soils Formed in Lake-laid Silts and Very Fine Sands

These associations make up about 17 percent of the county. The soils are nearly level to gently sloping, are moderately well drained to very poorly drained, and have a medium-textured to fine-textured subsoil. Natural drainage of the soils is the principal limitation to farm use. A fairly large part of the area is cropland that is not intensively used. The soils in these associations are generally free of stones and have a fairly high potential for growing vegetables.

8. Niagara-Collamer association

Deep, somewhat poorly drained and moderately well drained soils having a medium-textured to moderately fine textured subsoil

This association consists of nearly level to gently sloping soils in the lake plain areas (see pl. II, bottom). Four major areas are in the county. More than half the total acreage occurs near Slayton Settlement and Wheeler Roads.

This association occupies about 6 percent of the county. About 23 percent of this is Niagara soils and 23 percent is Collamer soils. The remaining 54 percent is made up of minor soils.

The Niagara soils are deep and somewhat poorly drained. They typically have a silt loam surface layer, a silt loam or silty clay loam subsoil, and underlying material of varved silt, very fine sand, and a small amount of clay. The Niagara soils are nearly level and occupy broad areas of the lake plain. A small part is gently sloping and occurs in dissected areas.

The gently sloping Collamer soils occupy areas in the lake plain. They normally are very susceptible to erosion. Many areas are slightly dissected. The major area of Collamer soils is near the Slayton Settlement Road. Collamer soils have a silt loam surface layer and a silt loam or silty clay loam subsoil. They are deep and moderately well drained. They are similar to the Niagara soils, except that they are better drained.

The soil pattern is complex in this association of the lake plain, and several soils of minor extent are included. Canandaigua soils, the wetter associates of the Niagara and Collamer soils, are commonly in depressions within larger areas of the Niagara and Collamer soils. The somewhat poorly drained Minoa soils and the moderately well drained Galen soils are coarser textured than the Niagara and Collamer soils but are intermingled with them on the same kinds of landscape. Also scattered throughout areas of this association are areas of the somewhat poorly drained Rhinebeck soils, their wetter and drier associates formed in clayey lacustrine sediments, and Claverack and Cosad soils that have a sandy surface layer. Alluvial soils occupy small areas along the streams that dissect the association.

This association has a high value for farming. The soils are mostly cultivated. Vegetables are grown extensively, but some areas are used intensively for fruit and some areas are in dairy farms.

Adequate drainage is the principal need where the soils are level or nearly level. Erosion control is the biggest need where the soils are sloping. Tile drainage generally works well if a suitable outlet is available. Group drainage projects normally are needed in the larger areas that are more difficult to drain. Since these soils are generally free of stones, compaction is likely in the intensively cultivated areas.

The soils in this association have an excellent potential for vegetables and fruit and a good potential for other kinds of farming. With adequate drainage and other good management, these soils are well suited to most crops grown in the county. They are generally free of stones and easy to cultivate. The need for lime is generally medium.

Community development is limited mostly by drainage, permeability, erosion, and instability of the soils. Sanitary sewers are needed for small lots or where houses are concentrated. Surface and

Sanitary sewers and adequate surface drainage are needed. In many places the soils are unstable because they formed in deep lake deposits.

About 85 percent of the acreage is in open land. The forested areas consist mostly of scattered farm woodlots. Some of the idle land is reverting to ash, soft maple, and other native hardwoods. Openland wildlife is plentiful in many areas. Pheasants and rabbits are the most commonly hunted wildlife species, and there is a potential for wetland wildlife. Recreation in this association consists mostly of hunting, fishing, camping, and golfing. Scenic areas are confined mostly to the part of the association that borders the Niagara River and Lake Ontario.

11. Odessa-Lakemont-Ovid association

Deep, somewhat poorly drained to very poorly drained soils having a fine textured or moderately fine textured subsoil that is dominantly reddish in color

This is the largest soil association in Niagara County. It consists of level or nearly level soils on lake plains south of the limestone escarpment (fig. 5). There are two large areas that are dotted with small knolls and ridges of till. The largest area is west of the Barge Canal, and the other area is in the same topographical position as the larger area but is east of the Barge Canal.

This association makes up about 21 percent of the county. About 24 percent of this is Odessa soils, 14 percent is Lakemont soils, and 11 percent is Ovid soils. The remaining 51 percent consists of minor soils.

The Odessa soils are deep and somewhat poorly drained. They typically have a silty clay loam surface layer, a silty clay subsoil, and clay and silt underlying material. These soils are level and occupy the broad areas between the poorly drained, depressional areas and the slightly elevated till ridges.

The Lakemont soils are level to slightly depressional and are generally adjacent to the better drained Odessa soils. Lakemont soils typically have a silty clay loam surface layer, a silty clay subsoil, and underlying material of clay and silt. They have a darker surface layer than the Odessa soils and show more indications of wetness.

The Ovid soils are nearly level to gently undulating and are on till landscapes at slightly higher elevations above the lake plain. They are deep and somewhat poorly drained. Ovid soils typically have a silt loam surface layer, a silty clay loam subsoil, and underlying material of loamy glacial till.

The minor soils are mainly of the Churchville, Cayuga, Cazenovia, Fonda, and Hilton series. Also included are some areas of shallow muck. In many places the moderately well drained Hilton and Cazenovia soils occupy the higher parts of the knolls and till ridges that are scattered throughout the association. Around the fringes of these areas, where lacustrine clays overlap the till, are the somewhat poorly drained Churchville soils and the moderately well drained Cayuga soils. The very poorly drained Fonda soils and the shallow muck occupy some of the deeper depressions in the lake plain.

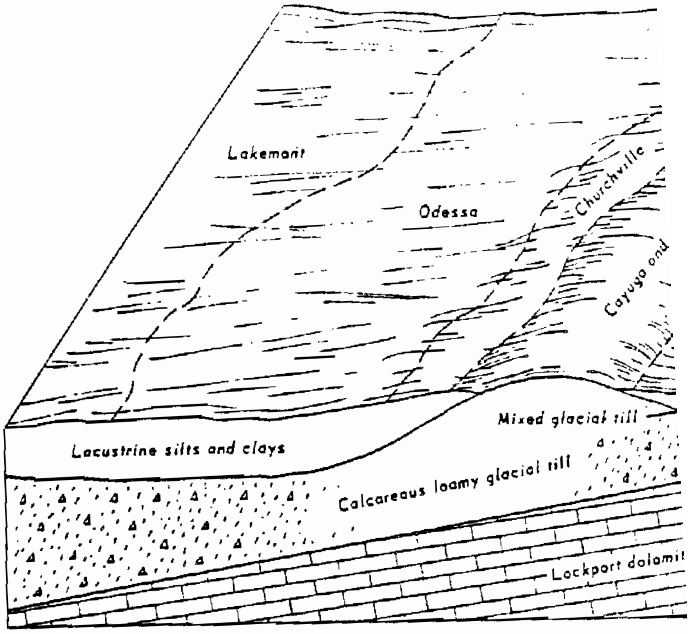


Figure 5.--Typical cross section of the Od

This association has a fairly low value for farming. Much of it is idle or cropland that is not intensively used. Communities are being rapidly developed in the western part of the association near Niagara Falls and in areas south of Lockport. The Conservation Needs Inventory for 1958 indicated that 58 percent of this association is cropland, 6 percent is pasture, 4 percent is forest, 14 percent is urban or built-up areas, and 18 percent is open land (6).

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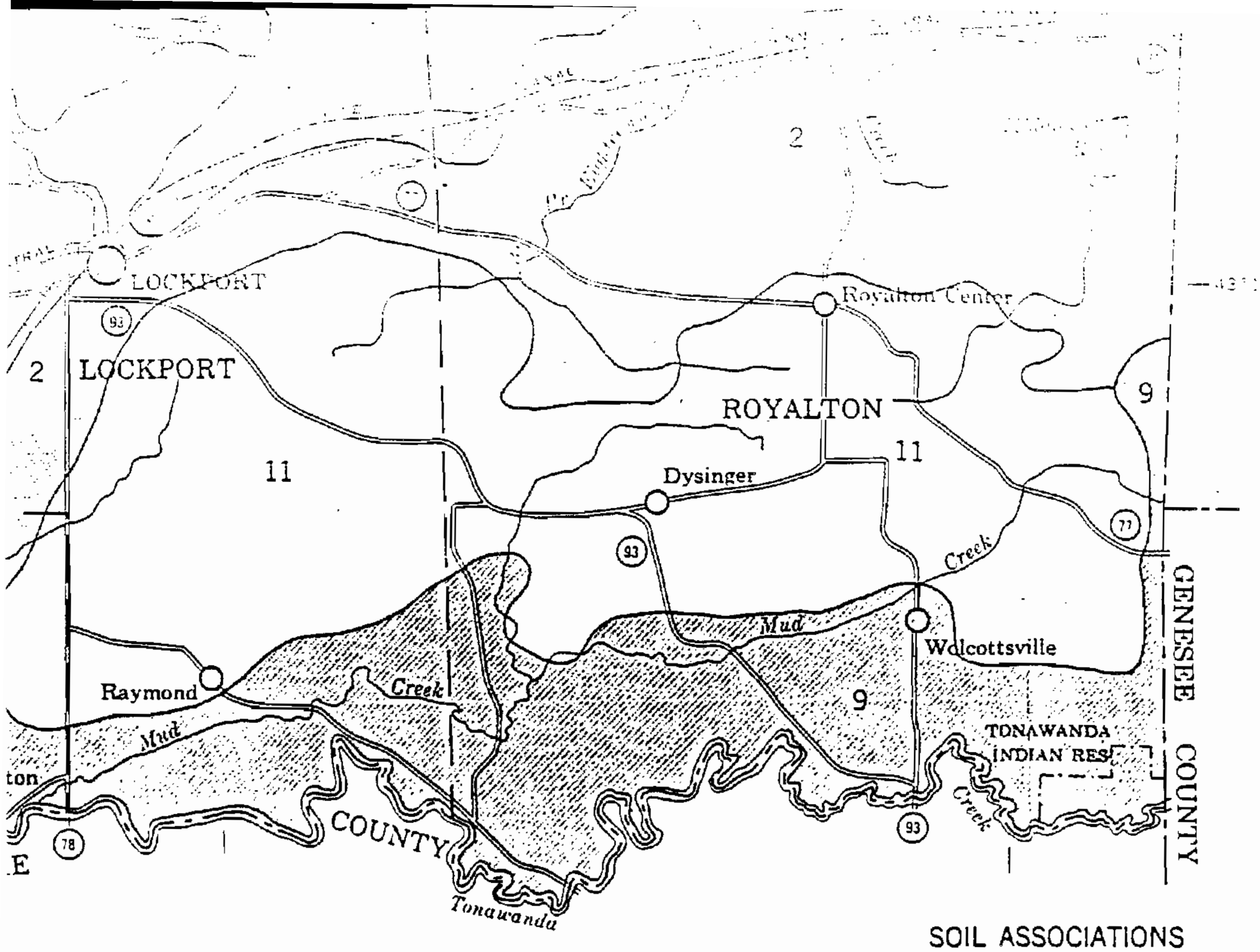

SOIL ASSOCIATIONS

AREAS DOMINATED BY SOILS FORMED IN GLACIAL TILL

1	Appleton-Hilton-Sun association: Deep, moderately well drained to very poorly drained soils having a medium-textured subsoil
2	Hilton-Ovid-Ontario association: Deep, well-drained to somewhat poorly drained soils having a medium-textured or moderately fine textured subsoil
3	Lockport-Ovid association: Moderately deep and deep, somewhat poorly drained soils having a fine textured or moderately fine textured subsoil

AREAS DOMINATED BY SOILS FORMED IN GRAVELLY GLACIAL OUTWASH OR IN BEACH AND BAR DEPOSITS

4	Howard-Arkport-Phelps association: Deep, somewhat excessively drained to moderately well drained soils having a medium-textured to moderately coarse textured subsoil, over gravel and sand
5	Otisville-Altmar-Fredon-Stafford association: Deep, excessively drained to poorly drained soils having a dominantly medium-textured to coarse-textured subsoil, over gravel and sand

AREAS DOMINATED BY SOILS FORMED IN LAKE-LAID SANDS

6	Minoa-Galen-Elnora association: Deep, somewhat poorly drained and moderately well drained soils having a medium-textured, moderately coarse textured, or coarse textured subsoil, over fine and very fine sand
7	Claverack-Cosad-Elnora association: Deep, moderately well drained and somewhat poorly drained soils having a coarse-textured subsoil, over clay or fine sand

AREAS DOMINATED BY SOILS FORMED IN LAKE-LAID SILTS AND VERY FINE SANDS

8	Niagara-Collamer association: Deep, somewhat poorly drained and moderately well drained soils having a medium-textured to moderately fine textured subsoil
9	Canandaigua-Raynham-Rhinebeck association: Deep, somewhat poorly drained to very poorly drained soils having a dominantly medium-textured to fine-textured subsoil

AREAS DOMINATED BY SOILS FORMED IN LAKE-LAID CLAYS AND SILTS

10	Rhinebeck-Ovid-Madalin association: Deep, somewhat poorly drained to very poor drained soils having a fine textured or moderately fine textured subsoil that is dominantly brown or olive in color
11	Odessa-Lakemont-Ovid association: Deep, somewhat poorly drained to very poorly drained soils having a fine textured or moderately fine textured subsoil that is dominantly reddish in color

REFERENCE NO. 5

GROUND WATER IN THE NIAGARA FALLS AREA, NEW YORK

With Emphasis on the Water-Bearing Characteristics of the Bedrock

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CONSERVATION DEPARTMENT
WATER RESOURCES COMMISSION

BULLETIN GW-53
1964

because studies made on the Lockport may contribute to a better understanding of the occurrence of ground water in bedrock generally. The Queenston Shale and Clinton and Albion Groups are poor aquifers in comparison to the Lockport Dolomite, and less is known of their water-bearing characteristics.

LOCKPORT DOLOMITE

Character and extent

The Lockport Dolomite is the uppermost bedrock formation in about one-third of the Niagara Falls area. Its outcrop area extends from the Niagara escarpment on the north to the southern boundary of the area covered by this report except in two small areas that may be underlain by the Salina Group. (See plate 3.) One of these areas is in the vicinity of the hamlet of Nashville and the other is in the extreme southeast corner. Because of a lack of rock outcrops in these areas the position of the contact between the Lockport and the Salina cannot be accurately determined. However, the Salina Group is not discussed as a separate water-bearing unit in this report because at most only a few feet of it occurs in the area. Continuous exposures of the Lockport are found along the gorge of the Niagara River and along the Niagara escarpment. The formation is about 150 feet thick in the southern part of the area but has been eroded to a thickness of only about 20 feet along the escarpment (pl. 2). The excellent exposures at Niagara Falls (fig. 5), where the Lockport forms the lip of the Falls, are shown in many geology textbooks as a classic example of flat-lying sedimentary rocks. Throughout most of the remainder of the area, which is relatively flat, the Lockport is concealed by a thin cover of glacial deposits.

As its name implies, the Lockport Dolomite consists mainly of dolomite; however, the formation also includes thin beds of limestone and shaly dolomite near the base. The Lockport consists of five lithologic types which, from top to bottom, are:

(a) brownish-gray, coarse- to medium-grained dolomite, locally saccharoidal with thin intervals of curved bedding (algal structures).

(b) gray to dark-gray, fine-grained dolomite, containing abundant carbonaceous partings.

(c) tannish-gray, fine-grained dolomite.

(d) light-gray, coarse-grained limestone containing abundant crinoid fragments (Gasport Limestone Member).

(e) light-gray shaly dolomite, laminated in part (DeCew Limestone Member of Williams, 1919).

Fisher (1960) divides the Lockport Dolomite into six units based on fossils as well as rock types. An excellent discussion of the stratigraphy of the

Lockport, including measured sections in the Niagara Falls area, is given in the recent thesis by Zenger [1].

The detailed breakdowns by Fisher and Zenger, although helpful for geologic mapping and correlating the Lockport with rocks of similar age elsewhere, are not necessary in descriptions of the water-bearing properties of the formation. For this purpose the Lockport is subdivided as follows (figure 5 and table 1): (1) upper and middle parts of the Lockport, and (2) lower part of the Lockport, including the Gasport Limestone Member and DeCew Limestone Member of Williams (1919).

Most of the beds in the Lockport are described as either "thick" (1 foot to 3 feet) or "thin" (1 inch to 1 foot). However, massive beds up to eight feet thick and very thin beds (1/4 to 1 inch) occur within the formation. The bedding is generally straight, but curved bedding occurs in some places in the upper part of the formation. The curved bedding is caused by dome-shaped algal structures called "stromatolites" (Zenger, p. 140). These reefs (bioherms), which occur as lens-like masses up to 50 feet across and 10 to 20 feet thick, contain no bedding.

Gypsum (calcium sulfate) is common in the Lockport, occurring chiefly as small irregularly shaped masses (commonly 1/2 to 5 inches in diameter) and as selenite. Sulfide minerals, particularly sphalerite (zinc sulfide), galena (lead sulfide), and pyrite (iron sulfide) occur as particles disseminated throughout the formation.

Water-bearing openings

Types.--Ground-water occurs in the Lockport Dolomite in three types of openings: (1) bedding joints which constitute at least seven important water-bearing zones, (2) vertical joints, and (3) small cavities from which gypsum has been dissolved. Of these, the bedding joints are the most important and transmit nearly all the water moving through the formation. The three types of openings were observed in the dewatered excavations for the conduits of the Niagara Power Project. (See the description of the power project in the introduction and the location of the conduits in figure 3.) The rock faces along the four-mile length of the conduits provided an unequaled opportunity to study water-bearing openings in the entire stratigraphic thickness of the Lockport and to observe the lateral extent of these openings for a few thousand feet. At the time the observations were made (July - August 1960), approximately one-third of the length of the conduits was available for inspection by the writer.

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[1] Zenger, D. H., 1962, Stratigraphy of the Lockport Formation (Silurian) in New York State: Unpublished doctoral thesis, Cornell University.

The bedding joints, which transmit most of the water in the Lockport, are fractures along prominent bedding planes which have been widened very slightly by solution of the rock. These planar openings persist laterally for distances of at least 3 to 4 miles. The separation along individual bedding joints is small (less than 1/8 inch). However, their continuity makes them effective "conduits" for movement of ground water. The large water-transmitting capacity of the bedding joints was shown by the fact that they supplied nearly all the ground-water seepage entering the conduit excavations. The almost continuous lines of seepage from bedding joints was strikingly apparent in the conduits. Figure 7 shows seepage from two bedding joints.

The bedding joints transmitting ground water comprise at least seven distinct water-bearing zones within the Lockport. These water-bearing zones could be traced laterally for distances of 1 to 4 miles. Figure 8 shows the stratigraphic position and part of the lateral extent of the seven zones. The water-bearing zones have been numbered from 1 to 7 from bottom to top. The three sections shown in figure 8 were surveyed by transit and then correlated on the following basis: (1) lithologic similarities, (2) laterally tracing seepage from individual water-bearing zones, and (3) in the case of section A, the distance above the Rochester Shale as shown by core holes. The correlation of water-bearing zone 6 between sections A and B has been changed slightly from an earlier published version (Johnston, 1962, fig. 110.2).

A water-bearing zone may consist of a single open bedding joint (for example zone 4, section C, fig. 8) or it may consist of an interval of rock measuring up to one foot in thickness containing several open bedding joints (zone 7, section A, fig. 8). Where the water-bearing zone consists of several joints, the open joint transmitting most of the water at one locality may "pinch out" laterally and be replaced by another open joint within the same zone elsewhere. For example, at section B (fig. 8) most seepage from water-bearing zone 6 came from a joint at the top of a thin-bedded interval; however, at section A all seepage came from a joint at the bottom of the interval. The opening along one bedding joint thus becomes closed while a parallel opening along an adjacent bedding joint becomes open.

The water-bearing zones occur most commonly within intervals of the Lockport containing thin beds from 1/4 to about 4 inches thick which are directly overlain by thick or massive beds. The thin beds generally contain open vertical joints, and at the intersection of such vertical joints with open bedding joints ground-water seepage is greatest. At a few such points water was observed to squirt from the openings into the conduit excavations in much the same manner as it would from a broken water pipe. It seems likely that open joints occur most commonly in thin-bedded intervals because the greater structural rigidity of the overlying thick or massive beds permits the joints to remain open.

Water-bearing zones occur less commonly within thick-bedded intervals. In such cases all seepage occurs from one distinct bedding joint rather than from several joints. Seepage from zone 4 at section C (fig. 8) came from one prominent bedding joint within an interval of beds averaging one foot in thickness. This bedding joint is open about 1/16 to 1/8 inch locally and appears to transmit as much ground water as any water-bearing zone in the Lockport.

Figure 7.--Seepage from bedding joints in the Lockport Dolomite.
View is of east wall of conduit number 1,
looking south from Porter Rd. bridge.
(Photograph by the Power Authority
of the State of New York.)

Vertical joints, excluding those mentioned above which are associated with open bedding joints in thin-bedded intervals, are not important water-bearing openings in the Lockport, except within the top few feet of rock. Two prominent sets of vertical joints exist in the Niagara Falls area; one set oriented N. 65° E. and the other N. 30° W. These joints are fractures in the rock which must be widened by solution before they can become effective water-bearing openings. Such widening is apparent in outcrops of the Lockport. For example, open vertical joints are particularly prominent in the rock cliffs of the Niagara River Gorge and the Niagara escarpment. The width of these joints in many areas exceeds several inches. However, in fresh exposures of the Lockport, such as the conduit excavations, vertical joints are tight and often not apparent to the eye except in the upper few feet of the rock.

Cavities formed by solution of gypsum occur in the Lockport Dolomite. These cavities range in size from 1/16 inch or less to 5 inches but are generally less than one inch in size. The cavities are formed by the dissolving of gypsum by percolating ground water, and there is a complete range in the development of cavities from voids containing no gypsum to pin-point openings in gypsum nodules. The cavities are most abundant in the top 10 to 15 feet of rock but they also occur along water-bearing zones in the lower part of the rock (for example, water-bearing zone 3, section C, fig. 8). In the upper part of the rock, the abundance of cavities locally gives a vuggy appearance to the dolomite.

The cavities in the Lockport resulting from solution of gypsum increase the ability of the Lockport to store water (porosity) but probably have little effect on the water-transmitting ability of the formation. This is because the water-transmitting ability (or permeability) is dependent upon the size of the continuous openings rather than the size of isolated openings. Thus, the relatively thin but continuous bedding joints determine the permeability of the Lockport rather than the larger but isolated cavities resulting from solution of gypsum.

The character and interrelationships of the three types of water-bearing openings described above result in two distinct sets of ground-water conditions in the Lockport Dolomite: (1) a moderately permeable zone at the top of rock, generally 10 to 15 feet thick, characterized by both vertical and bedding joints that have been widened by solution and by gypsum cavities, and (2) the remainder of the formation consisting of seven permeable zones (composed of bedding joints) surrounded by essentially impermeable rock.

<u>Areal extent</u>.--Relatively little is known about the areal extent of the seven water-bearing zones in the Lockport Dolomite, except as observed in the conduits (fig. 8). Many of the individual bedding joints tend to "pinch out" laterally, and be replaced by adjacent joints in the same zone. Such "pinching out" of joints transmitting water was observed in the conduits. Observations in the conduits and data from wells suggest that a few of the zones may persist for tens of miles. The water-bearing zones of greatest areal extent are those which occur at distinct lithologic breaks in the formation. Zone 1, occurring at the base of the Lockport (fig. 8), is frequently reported to be a water-bearing zone by drillers throughout the area. Zone 2, which occurs at the contact between coarse-grained limestone (Gasport Member) and shaly dolomite (DeCew Limestone Member of Williams, 1919) is the source of most of the springs along the Niagara escarpment. Other water-bearing zones, not located at contacts between distinct lithologic units, probably tend to pinch out within a few miles. In summary, at any point in the area, a number of water-bearing zones parallel to bedding exist in the Lockport. All such zones, however, are not necessarily equivalent to the seven water-bearing zones observed in the conduit excavations at Niagara Falls.

It was also noted in the conduit excavations that there were places, even along the most prominent water-bearing zones, where no seepage was occurring. Many such places doubtless represent natural supports for the overlying rock because no extensive horizontal opening below the earth's surface can exist for any great distance. Little is known either about the nature or the size of these support areas or the distance between them. The available data suggest, however, that they encompass an area of at least a few square feet and are separated by a few tens of feet. It may be expected that with depth the size of the supports increases and the distance between them decreases.

The occurrence of ground water principally in zones parallel to bedding is probably characteristic of flat-lying Paleozoic carbonate rocks in many other places. This type of occurrence was reported by Trainer and Salvas (1962, p. 42) in the Beekmantown Dolomite near Massena, N. Y. They observed that "... The openings which are horizontal or gently dipping, and most of which are probably joints or other fractures parallel to the bedding of the rocks, are wider and more numerous than the steeply dipping openings." Although the Beekmantown Dolomite is of an older geologic age than the Lockport, certain similarities exist between the two formations: (1) both units consist of indurated Paleozoic dolomite and limestone; (2) both units are gently dipping, neither having been subjected to extensive folding and faulting which would result in the development of more prominent vertical joints or fractures associated with faulting; (3) both units were subjected to scouring by ice during glaciation within the last 10,000 to 15,000 years and thus, the extensive solution features common to limestones and dolomites in unglaciated areas have not had time to develop. It seems probable that any flat-lying carbonate rock, possessing the characteristics just stated, will contain ground water principally within joints parallel to bedding.

Origin of water-bearing openings.--The origin and the sequence of development of both the vertical joints and bedding joints are of considerable importance in developing an understanding of the occurrence of water in bedrock. Although it was not possible to investigate the origin or the development during this study, speculations based on fundamental principles of geology, especially regarding the origin of the bedding joints, may be worthwhile.

It is widely recognized that joints are formed by forces which tend to pull the rock apart (tension joints) or slide one part of the rock past an adjacent part (shear joints); see, for example, the discussion by Billings (1954, p. 115). The vertical joints were probably formed by a combination of tension and shear forces during or following the folding of the Appalachian Mountains about 200 million years ago. The bedding joints represent tension fractures that formed as a result of expansion of the rock in a vertical direction during more recent geologic time. The Lockport as recently as 200 million years ago was doubtless buried under thousands of feet of other rocks in the Niagara Falls area just as it is at the present time in the southern part of New York State. During the erosion of the overlying rocks the Lockport expanded vertically. The expansion caused fracturing to occur along bedding planes which are natural planes of weakness in the rock and which are approximately parallel to the land surface. Vertical joints, being at right angles to the land surface were little affected by the removal of the overlying rock.

The bedding joints may have been further expanded by stresses produced in the rock during the recession of the glaciers 10 to 15 thousand years ago. The melting of several thousand feet of ice was doubtless accompanied by an expansion of the rock. This expansion either resulted in an enlargement of existing bedding-plane openings or the formation of new openings along other bedding planes.

In recent geologic times, chemical solution of the rock has widened both the vertical and bedding joints. In the already well-developed openings along bedding joints, slight widening by solution has occurred to depths of 100 feet or more. Enlargement of vertical joints, in contrast, is generally restricted to the upper 10 to 15 feet of rock. Cavities formed by solution of gypsum exist where water moving along joints in the Lockport came into contact with gypsum. Gypsum is much more soluble than dolomite; thus, openings formed by the solution of gypsum are wider than other openings along joints. Water moving down vertical joints has dissolved the gypsum to a depth of about 15 feet leaving irregularly-shaped cavities, and water moving along bedding joints has dissolved gypsum to depths of at least 70 feet.

Water-bearing characteristics

Ground water exists in the Lockport Dolomite under artesian, semi-artesian, and unconfined conditions. Unconfined conditions occur where the water table is the upper surface of the zone of saturation within an aquifer. The water table in an unconfined aquifer moves freely upward as water is added to storage, or downward as water is taken from storage. In contrast, an artesian aquifer contains water which is confined by an overlying impermeable bed and which is under sufficient pressure to rise above the top of the aquifer. The level to which water in an artesian aquifer will rise forms an imaginary surface which is called a piezometric surface. Water levels in artesian aquifers change in response to pressure changes on the aquifer rather than to changes in the amount of water stored in the aquifer.

Both artesian and water-table conditions exist in the Lockport. However, artesian conditions predominate. Figure 9 illustrates the occurrence of both artesian and water-table conditions in the Lockport. The wells shown in the diagram are cased through the clay and silt, but are open holes in the bedrock. A packer is installed in each well which tapped water at two or more distinct levels. The packers make possible the measurement of two distinct water levels in each well; a water level above the packer reflecting conditions in the upper part of the rock and a water level below the packer reflecting conditions in the lower part of the rock.

In the upper part of the rock, either artesian or water-table conditions may exist locally. The clay and silt overlying the Lockport are less permeable than the rock and thus act as a confining bed. Artesian conditions exist where the water in the Lockport has sufficient head to rise above the bottom of the overlying clay and silt. In contrast, unconfined (or water-table) conditions exist where the water level occurs within the fractured upper part of the rock, as at well 309-901-5 in figure 9. Locally a "washed till" or dirty gravel zone occurs just above the top of rock. In these localities good connection probably exists between the bedrock and the overlying till or gravel, and the upper part of the rock and washed till zone together form a continuous semi-confined aquifer.

In the lower part of the rock, artesian conditions occur exclusively. The seven water-bearing zones in the Lockport are surrounded by essentially impermeable rock and therefore act as separate and distinct artesian aquifers. The hydraulic nature of the water-bearing zones was observed during the drilling of observation wells in the vicinity of the Niagara Power Project. These wells, whose locations are shown in plate 1, were drilled to observe the effects of the reservoir on ground-water levels in the area. The piezometric level for each successively lower water-bearing zone is lower than for the zone just above it in most of the wells. The reasons for this will be discussed in the section entitled "Ground-Water Movement and Discharge." During construction, the water level in the wells progressively declined in a steplike sequence as the wells were drilled deeper--that is, when a well had been drilled through the uppermost water-bearing zone, the water level in the well remained approximately at a constant level until the next lower zone was penetrated, at which time the water level abruptly declined to the piezometric level of the next lower zone. The difference between the piezometric levels of any two water-bearing zones is large, and in some places is comparable to the distance between zones. If no packer is installed in a well tapping two water-bearing zones, the upper zone will continue to drain into the well indefinitely. This condition exists in a few of the power project observation wells. In these wells the sides of the well remain wet from the level of the upper zone down to the water level in the well. The nature of the water-bearing zones as described above substantiates the reports by drillers and others of "finding water and losing it" in a well, or of wells with "water running in the top and out the bottom." These phenomena occur in some wells tapping two or more water-bearing zones in the Lockport Dolomite.

A well drilled into the Lockport may penetrate several water-bearing zones, but only one of the zones may be hydraulically effective at the site of the well. This is the case for wells 309-901-1, 3, and 5 shown in figure 9. These wells are open below the packers to zones 1, 2, and 3. However, because the water levels observed below the packers in these three wells apparently represents the piezometric surface of zone 3, zones 1 and 2 are not believed to contain effective openings at the sites of the wells. A well also may be drilled through the section occupied by several zones and not be open to any of them. For example, well 309-901-7 shown in figure 9, is apparently open only to the weathered zone at the top of rock.

Yield and specific capacity of wells

The yield of a well in the Lockport Dolomite depends mainly upon which water-bearing zone or zones are penetrated and the degree to which the bedding joints comprising the zones are open to the well. Near the top of rock, the number of open vertical joints and gypsum cavities penetrated may also be important. The average yield of 56 wells tapping the upper and middle parts of the Lockport (which includes water-bearing zones 4 through 7) is 31 gpm (gallons per minute). In contrast, 15 wells penetrating only the lower 40 feet of the Lockport (which includes water-bearing zones 1, 2, and 3) have an average yield of 7 gpm. The yields of individual wells range from less than 1 gpm to 110 gpm. (These figures do not include a few exceptionally high yield wells which obtain water by induced infiltration from the Niagara River and which are discussed in a following paragraph.) Wells tapping the same water-bearing zone may have different yields. For example, wells 309-901-3 and 309-901-5, which are 500 feet apart and tap water-bearing zones 1 through 4 (fig. 9) yielded 7 gpm and 39 gpm, respectively, before the packers were installed. The bedding joints comprising the water-bearing zones are thus more open at well -5 than at well -3.

Increases in yield during drilling in the Lockport Dolomite occur abruptly rather than gradually. As drilling proceeds through the rock, relatively little increase in the yield of a well will be observed until a water-bearing zone is tapped. At that time a marked increase in yield usually occurs. For example, during the drilling of well 308-901-7, the bailing rate abruptly increased from 12 to 50 gpm when water-bearing zone 5 was tapped. During the drilling of well 308-900-21, three distinct increases in yield were observed. The yield, which was 3 gpm at 17 feet (water-bearing zone 7), increased to 9 gpm at 22 feet (an open vertical? joint or solution cavity?) and abruptly increased to 30 gpm at 34 feet (water-bearing zone 6).

Wells in an area about a half mile wide adjacent to the Niagara River above the falls have substantially higher yields than wells elsewhere in the area. The higher yields in this area are caused by two conditions: (1) the Lockport Dolomite is thickest in the area, and (2) more importantly, conditions are favorable for the infiltration of water from the Niagara River. The greater thickness of the Lockport provides the maximum number of water-bearing zones to supply water to the wells. The Niagara River provides an unlimited source of recharge to the water-bearing zones.

Evidence that a substantial part of the water pumped is supplied by induced infiltration from the Niagara River is indicated by the high yields, which exceed 2,000 gpm at some wells, and the chemical character of the water. The chemical composition of the water in well 304-901-6 (which has been pumped at 2,100 gpm) is more similar to Niagara River water than "typical" ground water in the Lockport. (See the following discussion of the chemical character of water and figure 11.) Similar infiltration of Niagara River water into the bedrock at Tonawanda, N. Y., a few miles south of Niagara Falls, was described by Reck and Simmons (1952, p. 19-20).

Infiltration from the river can occur where pumping has lowered ground-water levels below river level to such an extent that a hydraulic gradient is created between the river and the wells. The amount of the infiltration depends on the gradient and the nature of the hydraulic connection between the river and Lockport. The hydraulic connection is controlled by the character of the river bottom. Throughout most of its length in the Niagara Falls area the bottom of the river is covered by a layer of unconsolidated deposits including both till and clay and silt. This layer was found to be from 10 to 20 feet thick in the vicinity of the Niagara Falls water-system intake. (See logs 304-900-i and -j in figure 19.) In the section of the river occupied by rapids, extending a half mile or more above the falls, the bottom has been scoured clean by the river. Where the layer of unconsolidated deposits is present its low permeability greatly retards infiltration. Where the layer is thin or absent infiltration can readily occur.

One of the most striking features in plate 2 is that all wells yielding more than 1,000 gpm are located in a narrow band that intercepts the river about two miles east of the falls. This band trends in a northeasterly direction roughly parallel to one of the two major directions of vertical jointing. Thus, the very high yields may be caused by a greater abundance of vertical joints within the band of high-yielding wells. Vertical joints provide avenues through which water could readily move from the river downward to the bedding joints comprising the water-bearing zones in the Lockport Dolomite.

Wells in the Lockport Dolomite are almost always adequate for domestic needs of a few gallons per minute. Supplies of 50 to 100 gpm, which are adequate for commercial uses and small public supplies, can be obtained in much of the area underlain by the upper part of the Lockport (pl. 2). Large supplies (over 1,000 gpm), as previously noted, are available only in a small area adjacent to the Niagara River.

Wells inadequate for domestic needs are occasionally reported. All wells that are perennially inadequate are located near the Niagara escarpment and therefore tap only the lowest and least permeable water-bearing zones (1, 2, and 3) in the Lockport. Throughout the area a few shallow wells that derive nearly all their water from a single water-bearing zone become inadequate during the summer and autumn of some dry years. Such is the case with well 308-853-1. This well is 27 feet deep and reportedly obtained over 50 gpm from a water-bearing zone 17 feet below land surface. During the drought in 1960, this zone was dewatered as the water table declined in the fall of the year, and the yield of the well quickly declined to less than 1 gpm. The inadequacy of some wells in the Lockport Dolomite can normally be overcome by deepening the well until it penetrates one or more lower water-bearing zones.

Information on the specific capacity of a well is more meaningful than a simple statement of yield. The specific capacity is the yield per unit drawdown, generally expressed as gallons per minute per foot of drawdown. For example, well 307-903-1 was pumped at 20 gpm with 54 feet of drawdown which indicates a specific capacity of 0.37 gpm per foot. The yield and the drawdown for a number of wells in the Lockport are shown in plates 2 and 3. These data must be used with care as they apply only so long as no part of the formation is dewatered.

As water-bearing zones in the Lockport are dewatered, the specific capacity declines. The decline in specific capacity caused by dewatering a water-bearing zone is shown by the data obtained during a pumping test on well 309-859-1. This well was pumped at 2.2 gpm with 5.0 feet of drawdown for 70 minutes--specific capacity of 0.44 gpm per foot. After 70 minutes, water-bearing zone 3 was partially dewatered and a drawdown of 8.2 feet was required to maintain the pumping rate of 2.2 gpm. This indicates a specific capacity of 0.27 gpm per foot. At the time the well was drilled, it was bailed at 3 gpm with a drawdown of about 60 feet. Thus, during the bailing the entire 42 feet of Lockport penetrated by the well was dewatered. The specific capacity of the well with the Lockport dewatered is 0.07 gpm per foot (3 gpm with 42 feet of drawdown) compared to 0.44 gpm per foot with no dewatering.

water from the Queenston are usually found in two areas--(1) in a band about two miles wide immediately north of the Niagara escarpment, and (2) in areas immediately adjacent to streams. Both these areas are believed to be places of ground-water discharge--that is, areas where ground water is moving upward from the Queenston to discharge naturally.

The origin of the salty water in the Queenston is unknown. In commenting on a similar occurrence of salty water in the bedrock in northern St. Lawrence County, N. Y., Trainer and Salvas (1962, p. 103) suggest three causes for the salty water in that area: (1) connate water, (2) the Champlain Sea, and (3) evaporite deposits. They conclude that the Champlain Sea, which covered the area about 10 or 20 thousand years ago, is the most likely source. This source is not applicable to the Niagara area, however, because the Champlain Sea did not extend into the area. Furthermore, it is unlikely that the salty water in the Niagara area is derived from evaporite beds because no such deposits are known to exist in the Queenston. Nor do any salt beds occur in the bedrock formations overlying the Queenston Shale (fig. 5) in the Niagara Falls area. The nearest salt beds occur about 40 miles to the southeast in the Salina Group which overlies the Lockport Dolomite. However, it is very improbable that salty water from the Salina beds has entered the Queenston Shale because (1) the salt beds themselves act as impermeable barriers to water moving downward from the Salina to the Queenston, and (2) it is more likely that salty water from the Salina would be discharged at points between the outcrop areas of the two formations.

Although direct evidence is lacking, the writer believes that the salty water in the Queenston Shale is most likely derived from connate water. The discharge of connate water begins as soon as a deeply buried bed is brought up into the zone of circulating ground water. The Queenston rocks were deposited as a sea-bottom clay about 350 million years ago, and have been deeply buried throughout most of the intervening time. During some thousands of years of Recent geologic time, connate water has been flushed from the upper several hundred feet of the Queenston. However, it is probable that flushing of the deeper part of the formation is continuing at present.

OCCURRENCE OF WATER IN UNCONSOLIDATED DEPOSITS

The unconsolidated deposits in the Niagara Falls area are not important sources of water. These deposits may be classified into two types based on their water-bearing properties: (1) coarse-grained materials of high permeability (sand and gravel), and (2) fine-grained materials of very low permeability (glacial till and lake deposits). The unconsolidated deposits in the Niagara Falls area are predominantly of the fine-grained type. However, the lack of sand and gravel deposits in the Niagara Falls area, other than a few deposits of very limited thickness and extent, has severely limited the development of large ground-water supplies in the area. Most large ground-water supplies in New York State are derived from sand and gravel deposits.

Table 2 shows selected chemical constituents from wells tapping unconsolidated deposits. Water from the different types of unconsolidated deposits is not easy to differentiate on the basis of quality because many wells tap more than one type of deposit. Thus, water samples from such wells are mixtures of water from two or more deposits. In general, water from the unconsolidated deposits is very hard, but not so highly mineralized as water from the bedrock. A complete analysis of water from well 312-859-1, which taps both till and lake deposits, is listed in table 9. This is a calcium bicarbonate water, very hard (568 ppm of total hardness) containing a moderately high chloride content (105 ppm). Water from the unconsolidated deposits generally has a wide range in chloride content. Those wells which yield water with a high chloride content are probably affected either by (1) local pollution, or by (2) upward discharge of saline water from the underlying bedrock.

SAND AND GRAVEL

Sand and gravel is found in small isolated hills and in a narrow "beach ridge" which crosses the area along an east-west line (pl. 3). The sand and gravel deposits are of limited areal extent, generally thin, and occur as topographic highs. The deposits commonly consist of two lithologic types: (1) fine-grained reddish-brown sand, and (2) coarse sand and pebbles with a matrix of fine to medium sand. The origin of both the beach ridge and small hills of sand and gravel is associated with glaciation in the Niagara Falls area. The small hills are kames, i.e. hills of sand and gravel formed originally against an ice front by deposition from sediment-laden melt-water streams. The long, narrow beach ridge is believed to represent a former shore line of glacial Lake Iroquois. This large lake, the predecessor of the present Lake Ontario, existed in the Niagara Falls area near the end of the Ice Age. The sand and gravel composing the beach ridge apparently was produced from pre-existing material by wave action at the shore which winnowed out most of the silt and clay originally contained in the glacial deposit.

Although the sand and gravel deposits in the Niagara Falls area are much more permeable than the other unconsolidated deposits or the bedrock, their occurrence as small topographic highs permits them to drain rapidly. As a result, ground water generally occurs only within a thin zone at the base of the sand and gravel. This is shown in the cross section of the beach ridge in figure 12. It can be seen that the water table is only a few feet above the base of the sand and gravel. Extensive pumping of any of the wells shown would quickly dewater the sand and gravel. In general, wells in the beach ridge and kames will yield only the small amounts of water required for domestic and small-farm needs.

Moderate supplies of ground water can be obtained from a sand and gravel deposit (probably a kame) just east of Lockport, N. Y. (pl. 3). This is the largest sand and gravel deposit in the area, measuring 1 1/2 by 3/4 miles in size. The thickness of the deposit is highly variable because of the hummocky nature of the land surface, but probably averages 60-70 feet. Some notion of the ability of this deposit to yield water is shown by the yield of 165 gpm pumped from a sand pit during excavation. One large-diameter supply well has been constructed in this deposit. This well (311-838-3) was reportedly pumped at a rate of 200 gpm for 24 hours in 1956.

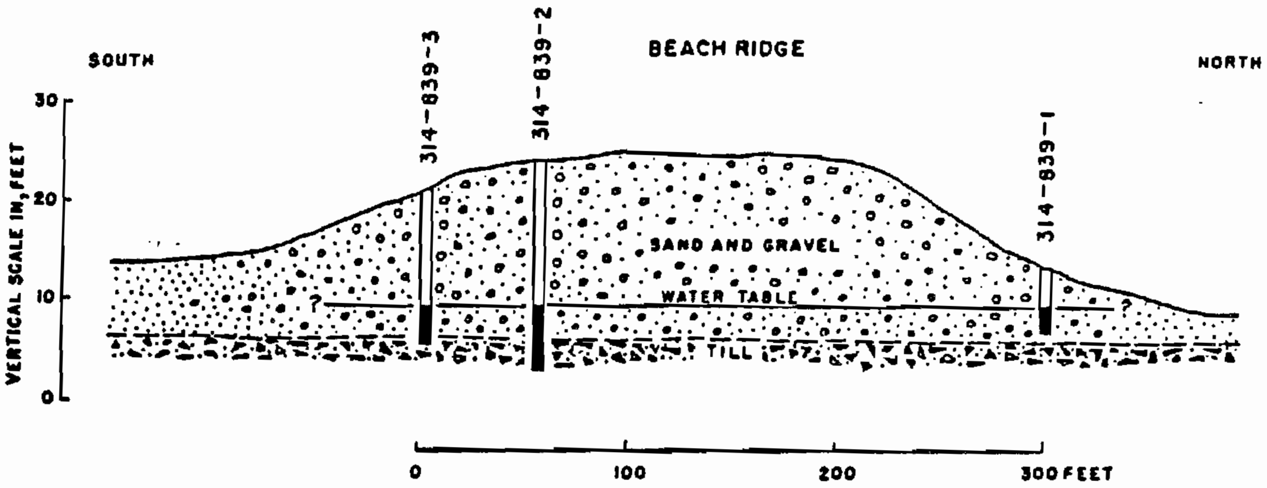


Figure 12.--Cross section of sand and gravel "beach ridge" through wells 314-839-1, -2, and -3.

LAKE DEPOSITS

Lake deposits consisting of silt, clay, and fine sand occur throughout the Niagara Falls area. These deposits are predominantly composed of laminated silt and clay which is characteristically dense and compact. Thin beds of fine sand (locally called quicksand) occur in the lake deposits. The clay, silt, and sand were deposited in lakes which existed in the area at the close of the Pleistocene Epoch (10,000 to 15,000 years ago). The lakes, which formed in the wake of the melting ice sheet, provided large bodies of quiet water for the slow accumulation of fine-grained deposits. Thus, the lake deposits are found at the surface nearly everywhere in the Niagara Falls area. The deposits are thinnest in the area south of the Niagara escarpment where they rarely exceed 20 feet in thickness. On the lake plain north of the escarpment the deposits average 30 to 40 feet in thickness; however, locally they vary from 0 to 90 feet in thickness. The greater thickness on the lake plain results from the persistence of a lake in this area (glacial Lake Iroquois) after the area south of the escarpment was above water.

The silt and clay have extremely low permeability and yield little water to wells. The thin beds of fine sand have comparatively greater permeability. Wells which tap only clay and silt will yield less than 100 gpd; those wells tapping sand beds yield more water and are usually adequate for domestic or very small agricultural needs. The lake deposits are utilized for water supplies only in the lake plain (north of the Niagara escarpment); to the south of the escarpment the deposits are too thin and are underlain by the much more permeable Lockport Dolomite.

The impermeable nature of the silt and clay was shown by a recovery test conducted on well 315-859-1. This well is believed to penetrate only clay and silt. After being pumped dry, the well required 4 1/2 months for the water level to rise to its static level 13 feet above the bottom. The permeability of the clay and silt, as calculated from the recovery data, was 0.04 gallons per day per square foot. The well was originally intended to provide water for a domestic supply, but was inadequate. In contrast, well 315-859-2, which is located about 500 feet to the south, provides an adequate domestic supply. This well undoubtedly penetrates a thin bed of sand.

GLACIAL TILL

A thin veneer of glacial till lies between the lake deposits described above and the bedrock throughout nearly all of the Niagara Falls area. The till is a mixture containing mostly sandy silt with boulders, pebbles, and some clay. The till was deposited directly by the ice sheet and is composed of rock which was quarried by the advancing ice, then ground up, and "plastered down" beneath the ice. The till cover in the Niagara Falls area is generally less than 10 feet thick. The greatest thickness of till (30 to 40 feet) is found in the moraines in the eastern part of the area. These features are the low ridges which trend approximately east-west located in the area southeast of Lockport and south of Medina (pl. 3). The moraines are composed of debris which was piled up in front of the advancing ice front. The moraines in the Niagara Falls area are believed to represent four minor readvances of the ice sheet during its retreat from the area (Kindle and Taylor, 1913, p. 10).

The poorly sorted nature of the till causes it to have very low permeability. An indication of the low permeability was obtained from a "slug" test on well 309-900-8. This well penetrates 7.5 feet of lake clay and silt and 1.5 feet of glacial till, and is cased through the lake deposits. The permeability of the till at this well was determined to be 23 gallons per day per square foot. This value for permeability may be too high because the well bottomed at the top of the Lockport Dolomite. Thus an open joint in the rock could have contributed to the yield of the well. However, the value for permeability may be representative of the "washed till-top of rock" aquifer tapped by many dug wells in the Niagara Falls area.

Yields adequate for domestic needs are obtained from till wells which tap: (1) sand lenses within the till, (2) the relatively permeable ("washed") zone at the top of rock, or (3) the sandy till making up the moraines. Wells which do not tap these more permeable horizons in the till are often inadequate to supply even domestic needs. Such inadequate wells yield less than 100 gpd.

separating Lake Erie from Lake Ontario. The winds are thus less moisture-laden than if they had passed over the lakes. Even those winds which may be moisture-laden (from evaporated lake water) may retain most of their moisture until they reach the more hilly areas east of Lake Ontario. The Niagara escarpment appears to have a local effect on the amount of precipitation also. As can be seen from the precipitation data given in table 5, Lewiston (elevation 320 feet), which is located below the escarpment, receives less precipitation than Lockport (elevation 520 feet), which is at the escarpment. Table 5 also shows that precipitation is fairly evenly distributed throughout the year. Within a given year, however, large variations from the average figures listed may occur. Note that the minimum monthly precipitation for each month during the 25-year period is between 1/2 and 1/20 the average precipitation for that month. However, the minimum annual precipitation (1941) is more than 1/2 the average annual precipitation. Average annual temperature is 48°F at Lewiston. The length of the growing season averages 160 days.

GROUND WATER

A part of the rain and snow falling on the Niagara Falls area seeps into the ground and continues downward to the water table to become ground water. The ground water is in constant, but generally very slow, movement from points of recharge to points of discharge. Ultimately all ground water in the area is discharged into Lake Ontario or the Niagara River either directly or via small tributary streams. The Niagara Falls area is, in effect, a peninsula-shaped catchment area in which the ground-water reservoir is being repeatedly replenished by precipitation, and constantly discharging to the surrounding surface-water bodies. This section of the report describes: (1) recharge to the unconsolidated deposits and the bedrock, (2) movement and discharge of ground water in the area, and (3) changes in storage in the ground-water reservoir as shown by water-level fluctuations.

RECHARGE

The source of nearly all the ground-water recharge in the Niagara Falls area is precipitation; however, a small amount of recharge also occurs in the area beneath and immediately adjacent to the Niagara Power Project reservoir by infiltration from the reservoir. Recharge of ground water means simply the addition of water (or quantity added) to the zone of saturation (Meinzer, 1923, p. 46). The rate and amount of recharge depends mainly upon the permeability of the soil, the amount of precipitation, and the soil-moisture condition at the time of precipitation. The rate of infiltration of water into the soil increases with increase of permeability. In the relatively small part of the Niagara Falls area underlain by sand and gravel, infiltration rates are greatest. However, throughout most of the area underlain by glacial till and lake clays and silts infiltration rates are low and surface runoff is high.

Table 5.--Monthly precipitation at Lewiston and Lockport, N. Y., 1936-60
(Data from reports of U.S. Weather Bureau)

Month	Lewiston (1 mile north of; elevation 320 feet)		Lockport (2 miles northeast of; elevation 520 feet)	
	Average (inches)	Minimum (inches)	Average (inches)	Minimum (inches)
January	1.98	0.59 (1946)	2.38	0.67 (1946)
February	2.35	.54 (1947)	2.52	.85 (1947)
March	2.49	.63 (1958)	2.56	.71 (1958)
April	2.66	.83 (1946)	2.80	.91 (1946)
May	3.08	.71 (1941)	3.26	.94 (1936)
June	2.18	.66 (1953)	2.41	.33 (1953)
July	2.44	1.15 (1955)	2.70	.90 (1954)
August	2.57	.21 (1948)	2.97	.36 (1948)
September	2.97	.46 (1941)	2.92	.14 (1941)
October	2.55	.47 (1947)	2.85	.60 (1938)
November	2.33	.75 (1939)	2.62	.64 (1939)
December	2.02	.39 (1958)	2.39	.71 (1943)
Annual	29.62	17.64 (1941)	32.38	19.75 (1941)

The mechanism of recharge to the Lockport Dolomite is of primary concern in this report because this bedrock unit is by far the most important aquifer in the Niagara Falls area. As discussed previously, most ground water occurs in the Lockport within seven relatively permeable zones parallel to bedding which are separated by essentially impermeable rock. Recharge to these water-bearing zones occurs by one of two mechanisms: (1) downward movement of water through vertical joints or (2) recharge directly to the water-bearing zones at the outcrop of the bedding joints composing the zones.

Several lines of evidence suggest that recharge to the Lockport Dolomite occurs predominantly at the outcrop of the water-bearing zones. The lack of persistent open vertical joints in the Lockport as observed in the conduit excavations, suggests that vertical joints are not important avenues for downward movement of water. However, this is not conclusive evidence in itself because on an areal basis, many vertical joints, although apparently tight, might be able to transmit appreciable quantities of water when considered as a whole even though each joint singly might transmit a very small quantity of water. More conclusive evidence of a negligible movement of water along vertical joints is the occurrence of "dry" open bedding joints below the "wet" bedding joints comprising the water-bearing zones in the Lockport (fig. 8). This phenomenon could not occur if permeable vertical joints connected the "dry" and "wet" bedding joints. It seems probable that the "dry" bedding joints exist because they receive little or no recharge in their outcrop area. This lack of recharge would be particularly applicable to those bedding joints cropping out along the Niagara escarpment where there is very little opportunity for recharge.

The most important indication that recharge to the water-bearing zones of the Lockport Dolomite occurs at the outcrop of the zones, is the alignment of water levels approximately parallel to the dip of the zones themselves. This alignment of water level is shown for water-bearing zone 3 in figure 9.

The wells shown in the cross section are adjacent to the reservoir of the Niagara Power Project; however, the water levels shown were measured prior to flooding of the reservoir. If recharge to the water-bearing zones did occur throughout the area by downward movement through vertical joints, the gradient along the zones would steepen in the downdip direction rather than continue roughly parallel to the dip of the zones--that is, if it is assumed that there is no increase in transmissibility downdip. This steepening of the hydraulic gradient would be required in order to transmit the ever-increasing amounts of water supplied to the zone by the vertical joints. No such steepening of the gradient was observed.

In summary, it appears that recharge occurs principally at the outcrop of the water-bearing zones in the Lockport Dolomite and that water then moves down the dip of the zone with a relatively constant loss of head. Recharge is probably not limited to the actual line of outcrop of a zone, however, but occurs throughout the area where the zone is reached by the enlarged vertical joints that occur in the upper few feet of the rock.

Little is known about the recharge to the other bedrock formations underlying the Niagara Falls area. It is probable that a very small amount of water moves downward from the Lockport Dolomite into the Rochester Shale and the underlying bedrock units. As was pointed out in the preceding discussion, however, vertical openings even in the Lockport Dolomite appear to transmit relatively little water except in the upper few feet of the rock. Therefore, movement of water from the Lockport into the underlying formations probably occurs only along widely spaced major vertical joints. Some of the water in the deeper bedrock units in the Niagara Falls area may also be derived from recharge to these beds in the area to the south. Such water would move through the Niagara area toward the Niagara gorge and Lake Ontario, both of which are regional discharge areas.

GROUND-WATER MOVEMENT AND DISCHARGE

Ground water moves from points of high head to points of low head (or potential), in other words from points where the water table or piezometric surfaces are highest to points where they are lowest. The direction of ground-water movement in the upper few feet of bedrock and in the unconsolidated deposits (where water-table conditions exist) is shown by the configuration of the water table. The direction of movement in the remainder of the bedrock is shown by the configuration of the piezometric surfaces associated with each of the artesian water-bearing zones in the different bedrock formations.

As discussed previously, each of the seven water-bearing zones in the Lockport is a distinct artesian aquifer with an associated piezometric surface. To show in detail the ground-water movement in the Niagara Falls area, it would be necessary to construct a water-table map, and piezometric maps for each of the water-bearing zones. Such maps are not included in this report because water levels could be measured in relatively few wells and because of the difficulty of differentiating between water levels which represent the water table and water levels which represent the piezometric surfaces associated with each of the several water-bearing zones. In a few wells constructed with packers, such as shown in figure 9, it was possible to measure separate water levels associated with the water table and with distinct water-bearing zones. In wells not equipped with packers, which includes all domestic and industrial wells in the area, a measured water level is an average of the heads of the different water-bearing openings penetrated by the well. Such an average water level represents neither the water table nor the piezometric surface of a single water-bearing zone.

Nearly all water-level data that could be used in determining direction of ground-water movement were obtained from wells in the vicinity of the pumped-storage reservoir. These data show that in general the configuration of the water table follows the surface of the land, being highest under hills and in interstream tracts and lowest in stream valleys. The configuration of the piezometric surfaces associated with each water-bearing zone in the Lockport has little relationship to the land surface. The piezometric surfaces are approximately parallel to the slope of the water-bearing zones. The disparity in the configuration of the water table and the piezometric surfaces is shown in figure 9, which was previously referred to in the discussion of artesian and water-table conditions in the Lockport. As shown in the figure, the water table slopes from all directions toward Fish Creek, whereas the piezometric surface for water-bearing zone 3 slopes to the south away from the creek. Thus, ground-water movement in the upper fractured part of rock and in the overlying unconsolidated deposits is toward the creek, but movement along water-bearing zone 3 and, presumable in the other water-bearing zones, is to the south toward the upper Niagara River.

Figure 14 shows the inferred direction of ground-water movement in the upper water-bearing zones of the Lockport Dolomite. This figure is based on adequate data only in the vicinity of the reservoir. Because only a few scattered water-level observations are available for the area south of the reservoir, the flow lines in that area are based largely on the fundamental principles governing ground-water movement.

It may be observed in figure 14 that ground water in the Lockport Dolomite moves north toward the Niagara escarpment in a narrow area parallel to the escarpment. This northerly direction of ground-water movement is shown by (1) the location of springs near the base of the Lockport along the escarpment (pl. 1), and (2) the decline of water levels in wells in the direction of the escarpment. A divide in the water table and in the upper fractured part of the rock apparently exists at a distance of 1,000 to 2,000 feet south of the escarpment. The existence of this divide is shown by the reversal of hydraulic gradient in the area. The gradient is toward the escarpment in the area less than 1,000 feet south of the escarpment. However, a hydraulic gradient to the southeast (approximately parallel to the dip of the beds in the Lockport) was observed in wells located over 2,500 feet south of the escarpment.

Prior to the start of the investigation it was assumed that water in the Lockport Dolomite in the western part of the Niagara Falls area moved west to the gorge to discharge. It was observed very early in the study, however, that there was practically no evidence of seepage on the sides of the gorge. The lack of seepage could be explained by (1) assuming that the water moving toward the gorge was intercepted by enlarged vertical joints parallel to the gorge, or (2) assuming that there was little or no movement of water toward the gorge.

Because the city of Niagara Falls and the area along the gorge north of the city is supplied by the Niagara Falls municipal water system, very few wells suitable for water-level observations were found in the area. The only wells readily accessible for water-level measurements were in the vicinity of the power station and canal. The data from these wells indicate that water moves toward the gorge. The width of the area supplying water to the gorge, however, could not be determined. Indirect information relative to this problem was derived from the water-level measurements in the vicinity of the reservoir. It was found that if the slope of the piezometric surface for a specific water-bearing zone (for example, zone 3 in figure 9) was extended to the south, the pressure reached the level of the upper Niagara River a short distance south of the reservoir. This does not prove but certainly strongly suggests that under natural (pre-power project) conditions the water in the Lockport Dolomite turned west to discharge into the Niagara River gorge, roughly midway between the escarpment and the upper Niagara River (fig. 14). The absence of seepage on the sides of the gorge, therefore, is believed to be attributable to enlarged vertical joints parallel to the gorge.

Ground-water movement as it probably existed in 1962 may be summarized as follows: (1) water moves northward in a narrow area parallel to the Niagara escarpment, (2) water moves southward (downdip) in the area around the reservoir (which acts as a recharge mound and tends to deflect the water moving from the north), (3) water moves into the canal, conduits, and area of industrial pumping to discharge, and (4) water moves toward the gorge in the southwestern part of the area.

On the lake plain, north of the Niagara escarpment, ground water moves in a generally northward direction toward Lake Ontario. The water table is located within the lake deposits about 3 to 10 feet below the surface. The water table very nearly parallels the land surface and slopes regionally toward Lake Ontario with a gradient of 5 to 20 feet per mile. It also slopes toward the streams crossing the lake plain in a narrow area adjoining each stream. The direction of ground-water movement in the Lockport Dolomite in the eastern part of the Niagara Falls area is not known.

WATER-LEVEL FLUCTUATIONS

Fluctuations of ground-water levels reflect changes in the amount of water stored in an aquifer. A decline in water level shows a decrease in storage in the aquifer, and means simply that discharge from the aquifer is exceeding recharge. A rise in water level indicates the reverse situation--recharge is greater than discharge. In wells tapping unconfined aquifers, water-level fluctuations show changes in the position of the water table. In wells tapping artesian aquifers, water-level fluctuations show changes in artesian pressure.

Natural fluctuations

Water-level fluctuations of natural origin can be broadly classified as either short- or long-term fluctuations. The short-term fluctuations are produced mainly by changes in atmospheric pressure, ocean tides, and earth tides. Fluctuations due to atmospheric pressure and earth tides occur in the Niagara Falls area but are of relatively little importance in the description of the ground water. Such short-term fluctuations are observed only in wells tapping artesian aquifers. Long-term fluctuations are largely a product of climate, particularly precipitation and temperature. The long-term fluctuations in water levels show changes in the natural rate of recharge to an aquifer compared to its rate of discharge to springs and stream beds.

The most noticeable fluctuation of ground-water levels in the Niagara Falls area are seasonal fluctuations. In general, water levels in the area reach their peak during the spring of the year (March and April) because of the large amount of recharge provided by snow melt and precipitation. Water levels generally decline throughout the summer because most of the precipitation is lost by evaporation and the transpiration of plants. Such water loss is characteristic of the summer growing season. During other seasons substantial amounts of water pass through the soil zone and continue downward to the water table. Water levels generally reach their yearly lows near the end of the growing season during September or October. Thereafter, water levels begin to rise and this rise is more or less continuous through March or April. Because the amount of precipitation is normally evenly spaced throughout the year in the Niagara Falls area (table 4), seasonal fluctuations are more a product of air temperature than of precipitation. The air temperature controls whether precipitation falls as snow or rain, whether the ground is frozen at the time of precipitation, and the length of the growing season; all of these are factors that affect water levels.

SPRINGS

Springs are not widely utilized as ground-water supplies in the Niagara Falls area. Springs are common along the Niagara escarpment but rarely occur elsewhere in the area. (See plates 1 and 3.)

Most of the springs along the escarpment originate near the base of the Lockport Dolomite. The source is nearly always seepage from bedding joints at the contact between the DeCew Limestone Member of Williams (1919) and the Gasport Limestone Member of the Lockport (water-bearing zone 2 in fig. 8). The springs occur where vertical joints intersect the water-bearing zone. Enlargement of both vertical and bedding joints is common at the springs, and in some cases has proceeded to the point where small caves have developed.

Springs are uncommon along the cliffs of the Niagara River Gorge. This lack of springs probably results from the development of extensive open vertical joints parallel to the face of the gorge. These joints drain water readily from the Lockport Dolomite through the underlying rocks and talus to the river. (See figure 6.)

Notable exceptions to the lack of springs along the gorge are springs 309-902-2Sp and -3Sp which are located just south of the Niagara escarpment (pl. 1). These springs are located in caves developed by solution of the shaly dolomite of the DeCew Member of Williams (1919) of the Lockport. The source of the springs, like the source of most springs along the escarpment, are bedding joints at the contact between the DeCew and Gasport Members (water-bearing zone 2 in fig. 8). Extensive solution features, such as sink holes, exist in the area drained by these two springs. Fish Creek, which crosses the area, loses water as it flows across the bedrock, and apparently contributes a major part of the water discharging from the springs. Dye introduced into Fish Creek reappeared at the springs, 1,000 feet away, 38 minutes after introduction (personal communication from C. P. Benziger of Uhl, Hall & Rich). The yield of these springs is therefore highly variable; the yields varying from about 15 gpm during dry periods to reportedly thousands of gallons per minute following heavy rains or periods of melting snow. The water from springs 309-902-2Sp and -3Sp is polluted by nearby septic tanks as shown by the strong odor of sewage and the sudsy character of the water.

The yield of single springs in the Niagara Falls area ranges from about 2 to 30 gpm during the dry parts of the year. The yields of most springs increase following rains but not nearly so much as the increase noted for springs 309-902-2Sp and -3Sp in the discussion above. Spring 310-859-6Sp is the only spring in the area utilized as a water supply on a year-round basis. This spring provides an adequate domestic supply for a trailer court with eight families.

PRESENT UTILIZATION

An estimated 10 mgd (million gallons per day) of ground water was obtained from wells in the Niagara Falls area during 1961-62. This figure contrasts with an estimated 60 mgd of water obtained from surface sources

REFERENCE NO. 6

NIAGARA COUNTY

HEALTH DEPARTMENT
HUMAN RESOURCES BUILDING
MAIN POST OFFICE BOX 428
10th AND EAST FALLS STREET
NIAGARA FALLS, NEW YORK 14302

October 8, 1987

Mr. Dennis Sutton
Ecology & Environment, Inc.
195 Sugg Road
P.O. Box D
Buffalo, New York 14225

Dear Dennis:

Attached are the signed interview forms you request. Please note that I added several comments as footnotes for clarification.

Contact me with any questions at 284-3126.

Sincerely,

Michael Hopkins
Assistant Public
Health Engineer

MH:lj

Attach.

Footnotes:

1) The Erie Barge Canal is intermittent in the Lockport area. This section is dewatered during the winter months.

2) The drinking water supply is over 10 miles away.

3) We believe that 4 families use groundwater for drinking at Witmer and Pennsylvania Avenue. These homes may be connected to public water in the future. A line is now available for hook up.

4) It is noted that the wells referred to in #3 are seperated from the Frontier Bronze site by the PASNY Conduits which should be a total sink and barrier to groundwater flow.

5) The irrigation well referred to is used only casually and occasionally to water fruit trees.

6) We are unaware of a fire official certifying any site in Niagara County to be a fire or explosion hazard. We do not feel that any of the sites listed constitues a fire threat.

7) I assume that the location drawings provided are only approxiamte site locations. Most overestimate the site area.

ecology and environment, inc.
195 SUGG ROAD, P.O. BOX D, BUFFALO, NEW YORK 14225, TEL. 716-632-4491, TELEX 91-9183
International Specialists in the Environment

October 2, 1987

Mr. Michael Hopkins
Niagara County Department
  of Health
10th and East Falls Street
Niagara Falls, New York 14302

Dear Mr. Hopkins:

On several occasions during the course of the Phase 1 investigations, E & E has contacted the Niagara County Department of Health to obtain information in regard to various characteristics of the sites under investigation. The DEC requires that all information contained in Phase 1 reports be fully documented. We ask you to review the information your department has provided, as presented in this letter, and sign this document to acknowledge that you have provided this information and that it (with any corrections or qualifications) is correct to the best of your knowledge.

<u>Ross Steel</u>

1) No hazardous waste is expected to be on site.
2) Groundwater is not used for irrigation within a 3-mile radius of the site.
3) Surface water within 3 miles of this site is used for commercial, industrial, and recreational purposes.
4) The drinking water intakes are upstream of site.

<u>Dussault Foundry</u>

1) There is no use of groundwater within 3 miles of site.
2) The surface water within 3 miles downstream of site is used for recreation (Erie Canal). (*1)

<u>Town of Lockport Landfill</u>

1) There is no use of groundwater within 3 miles of site.
2) The Erie Canal (surface water) is used for recreation near this site. (*1)
3) The drinking water intakes are located in the Niagara River located upstream of this site. (*2)

SKW Landfill

1) The drinking water surface intakes are located upstream of this site.
2) Groundwater is used within a 3 mile radius of this site for drinking water. *3
3) The surface water downstream (Niagara River) is used for recreation (Maid of Mist, fishing).

Diamond Shamrock

1) There is no groundwater used within a 3 mile radius of this site.

Roblin Street

1) There is no use of groundwater within a 3 mile radius of this site, drinking or irrigation.

Electro Minerals U. S. (formerly Carborundum Bldg. 82)

1) The water supply intakes are located upstream of this site.

Frontier Bronze

1) There is no suspected hazardous waste disposal present at this site.
2) Groundwater for drinking purposes is used by a neighborhood approximately 2.5 miles to the NW, at the intersection of Pennsylvania and Witmer Road. Two families, roughly 8 people, use groundwater for drinking purposes. *3

Walmore Road

1) The well on site is used for irrigation. *5
2) Approximately 1 acre of area is irrigated by this groundwater well.
3) There is no use of surface water 3 miles downstream of this site.

New York Power Authority Road Site

1) Hazardous waste is not suspected to be disposed of on site.
2) There is no land irrigated with groundwater within 3 miles of site.

I would also like you to confirm the fact that no fire official has declared any of the following sites a fire or explosion hazard: *6

- SKW Alloys Landfill - Witmer Road, Town of Niagara.
- Dussault Foundry - Washburn Street, Lockport.
- Frontier Bronze - New Road, City of Niagara Falls.
- Staufer Chemical, North Love Canal - Town of Lewiston.

- Electro Minerals, U.S., Inc., (formerly Carobrundum Bldg. #82), Buffalo Avenue, City of Niagara Falls.
- Ross Steel Co. - Pine Avenue, Niagara Falls (now the site of the New York Power Authority water intake conduit right-of-way).
- Roblin Steel Company - Oliver Street, North Tonawanda.
- LaSalle Expressway - specifically near Love Canal.
- Diamond Shamrock, now Occidental Petroleum Corp., Ohio Street, Lockport, New York.
- Town of Lockport Landfill - East Canal Street, Lockport, New York.
- Power Authority Road Site - New Road, Lewiston, New York (across from Hyde Park Landfill).
- 64 Street South (owned by Russo Chevrolet) - 64th and Niagara Falls Blvd., Niagara Falls.
- Walmore Road, 6373 Walmore Road, Town of Wheatfield, New York.

I certify that I provided the above information to Ecology and Environment, Inc., and It is correct to the best of my knowledge.
Subject to foot notes & comments provided

Michael E Hopkins
Signature

10/7/87
Date

Please find maps enclosed to assist you in locating these sites. If you have any questions regarding the above, please contact me at 633-9881.

Thank you very much for your time and assistance in our ongoing investigations.

Sincerely,

Dennis Sutton

oio

REFERENCE NO. 7

DUSSAULT FOUNDRY CORPORATION
2 WASHBURN STREET • P.O. BOX M
LOCKPORT, NEW YORK 14094
(716) 433-3851 (716) 625-8238

July 2, 1987

Ecology and Environment, Inc.
195 Sugg Road
P.O. Box D
Buffalo, New York 14225

Attention: Mr. Dennis Sutton

Dear Mr. Sutton:

In response to your letter of June 30, 1987, the following is noted:

1. no groundwater wells on site
2. soil samples have been collected, and analyzed at various times, and tested; both for initial landfill application in 1981, and most recently, for closure application in 1986.
3. the sand fill area is contained by a system of berms to contain runoffs.
4. total material was estimated to be 20,000 cu yds by, Wendell Engineering, and was suggested by use of computer contouring.
5. the foundry uses isopropal alchol, propane, tclusolforic acid, kerosene, curing agents, phenolics resins, hydrolic fluids, catalysts, and paints and thinners for various purposes on site.

Please call if I can be of additional service.

Respectfully;
DUSSAULT FOUNDRY CORPORATION

James W. Maxwell
President

db

REFERENCE NO. 8

ecology and environment, inc.

195 SUGG ROAD, P.O. BOX D, BUFFALO, NEW YORK 14225, TEL. 716-632-4491, TELEX 91-9183

International Specialists in the Environment

June 23, 1987

Mr. James McCann
Lockport Water Dept.
Lockport Municipal Bldg.
Lockport, New York 14094

Dear Mr. McCann:

On 6/10/87, I spoke with you via telephone concerning water supply for the City of Lockport. The following points were made during that conversation:

- o The City of Lockport obtains its water supply from a pumping station in the Niagara River in North Tonawanda, New York.
- o A back-up pumping station is located in the Erie Canal near Summit and Ohio Streets in the City of Lockport.
- o There are no known groundwater wells in use in the city or town of Lockport.

I would like to request that you review the above points and make any changes necessary. Please sign your name in agreement with the material, and return the original to me as soon as possible.

I will be using this information as part of the New York State Department of Environmental Conservation Phase 1 reports that are being compiled on several sites in the Lockport area. I appreciate the help you have given me on this matter, and look forward to hearing from you soon.

Sincerely,

Dennis Sutton

Dennis Sutton

Dear Mr. Sutton:

Items 1 & 2 are correct in your letter above. I cannot verify Item 3 concerning the Town of Lockport.

Sincerely,

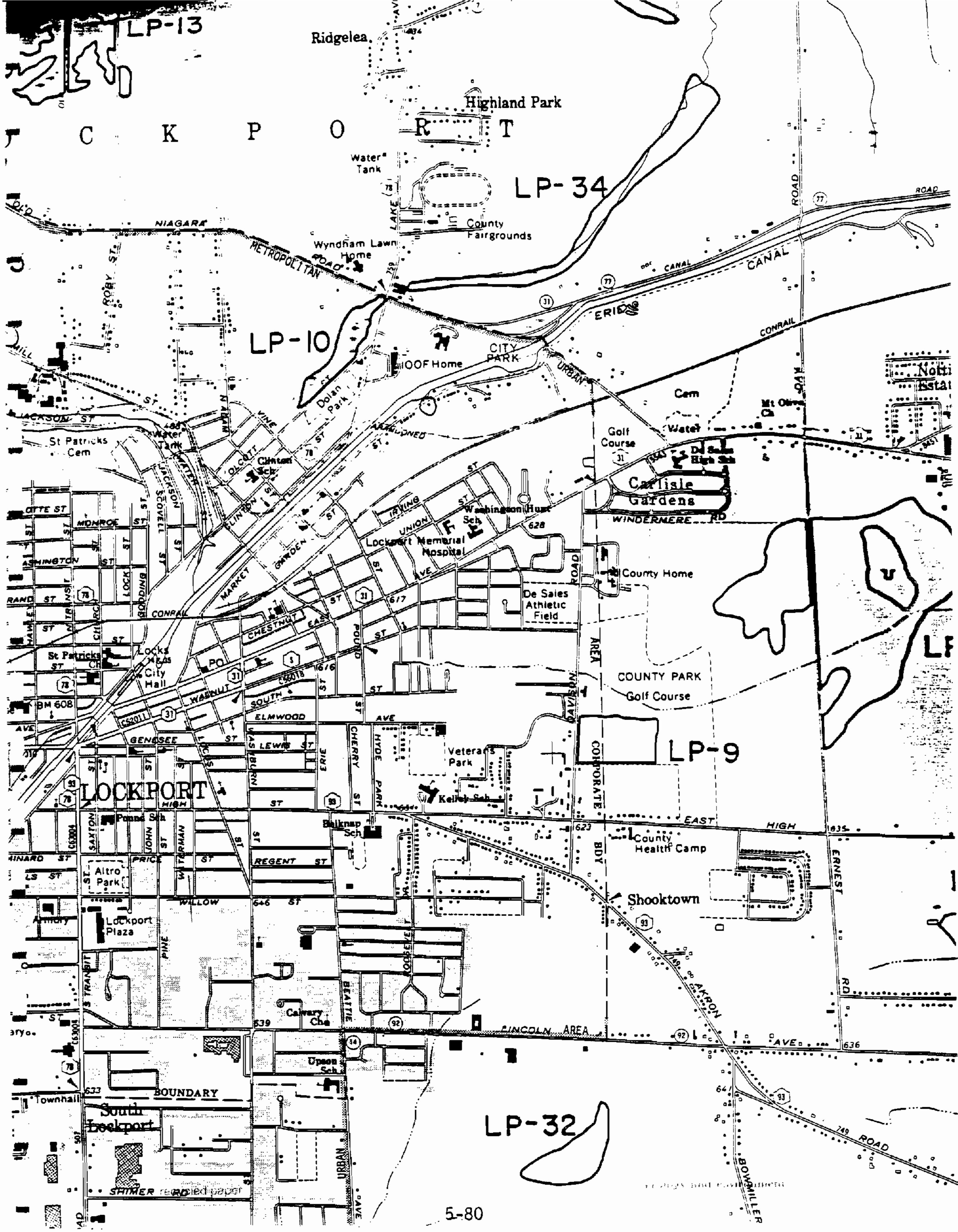
James P. McCann

James P. McCann
Sr. Building Inspecto

DS/db

recycled paper

REFERENCE NO. 9



LP-13
Ridgelea
Highland Park
LOCKPORT
Water Tank
LP-34
County Fairgrounds
Wyndham Lawn Home
NIAGARA
METROPOLITAN ROAD
OLD
ROBY ST
CANAL
ERIE
CONRAIL
ROAD
LP-10
CITY PARK
IOOF Home
Dolan Park
URBAN
ABANDONED
Cem
Mt Olivet Cem
Golf Course
Water
De Sales High Sch
Carlisle Gardens
WINDERMERE RD
St Patricks Cem
JACKSON ST
Water Tank
Clinton Sch
Washington Hunt Sch
Lockport Memorial Hospital
County Home
De Sales Athletic Field
MONROE ST
WASHINGTON
IRVING
UNION
GARDEN
MARKET
CHESTNUT
EAST AVE
CONRAIL
Locks
City Hall
St Patricks Ch
PO
WALNUT
SOUTH ST
ELMWOOD AVE
GENESEE ST
LEWIS ST
COUNTY PARK
Golf Course
DAVISON
CORPORATE BDY
AREA
LP-9
Veterans Park
Kelley Sch
LOCKPORT
HIGH ST
EAST HIGH
Pound Sch
Belknap Sch
County Health Camp
Shooktown
REGENT ST
PRICE ST
Altro Park
WILLOW ST
Armory
Lockport Plaza
PINE
ROOSEVELT
BEATTIE
ERNEST RD
AKRON
Calvary Ch
LINCOLN AVE
Upson Sch
Townhall
BOUNDARY
South Lockport
LP-32
SHIMER RD
URBAN AVE
BOWMILLER
ROAD

Freshwater Wetlands Classification Sheet

December 5, 1984

Niagara County
Map 10 of 18
Lockport Quadrangle

Wetlands Identification Code	Municipality	Classification
LP-1	Newfane	II
LP-2	Newfane	II
LP-3	Newfane	III
LP-4	Newfane, Lockport Town	II
LP-5	Lockport Town, City of Lockport	I
LP-7	Lockport Town	II
LP-8	Pendleton, Lockport Town	II
LP-9	Lockport Town, City of Lockport	II
LP-10	Lockport Town, City of Lockport	I
LP-12	Lockport Town	II
LP-13	Lockport Town	II
LP-14	Lockport Town	II
LP-15	Lockport Town	II
LP-16 (formerly LP, GA-16)	Lockport Town	III
LP-17 (formerly LP, NW-17)	Newfane	III
LP-18 (formerly LP, NW-18)	Newfane	III
LP-19 (formerly LP, CB-19)	Pendleton	II
LP-20 (formerly LP, CC-20)	Pendleton	II
LP-21 (formerly LP, CC-21)	Pendleton	II
LP-22 (formerly LP, GA-22)	Royalton, Lockport Town	III
LP-23	Lockport Town	II
LP-24	Lockport Town	II
LP-26	Newfane	III
LP-27	Newfane	III
LP-29	Newfane	II
LP-30	Lockport Town	II
LP-31	Newfane	III
LP-32	Lockport Town	III
LP-33 (formerly LP, CC-33)	Lockport Town	II
LP-34	Lockport Town	II
LP-35	Lockport Town	II
LP-36	Lockport Town	II
LP-37	Lockport Town	II
NW-24 (formerly NW, LP-24)	Newfane	III

REFERENCE NO. 10

CONTACT REPORT

AGENCY : New York State Department of Environmental Conservation, Region 9
ADDRESS : 600 Delaware Ave., Buffalo, NY 14202
PHONE : (716)847-4550
PERSON CONTACTED : James Snider, Senior Wildlife Biologist
TO : Jon Sundquist
DATE : June 2, 1987
SUBJECT : Critical Wildlife habitats near potential hazardous waste sites in Niagara County

In preparation of Phase 1 reports on potential hazardous waste sites in New York for the NYSDEC, information about nearby critical wildlife habitats is necessary. The following information is provided by Mr. James Snider of the Bureau of Wildlife, NYSDEC Region 9.

Except for the seasonal appearance of migratory birds, including, possibly the bald eagle, there are no critical habitats of endangered species within 2 miles of the suspected waste sites listed below:

- SKW Alloys
  Witmer Road at Maryland Ave.
  Niagara Falls, NY
- Dussault Foundries
  2 Washburn Street
  Lockport, NY
- North Love Canal
  Near Cleghorn Drive
  Lewiston, NY
- Carborundum Building 82
  Buffalo Ave.
  Niagara Falls, NY
- Ross Steel Company
  4237 Pine Ave.
  Niagara Falls, NY
- Frontier Bronze
  4870 Packard Rd.
  Niagara Falls, NY
- Roblin Steel
  101 East Ave.
  N. Tonawanda, NY

- LaSalle Expressway
  Niagara Falls, NY
- Diamond Shamrock
  Ohio Ave.
  Lockport, NY
- Town of Lockport Landfill
  Canal Road
  Lockport, NY.
- Power Authority Road
  Lewiston, NY
- 64th Street South
  Chevy Place
  Niagara Falls, NY
- Walmore Road
  Walmore Rd., 0.5 miles south of Lockport Road
  Wheatfield, NY

James R.

Signature

July 27, 1987

Date

REFERENCE NO. 11

Dangerous Properties of Industrial Materials

Sixth Edition

N. IRVING SAX

Assisted by:

Benjamin Feiner/Joseph J. Fitzgerald/Thomas J. Haley/Elizabeth K. Weisburger

VAN NOSTRAND REINHOLD COMPANY
NEW YORK CINCINNATI TORONTO LONDON MELBOURNE

TABLE I

EPA Hazard Ranking System Waste Characteristics Values (Toxicity/Persistence Matrix)

Chemical/Compound	Ground Water and Surface Water Pathway Values	Air Pathway Values
Acenapthene	9	3
Acetaldehyde	6	6
Acetic Acid	6	6
Acetone	6	6
2-Acetylaminoflourene	18	9
Aldrin	18	9
Ammonia	9	9
Aniline	12	9
Anthracene	15	9
Arsenic	18	9
Arsenic Acid	18	9
Arsenic Trioxide	18	9
Asbestos	15	9
Barium	18	9
Benzene	12	9
Benzidine	18	9
Benzoapyrene	18	9
Benzopyrene, NOS	18	9
Beryllium & Compounds NOS	18	9
Beryllium Dust, NOS	18	9
Bis (2-Chloroethyl) Ether	15	9
Bis (2-Ethylhexyl Phthalate	12	3
Bromodichloromethane	15	6
Bromoform	15	6
Bromomethane	15	9
Cadmium	18	9
Carbon Tetrachloride	18	9
Chlordane	18	9
Chlorobenzene	12	6
Chloroform	18	6
3-Chlorophenol	12	6
4-Chlorophenol	15	9
2-Chlorophenol	12	6
Chromium	18	9
Chromium, Hexavalent (Cr^{+6})	18	9

Table I (cont.)

Chemical/Compound	Ground Water and Surface Water Pathway Values	Air Pathway Values
Chromium, Trivalent (Cr^{+3})	15	6
Copper & Compounds, NOS	18	9
Creosote	15	6
Cresols	9	6
4-Cresol	12	9
Cupric chloride	18	9
Cyanides (soluble salts), NOS	12	9
Cyclohexane	12	6
DDE	18	9
DDT	18	9
Diaminotoluene	18	6
Dibromochloromethane	15	6
1, 2-Dibromo, 3-chloropropane	18	9
Di-N-Butyl-Phthalate	18	6
1, 4-Dichlorobenzene	15	6
Dichlorobenzene, NOS	18	6
1, 1-Dichloroethane	12	6
1, 2-Dichloroethane	12	9
1, 1-Dichloroethene	15	9
1, 2-cis-Dichloroethylene	12	3
1, 2-trans-Dichloroethylene	12	3
Dichloroethylene, NOS	12	3
2, 4-Dichlorophenol	18	6
2, 4-Dichlorophenoxyacetic Acid	18	9
Dicyclopentadiene	18	9
Dieldrin	18	9
2, 4-Dinitrotoluene	15	9
Dioxin	18	9
Endosulfan	18	9
Endrin	18	9
Ethylbenzene	9	6
Ethylene Dibromide	18	9
Ethylene Glycol	9	6
Ethyl Ether	15	3
Ethylmethacrylate	12	6

Table I (cont.)

Chemical/Compound	Ground Water and Surface Water Pathway Values	Air Pathway Values
Fluorine	18	9
Formaldehyde	9	9
Formic Acid	9	6
Heptachlor	18	9
Hexachlorobenzene	15	6
Hexachlorobutadiene	18	9
Hexachlorocyclohexane, NOS	18	9
Hexachlorocyclopentadiene	18	9
Hydrochloric Acid	9	6
Hydrogen Sulfide	18	9
Indene	12	6
Iron & Compounds, NOS	18	9
Isophorone	12	6
Isopropyl Ether	9	3
Kelthane	15	6
Kepone	18	9
Lead	18	9
Lindane	18	9
Magnesium & Compounds, NOS	15	6
Manganese & Compounds, NOS	18	9
Mercury	18	9
Mercury Chloride	18	9
Methoxychlor	15	6
4, 4-Methylene-Bis-(2-Chloroaniline)	18	9
Methylene Chloride	12	6
Methyl Ethyl Ketone	6	6
Methyl Isobutyl Ketone	12	6
4-Methyl-2-Nitroaniline	12	9
Methyl Parathion	9	9
2-Methylpyridine	12	6
Mirex	18	9

Table I (cont.)

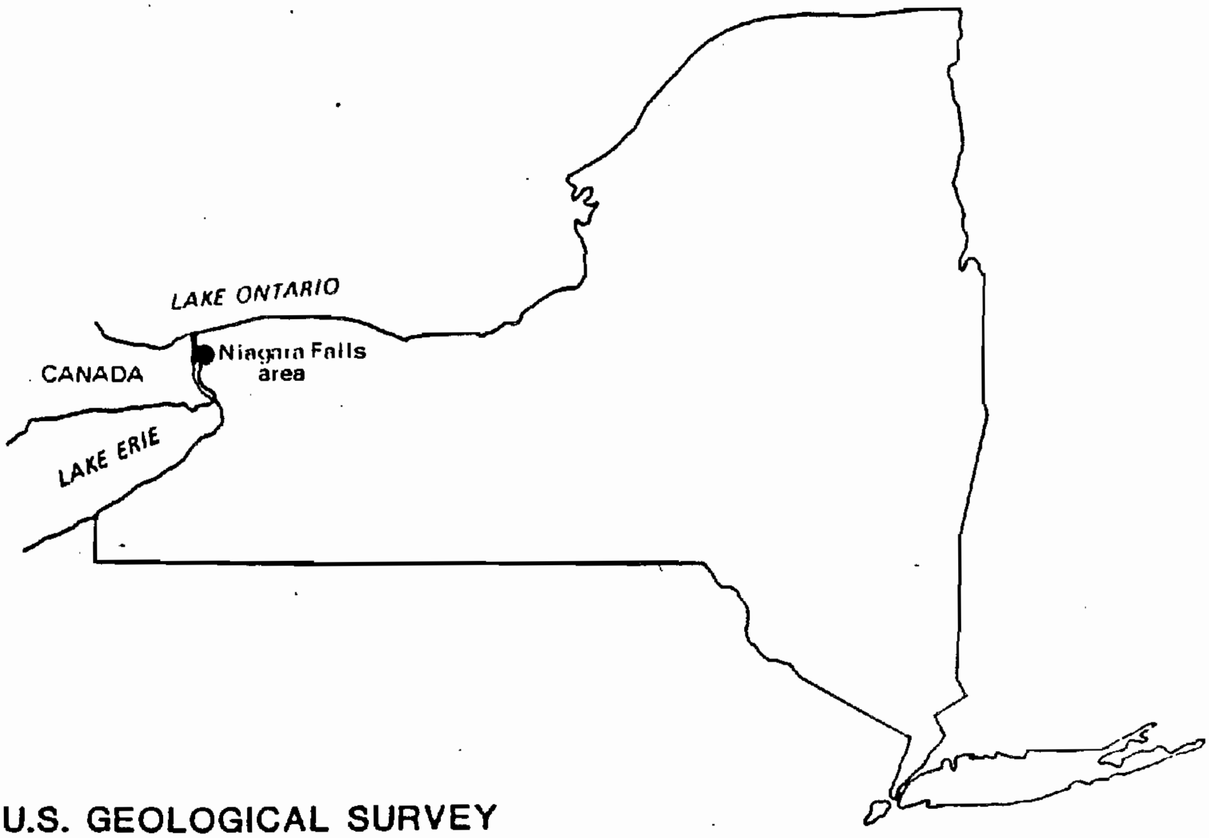
Chemical/Compound	Ground Water and Surface Water Pathway Values	Air Pathway Values
Naphthalene	9	6
Nickel & Compounds, NOS	18	9
Nitric Acid	9	9
Nitroaniline, NOS	18	9
Nitrogen Compounds, NOS	12	0
Nitroguanidine	12	9
Nitrophenol, NOS	15	9
m-Nitrophenol	15	
o-Nitrophenol	12	
p-Nitrophenol	15	
Nitrosodiphenylamine	12	6
Parathion	9	9
Pentachlorophenol (PCP)	18	9
Pesticides, NOS	18	9
Phenanthrene	15	9
Phenol	12	9
Phosgene	9	9
Polybrominated Biphenyl (PBB), NOS	18	9
Polychlorinated Biphenyls (PCB), NOS	18	9
Potassium Chromate	18	9
Radium & Compounds, NOS	18	9
Radon & Compounds, NOS	15	9
RDX (Cyclonite)	15	
2, 4-D, Salts & Esters	18	9
Selenium	15	9
Sevin (Carbaryl)	18	9
Sodium Cyanide	12	9
Styrene	9	6
Sulfate	9	0
Sulfuric Acid	9	9
2, 4, 5-T	18	9
1, 1, 2, 2-Tetrachloroethane	18	9
Tetrachloroethane, NOS	18	9
1, 1, 2, 2-Tetrachloroethene	12	6

Table I (cont.)

Chemical/Compound	Ground Water and Surface Water Pathway Values	Air Pathway Values
Tetraethyl Lead	18	9
Tetrahydrofuran	15	6
Thorium & Compounds, NOS	18	9
Toluene	9	6
TNT	12	
Toxaphene	18	9
Tribromomethane	18	9
1, 2, 4-Trichlorobenzene	15	6
1, 3, 5-Trichlorobenzene	15	6
1, 1, 1-Trichloroethane	12	6
1, 1, 2-Trichloroethane	15	6
Trichloroethane, NOS	15	6
Trichloroethene	12	6
1, 1, 1-Trichloropropane	12	6
1, 1, 2-Trichloropropane	12	6
1, 2, 2-Trichloropropane	12	6
1, 2, 3-Trichloropropane	15	9
Uranium & Compounds, NOS	18	9
Varsol	12	6
Vinyl Chloride	15	9
Xylene	9	6
Zinc & Compounds, NOS	18	9
Zinc Cyanide	18	9

REFERENCE NO. 12

Effect of Niagara Power Project on Ground-Water Flow in the Upper Part of the Lockport Dolomite Niagara Falls Area, New York



U.S. GEOLOGICAL SURVEY
Water-Resources Investigations
Report 86-4130

Prepared in cooperation with the

U.S. ENVIRONMENTAL PROTECTION AGENCY

NEW YORK STATE DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

U.S. DEPARTMENT OF THE INTERIOR
MARCH 3, 1849

of studies by the New York State Department of Environmental Conservation, private consultants, and by the U.S. Geological Survey to describe ground-water conditions at many waste-disposal sites in the Niagara Falls area.

Acknowledgments

The New York Power Authority provided construction details of the power-project facilities, water-level data from the forebay canal and pumped-storage reservoir, and assistance in measuring water levels in NYPA wells in the vicinity of the pumped-storage reservoir. The New York State Department of Environmental Conservation coordinated the water-level measurements at industrial sites. Several industries, including Occidental Petroleum and E.I. Dupont De Nemours and Company, provided water-level data. The City of Niagara Falls provided construction details on many sewer and building projects and assisted in obtaining permits and permission to drill observation wells within the city.

GEOHYDROLOGY OF THE LOCKPORT DOLOMITE

Stratigraphy and Lithology

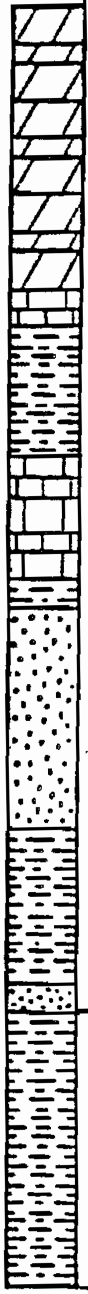
Unconsolidated glacial deposits of till and lacustrine silt and clay, generally 5 to 15 ft thick but ranging to 48 ft thick, overlie the 80- to 158-ft-thick Lockport Dolomite of Middle Silurian age within the Niagara Falls area (Tesmer, 1981). The thickest unconsolidated deposits (up to 48 ft) are in a shallow buried valley in the western part of the city (pl. 1B).

Underlying the Lockport Dolomite is a 27-ft-thick sequence of Middle Silurian shale, limestone, and dolomite in the lower part of the Clinton Group, which is underlain by a 113-ft-thick sequence of Lower Silurian sandstone and shale that is in turn underlain by 1,200-ft-thick Upper Ordovician shale. These rocks are exposed only in the Niagara River gorge and are shown in the stratigraphic column in figure 2. The strata are gently folded and dip slightly to the south-southwest at about 30 ft/mi (Fisher and Brett, 1981).

The Lockport Dolomite is a fine to coarse crystalline, thin to massive bedded dolomite, limestone, and shaly dolomite, with vugs containing gypsum (calcium sulfate) and calcite (calcium carbonate). Other minor minerals disseminated throughout the formation are sphalerite (zinc sulfide), pyrite (iron sulfide), and galena (lead sulfide) (Tesmer, 1981).

Hydraulic Conductivity

The Lockport can be divided into two zones on the basis of water-transmitting properties. The upper 10 to 25 ft of rock is a moderately permeable zone that contains relatively abundant bedding planes and vertical joints enlarged by dissolution of dolomite and abundant solution cavities left by dissolution of gypsum; the remainder of the formation contains low to moderately permeable bedding planes of which as many as seven may be major water-bearing zones that are surrounded by fine-grained crystalline dolomite of low permeability. Hydraulic-conductivity values obtained from model simulations and limited aquifer-test data (Maslia and Johnston, 1982) range from 5 to 15 ft/d in the upper part and from 1 to 2 ft/d in the lower part. Well yields commonly range from 10 to 100 gal/min.



System and series		Group	Formation	Thickness (feet)	Description
Silurian	Middle	Lockport	Lockport Dolomite	158	Dark-gray to brown, massive to thin-bedded dolomite locally containing algal reefs and small, irregularly shaped masses of gypsum. Near the base are light-gray coarse-grained limestone (Gasport Limestone Member, dark-gray shaley dolomite)
		Clinton	Rochester Shale	60	Dark-gray calcareous shale weathering light-gray to olive.
			Irondequoit Limestone	12	Light-gray to pinkish-white coarse-grained limestone.
			Reynales Limestone	10	White to yellowish-gray shaly limestone and dolomite.
			Neahga Shale	5	Greenish-gray soft fissile shale.
	Lower	Medina	Thorold Sandstone	8	Greenish-gray shaly sandstone.
			Grimsby Sandstone	45	Reddish-brown to greenish-gray cross-bedded sandstone interbedded with red to greenish-gray shale.
			Power Glen Shale	40	Gray to greenish-gray shale interbedded with light-gray sandstone.
			Whirlpool Sandstone	20	White, quartzitic sandstone
Ordovician	Upper	Richmond	Queenston Shale	1,200	Brick-red sandy to argillaceous shale.

Figure 2.--Stratigraphy of the Niagara Falls area. (Modified from Fisher, 1959.)

Ground Water

Occurrence

The Lockport Dolomite is the principal source of ground water in the Niagara Falls area. Although the effective primary porosity is negligible, significant ground-water movement occurs through secondary openings such as bedding joints (planes), vertical joints (fractures), and solution cavities, described below. The upper 25 ft of the Lockport has a greater potential for movement of ground water (and contaminants) than the deeper parts because it has more interconnected vertical and horizontal joints that have been widened by solutioning, which allows direct entry of contaminants from surface sources.

Bedding planes.--The bedding planes, which transmit most of the water in the Lockport (Johnston, 1964), are relatively continuous fracture planes parallel to the natural layering of the rock. These openings were caused by crustal movements and the expansion of the rock during removal of weight by erosion of overlying rock units and by retreat of the glaciers. Johnston (1964) identified seven water-bearing zones, which consist either of a single open-bedding plane or an interval of rock layers containing several open planes. The top 10 to 25 ft of rock may contain one or two significant bedding planes; these are probably connected by vertical joints, which are abundant in the upper part of the formation.

The lower part of the Lockport Dolomite contains fewer water-bearing bedding planes that are interconnected by vertical joints. These deeper water-bearing zones are underlain and overlain by essentially impermeable rock. Each water-bearing bedding plane can be considered a separate and distinct artesian aquifer (Johnston, 1964). The hydraulic head within each water-bearing zone is lower than that in the zone above it; this indicates a downward component of ground-water flow.

Vertical joints.--Vertical joints in the Lockport Dolomite are not significant water-bearing openings except (1) in the upper 10 to 25 ft of rock, (2) within about 200 ft of the Niagara River Gorge, and (3) in the vicinity of the buried conduits. Physical and chemical weathering have increased the number, continuity, and size of vertical fractures in the upper part of the Lockport. The major joints, oriented N 70°E to N 80°E, are generally straight, spaced 10 to 80 ft apart, and penetrate 10 to 25 ft (American Falls International Board, 1974). Intersecting the major joint set are less extensive high-angle joints that are confined to particular beds. Vertical joints become narrower, less numerous, and less connected with depth.

In addition to the major regional fractures, extensive tension-release fractures were formed near the gorge wall by the erosion and removal of the supporting rock mass in the gorge; openings up to 0.3 ft wide have been observed (American Falls International Board, 1974). Less developed tension-release joints and blasting-originated joints are common along the twin conduits. These fractures probably extend less than 100 ft from the trench walls.

Solution cavities.--Solution cavities are formed by the dissolution of gypsum pockets and stringers by percolating ground water. These cavities range in diameter from 1/16 in to 5 in; they are most abundant in the upper 10 to 15 ft of rock but occur also along water-bearing bedding zones throughout the Lockport. The solution cavities become less continuous with depth and therefore have little effect on the water-transmitting ability of the lower parts of the formation.

Recharge

Most of the recharge to the Lockport Dolomite results from infiltration of rainfall and snowmelt through the soil to the water table. Precipitation in the Niagara Falls area averages 30 in/yr and is fairly evenly distributed throughout the year (Dethier, 1966). Snow usually accumulates from mid-December to mid-March, during which time several thaws may reduce or entirely melt the snow pack. Seven 14-month hydrographs of U.S. Geological Survey wells installed in the upper part of the Lockport (fig. 3) and a 10-year hydrograph of a long-term observation well, Ni-69 (fig. 4) indicate that most recharge occurs from late fall through winter (November to April), when evapotranspiration is low. Generally, water levels fluctuate less than 6 ft annually.

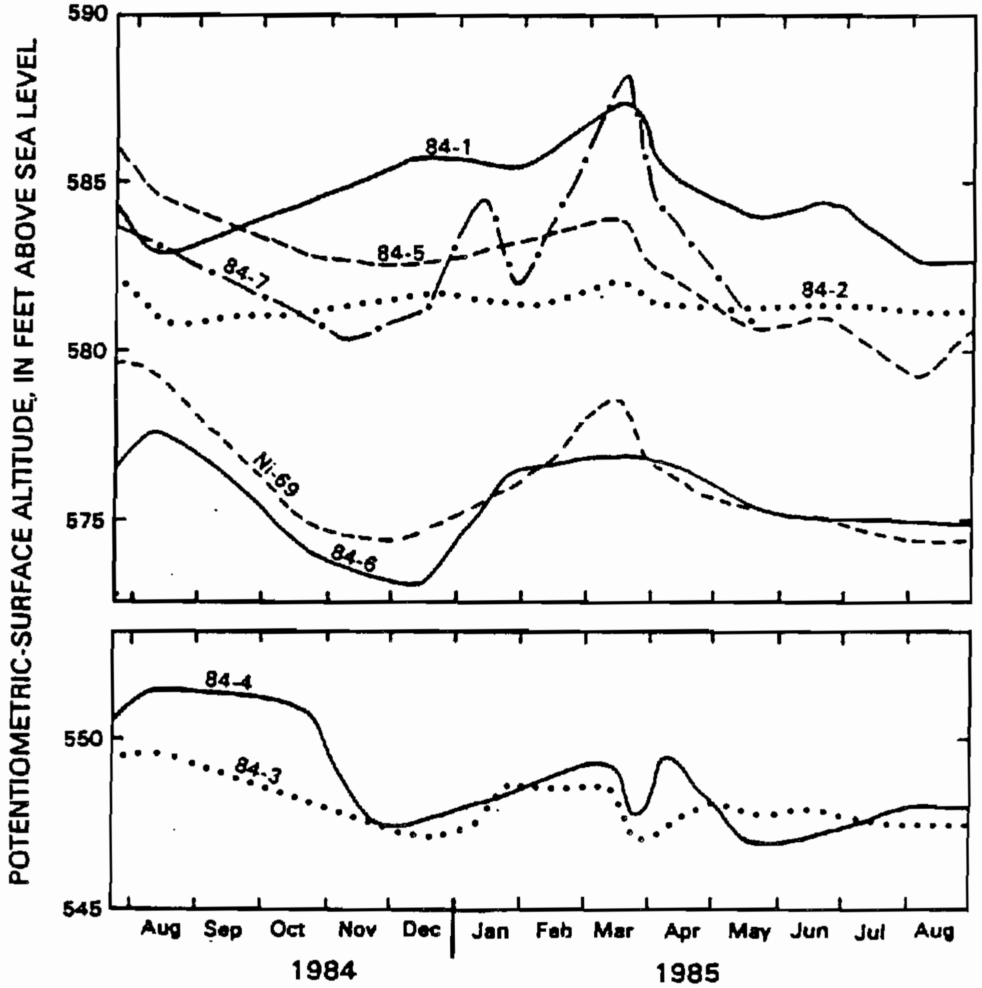


Figure 3.--Hydrographs of wells 84-1 through 84-7 in and near the City of Niagara Falls.

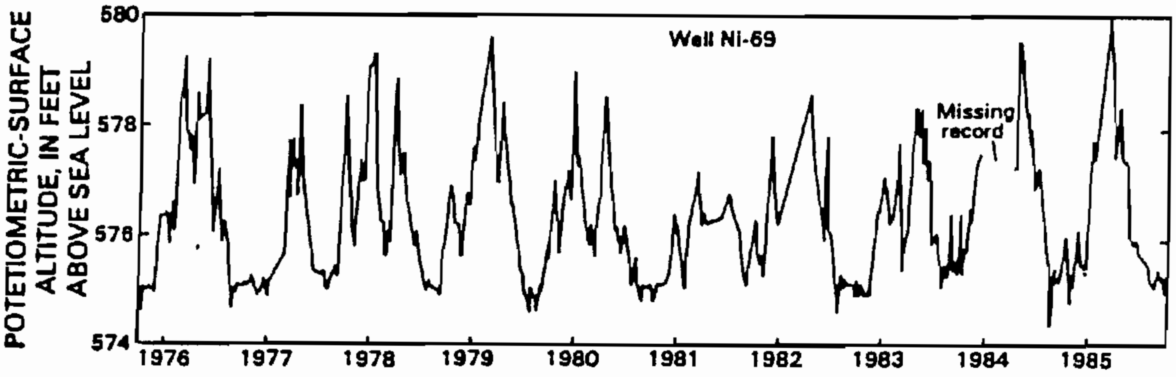


Figure 4.--Hydrograph of well Ni-69 in northern part of the city of Niagara Falls.

The rate and amount of recharge to a formation from precipitation depends on the permeability of the overlying lacustrine fine sand, silt, clay, and till, which in the Niagara Falls area is relatively low, with hydraulic conductivity ranging from 0.0014 to 0.27 ft/d. The average annual recharge from precipitation is estimated to be 5 to 6 in/yr (LaSala, 1967) but is probably greater in several small areas where the Lockport, whose hydraulic conductivity ranges from 5 to 15 ft/d, crops out at land surface.

Movement and Discharge

Before construction of Niagara Power project and Falls Street tunnel.--Little information is available on ground-water levels in the Niagara Falls area before 1960; therefore, interpretation of ground-water movement in the upper part of the Lockport Dolomite before that time is based largely on fundamental assumptions governing ground-water flow. These assumptions are that (1) ground-water divides coincide with topographic highs; thus the major divides in the region were at the Niagara Escarpment, north of the study area (fig. 1), and in the central part of the City of Niagara Falls (pl. 1A); (2) regional flow of ground water followed the south-southwestward slope of the land surface and the southwestward dip of major bedding planes, (3) local ground-water movement followed the configuration of the buried bedrock surface; and (4) ground water in the central and southern parts of the city discharged to the upper Niagara River, while water in the western part discharged to the lower Niagara River in the gorge. The general inferred directions of ground-water movement in the upper part of the Lockport Dolomite before any major construction or industrial pumping is shown in figure 5.

Effect of Falls Street tunnel.--In the early 1900's, the Falls Street tunnel was excavated through the upper part of the Lockport Dolomite from 56th Street to the Niagara gorge (fig. 6). This 3.5-mi-long unlined tunnel trends east-west and slopes 20 ft/mi beneath the southern part of the city approximately 0.65 mi north of the upper Niagara River (fig. 1). Runoff and ground water that drained into the tunnel flowed west with sewage to a treatment plant in the Niagara River gorge below the Falls.

The bottom of the Falls Street tunnel slopes westward from 549 ft above sea level at 56th Street to 533 ft at 27th Street (fig. 6), which places the tunnel at or above the altitude of the lowest part of the Niagara River channel in this reach. Thus, in the reach from 56th Street to 27th Street, water from the Niagara River (surface altitude about 560 ft) probably moves through the upper part of the Lockport northward toward the tunnel through the relatively permeable upper 15 to 20 ft of the Lockport. A shallow bedrock valley in this area (pl. 1B) may be a major zone of infiltration to the tunnel because the depth of weathering would be deepest under this channel. Ground water north and south of the tunnel probably drains into the tunnel also, but the size of the area affected by the tunnel is unknown.

The Falls Street tunnel from 24th Street west to the Niagara gorge is 25 ft or more below the relatively permeable upper zone of the Lockport. Thus, the tunnel in this area is overlain by less fractured, less permeable beds that limit downward flow. A study of ground-water infiltration into the tunnel (Camp, Dresser and McKee, 1982) found only minimal seepage to the Falls Street tunnel between 24th Street and the gorge. Although the amount of water that drained into the tunnel before construction of the conduits is unknown, the Falls Street tunnel east of 27th Street probably altered ground-water movement by creating a local ground-water low as water drained into the tunnel from the upper 25 ft of bedrock and possibly from the Niagara River.

During the 1930's and 1940's, several companies drilled and pumped water from an industrialized area within 2,000 ft of the Niagara River near Gill Creek (fig. 1); yields from these wells were as high as 1,800 gal/min. Johnston 1964) and Woodward-Clyde Consultants (1983) reported that most of the pumped water was induced recharge from the Niagara River that moves predominantly through the upper part of the Lockport Dolomite. The induced recharge from the Niagara River by industrial pumping and possibly some infiltration to the Falls Street tunnel are the only known changes in natural ground-water flow patterns in this part of the city before the construction of the Niagara Power Project.

HYDROLOGIC EFFECTS OF NIAGARA POWER PROJECT

The Niagara Power Project, constructed by New York Power Authority during 1958-62, has an electrical production capacity of 1,950,000 kw. Part of the flow of the upper Niagara River 2.5 mi above the Falls is diverted 4 mi north through the twin buried conduits to the L-shaped forebay canal, which is between the Robert Moses powerplant and the Lewiston powerplant (fig. 1). The conduits can divert 50,000 to 75,000 ft^3/s of water, which is at least 25 percent of the river's flow.

Table 1.--Flow of Niagara River over Horseshoe and American Falls.[1]

Season	Dates	Hours		Minimum flow over falls (ft^3/s)
Tourist season	Apr. 1 to Sept. 15	Day:	8:00 am to 10:00 pm	100,000
		Night:	10:00 pm to 8:00 am	50,000
	Sept. 1 to Oct. 31	Day:	8:00 am to 8:00 pm	100,000
	..	Night:	8:00 pm to 8:00 am	50,000
Non-tourist season	Nov. 1 to Mar. 30		12:00 am to 12:00 am	50,000

[1] The diverted water (average total flow of river, 204,000 ft^3/s, minus flow over falls) is divided between Canada and United States.

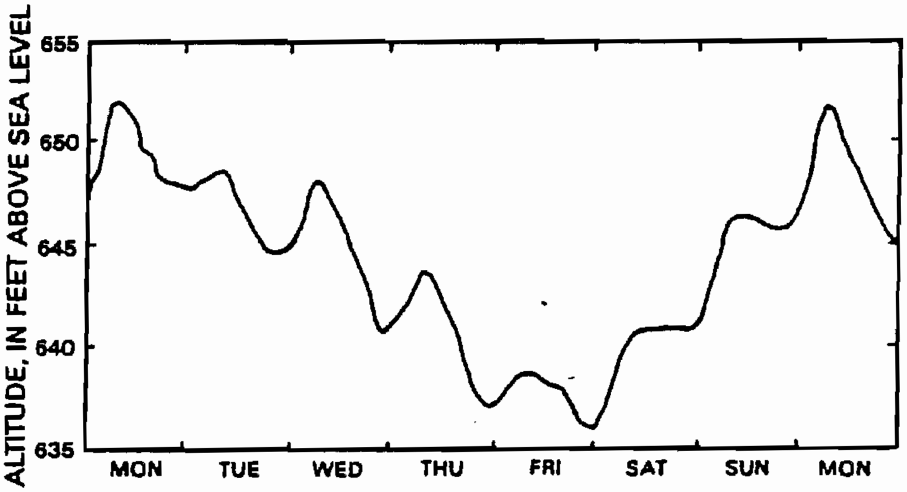


Figure 8.

Typical Lewiston Reservoir water levels during a weekly pumped-storage/release cycle.

Ground-Water Flow and Water Levels

Construction of the twin buried conduits, the forebay canal, and the pumped-storage reservoir has modified hydrologic conditions within the Niagara Falls area. The daily and seasonal regulation of water levels in the reservoir and forebay canal have changed the natural flow patterns and water levels in the upper part of the Lockport Dolomite. To determine the effect of the power project on ground-water movement, water levels in the upper part of the Lockport Dolomite were measured at 104 wells on October 23-24, 1984 and on March 26-27, 1985 (values are given in table 2, at end of report). The difference between water levels in October and those in March were relatively small (generally within 3 to 5 ft); therefore, only the water levels measured in March were used to construct a potentiometric-surface map (pl. 1A), which includes arrows showing the directions of ground-water flow.

Effect of Twin Buried Conduits

The twin buried conduits were constructed in two separate parallel bedrock trenches approximately 4 mi long. Each trench is 52 ft wide and penetrates 100 to 160 ft into the Lockport Dolomite; at the north end they penetrate the Lockport and upper part of the underlying Rochester Shale (fig. 9). The top of the conduits averages more than 40 ft below land surface. General construction details for the conduits are shown in figure 10.

Along the conduits are two dewatering stations--one at the intersection of the Falls Street tunnel at Royal Avenue, the other just south of the forebay canal (fig. 1). Each pumping station has direct access to water in both conduits and to water in the drain system that surrounds the conduits, which is in hydraulic contact with the surrounding bedrock. The pumping stations were designed to drain water from the bedrock surrounding each conduit through the drain system to reduce hydrostatic pressure, which could collapse the conduits should they need to be dewatered.

The drain system surrounding the conduits consists of formed, vertical 6-in-diameter drains placed every 10 ft along both sides of each conduit (fig. 11A), and two semicircular (2-ft radius) floor drains beneath the full length of the conduits at the bottom of each trench. The wall and floor drains are connected to continuous concrete-formed side drains in the lower corners of each bedrock trench (fig. 11A). All drains were formed into the concrete-conduit structure and are open to the bedrock walls and floor of conduit trenches but are not open directly to the river or forebay canal.

The only locations where water in the drain system can mix with water inside the conduits is at the two pumping stations. Each station has three sumps (fig. 11B)--a central sump connected to the conduit drain system that surrounds both conduits, and the two outer sumps, each of which is connected to the adjacent conduit. Both pumping stations have a pair of balancing weirs; one is near the Falls Street tunnel and operates at an altitude of 560 ft; the other is at the conduit outlet on the forebay canal and operates at an altitude of 550 ft. When the water level in the drain system exceeds the altitude of the balancing weir, water from the drains flows through the weir to the outer sumps and into the conduits, which discharge into the forebay canal.

Ground-water discharge into the backfill.—Backfill on top of the conduits was found to be relatively permeable where the Falls Street tunnel and conduits intersect (Koszalka and others, 1985, p. 56); however, no description of the backfill materials elsewhere along the conduits could be found. To determine whether the backfill is permeable elsewhere and forms a major pathway for ground-water movement, four wells were drilled during this study, three over the east conduit (wells 84-9, 84-10, and 84-11) and one over the west conduit (84-8, fig. 1). Drill cuttings indicated that the backfill consists of 2 to 5 ft of topsoil overlying 30 to 75 ft of shotrock (cobble- to boulder-size clasts of Lockport Dolomite that was blasted and removed during trench excavation), which overlies 5 to 15 ft of sandy, clayey silt fill of low permeability that overlies the conduits. The shotrock is permeable but unsaturated; only the lower part of the sandy, clayey silt was saturated. Water-level recorders installed on two wells in the sandy clayey silt (84-9 and 84-11, location shown in fig. 1) indicated that the water levels took several months to recover to a static level after the wells were pumped dry (fig. 12), which indicates that the sandy, clayey silt backfill has very low permeability and therefore transmits little ground water. Well 84-9 did not respond to fluctuations of water levels in the forebay canal, and water levels in well 84-11 fluctuated only when water levels in the forebay rose to altitudes greater than 560 ft, which occurred at the end of January and beginning of February 1985, when NYPA raised the water level in the forebay canal to clear a large accumulation of pack ice from the conduit intakes along the upper Niagara River. When this occurred, the water level in well 84-11 rose 10 ft to an altitude of 556.11 ft, then began a slow, steady decline (fig. 12). Water-level altitudes greater than 560 ft at well 84-11 would have caused the lower zone of the permeable shotrock fill to become saturated. Water probably entered the well relatively rapidly by leakage down the side of the casing, which could explain the rapid rise of the water level in the well; normally this should not have occurred because the well was installed in relatively impermeable sediment. Well 84-11 does not respond to water-level fluctuations in the bedrock or forebay canal below this altitude.

The relatively impermeable, sandy, clayey silt in the saturated part of the backfill prevents significant ground-water movement in the backfill. An exception may be at the intersection of the Falls Street tunnel and the conduits, where more permeable backfill was found. The method of backfilling there may have been different from that used elsewhere along the conduits because the conduits dip where they pass under the Falls Street sewer (fig. 9).

Ground-water discharge into drains surrounding the conduits.--The drain system that surrounds the conduits has lowered ground-water levels near the conduit trenches, which causes ground water in the Lockport Dolomite to flow toward the conduits (pl. 1A). Ground water within 0.5 mi of the conduits that previously flowed southward now flows toward the conduits and discharges into the drain system. To determine the direction of flow in the drains, water levels were measured in the central chamber in the pumping stations and in several NYPA open-hole wells installed in the bedrock 5 to 10 ft from the vertical wall drains. Because the drain system is in direct hydraulic contact

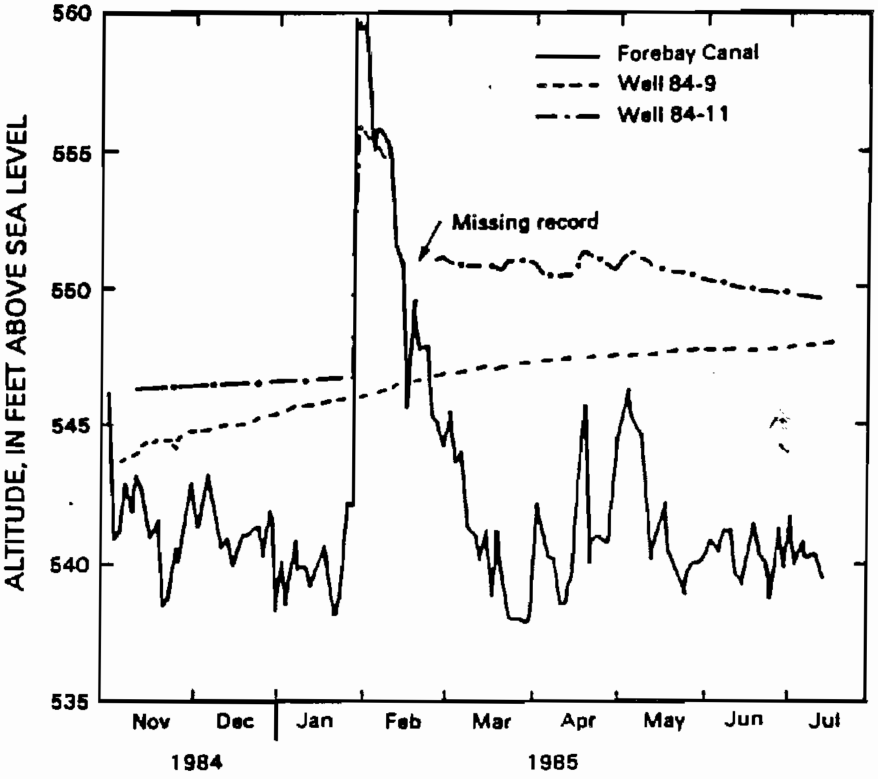


Figure 12.

Average daily water-level fluctuations in the forebay canal and recovery of water levels in wells 84-9 and 84-11 (installed in backfill atop conduits) after evacuation of water from the casing, November 1984 through July 1986.

with ground water in the Lockport Dolomite, the hydraulic heads measured in the NYPA wells are the same or nearly the same as water levels in the drains that surround the conduits (fig. 10). Water levels in wells adjacent to the conduits indicate that, most of the time, water from the vicinity of the forebay canal that enters the drains flows southward to where the Falls Street tunnel crosses the conduits (pl. 1A), whereas water from the upper Niagara River that enters the drains flows northward to the tunnel. The drain system acts as the path of least resistance to ground-water flow in and near the conduit trenches.

The major discharge point for water in the conduit drains is the Falls Street tunnel where it crosses the conduits (fig. 9). The method of construction at the conduit/tunnel intersection probably created this discharge zone. During construction of the conduit trenches, a 400-ft section of the Falls Street tunnel was rebuilt with precast concrete pipe sections, and the conduit trenches were then excavated beneath the Falls Street pipeline. After backfill was placed over the conduits and around the Falls Street tunnel pipe section, ground-water levels in the backfill fluctuated at or above the top of the rebuilt section of the Falls Street tunnel (fig. 13). Apparently the seals between the concrete pipe sections failed, and water from the drains began to leak into the Falls Street tunnel.

In 1982, the Falls Street tunnel was inspected for ground-water infiltration, and a large amount of inflow, estimated at approximately 6 Mgal/d, was found to leak into the Falls Street tunnel through joints in the concrete pipe where the tunnel passes over the conduits (Camp, Dresser and McKee, 1982). Most of this leakage is probably water from the conduit drain system, which drains ground water from 0.5 mi on both sides of the 4-mi-long trenches. The Lockport Dolomite is too impermeable to supply the quantity of water that

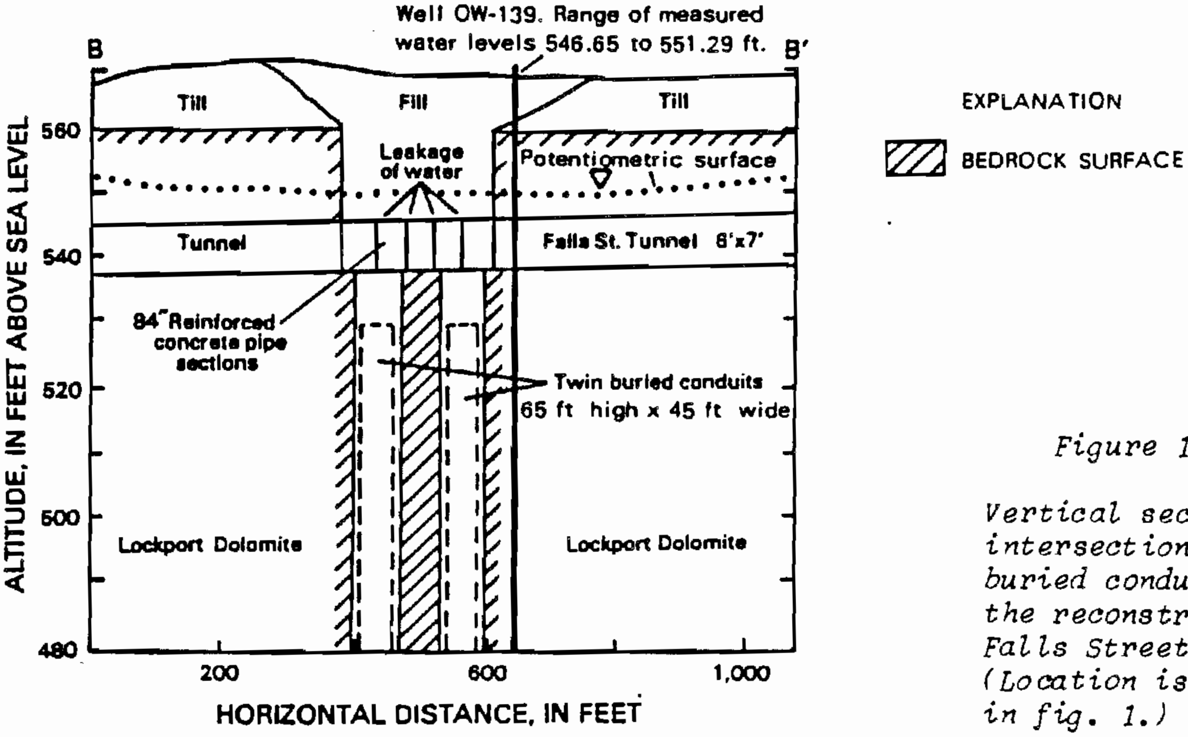


Figure 13.

Vertical section of intersection of twin buried conduits and the reconstructed Falls Street tunnel. (Location is shown in fig. 1.)

leaks into the tunnel. Estimation of how much water enters the Falls Street tunnel from either the north (powerplant) or south (river) side of the tunnel was beyond the scope of this project, however.

Effect of Forebay Canal

The forebay canal is an L-shaped excavation that penetrates the Lockport Dolomite and upper part of the Rochester Shale at the north end (outlet) of the twin conduits (fig. 1). It is 4,000 ft long, 500 ft wide, and 110 ft deep. The walls and floor are unlined. Water that enters the forebay canal from the conduits is routed to the Robert Moses powerplant, and some is pumped up to the Lewiston Reservoir, depending on the daily power-demand schedule.

The daily range of water-level fluctuations in the canal is dependent on the seasonal diversion schedule, the demand for power generation, and the flow of the Niagara River. During the summer and early fall, when the flow in the Niagara River is generally lower, daily fluctuations in the canal are greatest, as much as 25 ft. The water level in the forebay canal is increased by the release of water from the Lewiston Reservoir, which supplements the flow entering from the conduits. This combined flow into the forebay canal increases the hydraulic head in the canal to drive the Robert Moses powerplant turbines more efficiently. During high-flow periods (generally during spring) or when allowable diversions from the Niagara River are higher (table 1), daily water-level fluctuations in the forebay are less, usually ranging from 5 to 10 ft even during peak power-demand periods (fig. 7).

<u>Ground-water discharge into the forebay canal</u>.--The walls and floor of the forebay canal consist of bedrock. Observations of ground-water seepage from bedding planes in the forebay canal walls to the forebay canal (Lockport Dolomite) and higher water levels in nearby wells than in the forebay (pl. 1A and table 2) indicate that ground water generally discharges into the forebay canal. Little, if any, water enters the forebay canal from the underlying Rochester Shale, which has low permeability.

<u>Effects of water-level fluctuations in the forebay canal</u>.--The daily water-level fluctuations in the forebay canal, which can range to as much as 25 ft (fig. 7), cause instantaneous water-level fluctuations in wells along the conduits to as least 3.4 mi south of the forebay canal. The water-level fluctuations in the forebay canal also cause hydraulic-pressure changes in the drain system that surrounds the conduits. Instantaneous head responses in wells adjacent to the twin conduits to water-level fluctuations in the forebay canal suggest a direct hydraulic connection between the forebay canal and the drains. Water probably moves from the canal to the drains through gently southward dipping water-bearing bedding planes that are exposed in the walls of the forebay canal and is intercepted by the drain system that surrounds the conduits.

Water levels were recorded at four NYPA observation wells adjacent to the conduits at various distances south of the forebay canal; well OW-167 is at the outlet of the conduits, and wells OW-162, OW-152, and OW-139 are 0.8, 2.2,

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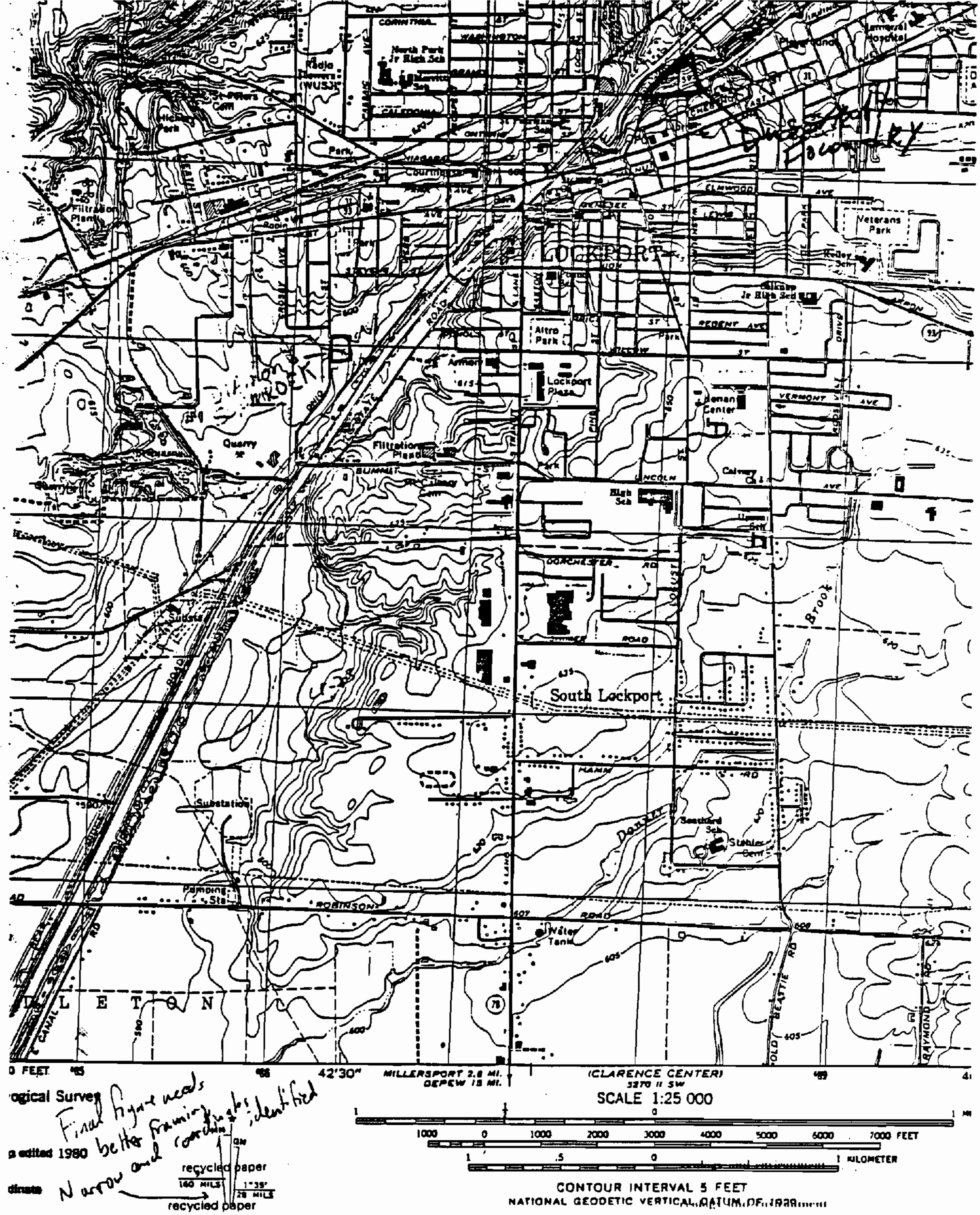

Final figure needs better framing and coordinates identified

Narrow

REFERENCE NO. 14

Sample Number
BD-458 RE

.Organics Analysis Data Sheet
(Page 1)

Laboratory Name: Ecology & Environment Inc.
Case No: 6761
Lab Sample ID No: 614 RE
QC Report No:
Sample Matrix: SOIL
Contract No: 68-01-7158
Data Release Authorized By:
Date Sample Received: 1-21-87

Volatile Compounds

Concentration: [✓ Low] Medium (Circle One)

Date Extracted/Prepared:

Date Analyzed: 1-23-87

Conc/Dil Factor: 1 pH 8.4

Percent Moisture: (Not Decanted) 12

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
74-87-3	Chloromethane	11	U
74-83-9	Bromomethane	11	U
75-01-4	Vinyl Chloride	11	U
75-00-3	Chloroethane	11	U
75-09-2	Methylene Chloride	20	B
67-64-1	Acetone	130	B
75-15-0	Carbon Disulfide	6	U
75-35-4	1, 1-Dichloroethene	6	U
75-34-3	1, 1-Dichloroethane	6	U
156-60-5	Trans-1, 2-Dichloroethene	6	U
67-66-3	Chloroform	6	U
107-06-2	1, 2-Dichloroethane	6	U
78-93-3	2-Butanone	11	U
71-55-6	1, 1, 1-Trichloroethane	6	U
56-23-5	Carbon Tetrachloride	6	U
108-05-4	Vinyl Acetate	11	U
75-27-4	Bromodichloromethane	6	U

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
78-87-5	1, 2-Dichloropropane	6	U
10061-02-6	Trans-1, 3-Dichloropropene	6	U
79-01-6	Trichloroethene	6	U
124-48-1	Dibromochloromethane	6	U
79-00-5	1, 1, 2-Trichloroethane	6	U
71-43-2	Benzene	6	U
10061-01-5	cis-1, 3-Dichloropropene	6	U
110-75-8	2-Chloroethylvinylether	11	U
75-25-2	Bromoform	6	U
108-10-1	4-Methyl-2-Pentanone	11	U
591-78-6	2-Hexanone	11	U
127-18-4	Tetrachloroethene	6	U
79-34-5	1, 1, 2, 2-Tetrachloroethane	6	U
108-88-3	Toluene	6	U
108-90-7	Chlorobenzene	6	U
100-41-4	Ethylbenzene	6	U
100-42-5	Styrene	6	U
	Total Xylenes	6	U

Data Reporting Qualifiers

For reporting results to EPA, the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However, the definition of each flag must be explicit.

Value	If the result is a value greater than or equal to the detection limit, report the value	**C**	This flag applies to pesticide parameters where the identification has been confirmed by GC MS. Single component pesticides ≥10 ng/ ul in the final extract should be confirmed by GC/MS
U	Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g., 10U) based on necessary concentration/dilution action. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample	**B**	This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action
J	Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g., 10J). If limit of detection is 10 µg/l and a concentration of 3 µg/l is calculated, report as 3J	**Other**	Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

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Laboratory Name Ecology & Environment Inc.

Case No: 6761

Sample Number
BD-458

Organics Analysis Data Sheet
(Page 2)

Semivolatile Compounds

Concentration: [✓ Low] Medium (Circle One)

Date Extracted/Prepared: 1-22-87

Date Analyzed: 1-30-87

Conc/Dil Factor: 2

Percent Moisture (Decanted) 12

GPC Cleanup ☐Yes ☒No

Separatory Funnel Extraction ☐Yes

Continuous Liquid - Liquid Extraction ☐Yes

CAS Number		ug/l or [✓ ug/Kg] (Circle One)
108-95-2	Phenol	380 U
111-44-4	bis(-2-Chloroethyl)Ether	380 U
95-57-8	2-Chlorophenol	380 U
541-73-1	1, 3-Dichlorobenzene	380 U
106-46-7	1, 4-Dichlorobenzene	380 U
100-51-6	Benzyl Alcohol	380 U
95-50-1	1, 2-Dichlorobenzene	380 U
95-48-7	2-Methylphenol	380 U
39638-32-9	bis(2-chloroisopropyl)Ether	380 U
106-44-5	4-Methylphenol	380 U
621-64-7	N-Nitroso-Di-n-Propylamine	380 U
67-72-1	Hexachloroethane	380 U
98-95-3	Nitrobenzene	380 U
78-59-1	Isophorone	380 U
88-75-5	2-Nitrophenol	380 U
105-67-9	2, 4-Dimethylphenol	380 U
65-85-0	Benzoic Acid	1800 U
111-91-1	bis(-2-Chloroethoxy)Methane	380 U
120-83-2	2, 4-Dichlorophenol	380 U
120-82-1	1, 2, 4-Trichlorobenzene	380 U
91-20-3	Naphthalene	480
106-47-8	4-Chloroaniline	380 U
87-68-3	Hexachlorobutadiene	380 U
59-50-7	4-Chloro-3-Methylphenol	380 U
91-57-6	2-Methylnaphthalene	710
77-47-4	Hexachlorocyclopentadiene	380 U
88-06-2	2, 4, 6-Trichlorophenol	380 U
95-95-4	2, 4, 5-Trichlorophenol	1800 U
91-58-7	2-Chloronaphthalene	380 U
88-74-4	2-Nitroaniline	1800 U
131-11-3	Dimethyl Phthalate	380 U
208-96-8	Acenaphthylene	380 U
99-09-2	3-Nitroaniline	1800 U

CAS Number		ug/l or [✓ ug/Kg] (Circle One)
83-32-9	Acenaphthene	380 U
51-28-5	2, 4-Dinitrophenol	1800 U
100-02-7	4-Nitrophenol	1800 U
132-64-9	Dibenzofuran	200 J
121-14-2	2, 4-Dinitrotoluene	380 U
606-20-2	2, 6-Dinitrotoluene	380 U
84-66-2	Diethylphthalate	380 U
7005-72-3	4-Chlorophenyl-phenylether	380 U
86-73-7	Fluorene	380 U
100-01-6	4-Nitroaniline	1800 U
534-52-1	4, 6-Dinitro-2-Methylphenol	1800 U
86-30-6	N-Nitrosodiphenylamine (1)	380 U
101-55-3	4-Bromophenyl-phenylether	380 U
118-74-1	Hexachlorobenzene	380 U
87-86-5	Pentachlorophenol	1800 U
85-01-8	Phenanthrene	920
120-12-7	Anthracene	380 U
84-74-2	Di-n-Butylphthalate	380 U
206-44-0	Fluoranthene	900
129-00-0	Pyrene	990
85-68-7	Butylbenzylphthalate	380 U
91-94-1	3, 3'-Dichlorobenzidine	750 U
56-55-3	Benzo(a)Anthracene	680
117-81-7	bis(2-Ethylhexyl)Phthalate	380 U
218-01-9	Chrysene	980
117-84-0	Di-n-Octyl Phthalate	380 U
205-99-2	Benzo(b)Fluoranthene	1200
207-08-9	Benzo(k)Fluoranthene	380 U
50-32-8	Benzo(a)Pyrene	380 U
193-39-5	Indeno(1, 2, 3-cd)Pyrene	380 U
53-70-3	Dibenz(a, h)Anthracene	380 U
191-24-2	Benzo(g, h, i)Perylene	380 U

(1)-Cannot be separated from diphenylamine

Laboratory Name Ecology & Environment, Inc

Case No 6761

Sample Number BD-458

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

	CAS Number	Compound Name	Fraction	RT or Scan Number min	Estimated Concentration (ug/l or [✓ ug/kg])
1.		Hexene isomer	VOA	17.31	14 BJ
2.		Hexane isomer	VOA	21.34	35 BJ
3.					
4.		Unknown hydrocarbon	BNA	11.20	660 J
5.		Unknown hydrocarbon		13.26	580 J
6.		Unknown hydrocarbon		13.53	340 J
7.		Unknown hydrocarbon		14.63	550 J
8.		Unknown hydrocarbon		15.14	1100 J
9.		Unknown hydrocarbon		16.46	280 J
10.		Unknown hydrocarbon		16.85	800 J
11.		Dimethylnaphthalene isomer		17.05	460 J
12.		Dimethylnaphthalene isomer		17.38	260 J
13.		Ethylnaphthalene isomer		17.62	150 J
14.		Unknown hydrocarbon		17.89	2400 J
15.		Unknown hydrocarbon		18.56	2600 J
16.		Unknown hydrocarbon		20.03	2000 J
17.		Unknown hydrocarbon		20.76	1100 J
18.		Unknown hydrocarbon		21.49	1500 J
19.		Unknown hydrocarbon		21.58	3000 J
20.		Unknown hydrocarbon		22.88	920 J
21.	10544500	Molecular Sulfur		25.67	1400 J
22.	90302	Nonox A		27.14	5200 J
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30					

Laboratory Name Ecology & Environment Inc.
Case No: 6761

Sample Number
BD-458 RE

Organics Analysis Data Sheet
(Page 2)

Semivolatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared: 2-5-87
Date Analyzed: 2-11-87
Conc/Dil Factor: 2
Percent Moisture (Decanted) 12

GPC Cleanup ☐Yes ☒No
Separatory Funnel Extraction ☐Yes
Continuous Liquid - Liquid Extraction ☐Yes

CAS Number		ug/l or [✓ ug/Kg] (Circle One)
108-95-2	Phenol	380 U
111-44-4	bis(-2-Chloroethyl)Ether	380 U
95-57-8	2-Chlorophenol	380 U
541-73-1	1, 3-Dichlorobenzene	380 U
106-46-7	1, 4-Dichlorobenzene	380 U
100-51-6	Benzyl Alcohol	380 U
95-50-1	1, 2-Dichlorobenzene	380 U
95-48-7	2-Methylphenol	380 U
39638-32-9	bis(2-chloroisopropyl)Ether	380 U
106-44-5	4-Methylphenol	380 U
621-64-7	N-Nitroso-Di-n-Propylamine	380 U
67-72-1	Hexachloroethane	380 U
98-95-3	Nitrobenzene	380 U
78-59-1	Isophorone	380 U
88-75-5	2-Nitrophenol	380 U
105-67-9	2, 4-Dimethylphenol	380 U
65-85-0	Benzoic Acid	1800 U
111-91-1	bis(-2-Chloroethoxy)Methane	380 U
120-83-2	2, 4-Dichlorophenol	380 U
120-82-1	1, 2, 4-Trichlorobenzene	380 U
91-20-3	Naphthalene	670
106-47-8	4-Chloroaniline	380 U
87-68-3	Hexachlorobutadiene	380 U
59-50-7	4-Chloro-3-Methylphenol	380 U
91-57-6	2-Methylnaphthalene	1100
77-47-4	Hexachlorocyclopentadiene	380 U
88-06-2	2, 4, 6-Trichlorophenol	380 U
95-95-4	2, 4, 5-Trichlorophenol	1800 U
91-58-7	2-Chloronaphthalene	380 U
88-74-4	2-Nitroaniline	1800 U
131-11-3	Dimethyl Phthalate	380 U
208-96-8	Acenaphthylene	380 U
99-09-2	3-Nitroaniline	1800 U

CAS Number		ug/l or [✓ ug/Kg] (Circle One)
83-32-9	Acenaphthene	380 U
51-28-5	2, 4-Dinitrophenol	1800 U
100-02-7	4-Nitrophenol	1800 U
132-64-9	Dibenzofuran	300 J
121-14-2	2, 4-Dinitrotoluene	380 U
606-20-2	2, 6-Dinitrotoluene	380 U
84-66-2	Diethylphthalate	380 U
7005-72-3	4-Chlorophenyl-phenylether	380 U
86-73-7	Fluorene	380 U
100-01-6	4-Nitroaniline	1800 U
534-52-1	4, 6-Dinitro-2-Methylphenol	1800 U
86-30-6	N-Nitrosodiphenylamine (1)	380 U
101-55-3	4-Bromophenyl-phenylether	380 U
118-74-1	Hexachlorobenzene	380 U
87-86-5	Pentachlorophenol	1800 U
85-01-8	Phenanthrene	1200
120-12-7	Anthracene	380 U
84-74-2	Di-n-Butylphthalate	550
206-44-0	Fluoranthene	1200
129-00-0	Pyrene	910
85-68-7	Butylbenzylphthalate	380 U
91-94-1	3, 3'-Dichlorobenzidine	750 U
56-55-3	Benzo(a)Anthracene	820
117-81-7	bis(2-Ethylhexyl)Phthalate	380 U
218-01-9	Chrysene	1100
117-84-0	Di-n-Octyl Phthalate	360
205-99-2	Benzo(b)Fluoranthene	1500
207-08-9	Benzo(k)Fluoranthene	380 U
50-32-8	Benzo(a)Pyrene	730
193-39-5	Indeno(1, 2, 3-cd)Pyrene	620
53-70-3	Dibenz(a, h)Anthracene	380 U
191-24-2	Benzo(g, h, i)Perylene	620

(1)-Cannot be separated from diphenylamine

Laboratory Name ECOLOGY & ENVIRONMENT INC.
Case No 6761

Sample Number
BD-45B RE

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

	CAS Number	Compound Name	Fraction	RT or Scan Number	Estimated Concentration (ug/l or [✓ ug/kg])
1.		HEXENE ISOMER	VOA	17.26	12 BJ
2.		HEXANE ISOMER	VOA	21.30	27 BJ
3.					
4.		Trimethylbenzene isomer	BNA	8.51	360 J
5.		unknown hydrocarbon	BNA	9.39	280 J
6.		unknown hydrocarbon	BNA	11.17	149 ~~250~~ J
7.		unknown hydrocarbon	BNA	13.22	660 J
8.		unknown hydrocarbon	BNA	13.49	440 J
9.		unknown hydrocarbon	BNA	14.61	840 J
10.	90120	1-methylnaphthalene	BNA	15.14	1500 J
11.		unknown hydrocarbon	BNA	16.43	320 J
12.		unknown hydrocarbon	BNA	16.83	1100 J
13.		dimethylnaphthalene isomer	BNA	17.04	640 J
14.		dimethylnaphthalene isomer	BNA	17.34	400 J
15.		unknown hydrocarbon	BNA	17.85	4600 J
16.		unknown hydrocarbon	BNA	18.47	3200 J
17.		unknown hydrocarbon	BNA	20.02	2200 J
18.		unknown hydrocarbon	BNA	21.48	1800 J
19.		unknown hydrocarbon	BNA	21.56	3400 J
20.		unknown hydrocarbon	BNA	22.87	980 J
21.	10544500	molecular sulfur	BNA	25.66	2400 J
22.	90302	nonox A	BNA	27.13	6200 J
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30					

Form 1, Part B

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Laboratory Name Ecology & Environment Inc.
Case No 6761

Sample Number
BD-459

Organics Analysis Data Sheet
(Page 2)

Semivolatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared: 1-22-87
Date Analyzed: 1-26-87
Conc/Dil Factor: 2
Percent Moisture (Decanted) 29

GPC Cleanup ☐Yes ☒No
Separatory Funnel Extraction ☐Yes
Continuous Liquid - Liquid Extraction ☐Yes

CAS Number		ug/l or [✓ ug/Kg] (Circle One)
108-95-2	Phenol	110,000 E
111-44-4	bis(-2-Chloroethyl)Ether	460 U
95-57-8	2-Chlorophenol	460 U
541-73-1	1, 3-Dichlorobenzene	460 U
106-46-7	1, 4-Dichlorobenzene	460 U
100-51-6	Benzyl Alcohol	460 U
95-50-1	1, 2-Dichlorobenzene	460 U
95-48-7	2-Methylphenol	770
39638-32-9	bis(2-chloroisopropyl)Ether	460 U
106-44-5	4-Methylphenol	23,000
621-64-7	N-Nitroso-Di-n-Propylamine	460 U
67-72-1	Hexachloroethane	460 U
98-95-3	Nitrobenzene	460 U
78-59-1	Isophorone	460 U
88-75-5	2-Nitrophenol	460 U
105-67-9	2, 4-Dimethylphenol	460 U
65-85-0	Benzoic Acid	2200 U
111-91-1	bis(-2-Chloroethoxy)Methane	460 U
120-83-2	2, 4-Dichlorophenol	460 U
120-82-1	1, 2, 4-Trichlorobenzene	460 U
91-20-3	Naphthalene	460 U
106-47-8	4-Chloroaniline	460 U
87-68-3	Hexachlorobutadiene	460 U
59-50-7	4-Chloro-3-Methylphenol	460 U
91-57-6	2-Methylnaphthalene	460 U
77-47-4	Hexachlorocyclopentadiene	460 U
88-06-2	2, 4, 6-Trichlorophenol	460 U
95-95-4	2, 4, 5-Trichlorophenol	2200 U
91-58-7	2-Chloronaphthalene	460 U
88-74-4	2-Nitroaniline	2200 U
131-11-3	Dimethyl Phthalate	460 U
208-96-8	Acenaphthylene	460 U
99-09-2	3-Nitroaniline	2200 U

CAS Number		ug/l or [✓ ug/Kg] (Circle One)
83-32-9	Acenaphthene	460 U
51-28-5	2, 4-Dinitrophenol	2200 U
100-02-7	4-Nitrophenol	2200 U
132-64-9	Dibenzofuran	460 U
121-14-2	2, 4-Dinitrotoluene	460 U
606-20-2	2, 6-Dinitrotoluene	460 U
84-66-2	Diethylphthalate	460 U
7005-72-3	4-Chlorophenyl-phenylether	460 U
86-73-7	Fluorene	460 U
100-01-6	4-Nitroaniline	2200 U
534-52-1	4, 6-Dinitro-2-Methylphenol	2200 U
86-30-6	N-Nitrosodiphenylamine (1)	460 U
101-55-3	4-Bromophenyl-phenylether	460 U
118-74-1	Hexachlorobenzene	460 U
87-86-5	Pentachlorophenol	2200 U
85-01-8	Phenanthrene	460 U
120-12-7	Anthracene	460 U
84-74-2	Di-n-Butylphthalate	630
206-44-0	Fluoranthene	460 U
129-00-0	Pyrene	460 U
85-68-7	Butylbenzylphthalate	460 U
91-94-1	3, 3'-Dichlorobenzidine	930 U
56-55-3	Benzo(a)Anthracene	460 U
117-81-7	bis(2-Ethylhexyl)Phthalate	400 U
218-01-9	Chrysene	460 U
117-84-0	Di-n-Octyl Phthalate	460 U
205-99-2	Benzo(b)Fluoranthene	460 U
207-08-9	Benzo(k)Fluoranthene	460 U
50-32-8	Benzo(a)Pyrene	460 U
193-39-5	Indeno(1, 2, 3-cd)Pyrene	460 U
53-70-3	Dibenz(a, h)Anthracene	460 U
191-24-2	Benzo(g, h, i)Perylene	460 U

(1)-Cannot be separated from diphenylamine

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Laboratory Name Ecology & Environment Inc.
Case No 6761

Sample Number
BD-459 DL

Organics Analysis Data Sheet
(Page 2)

Semivolatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared: 1-22-87
Date Analyzed: 2-11-87
Conc/Dil Factor: 20
Percent Moisture (Decanted) 29

GPC Cleanup ☐Yes ☒No
Separatory Funnel Extraction ☐Yes
Continuous Liquid - Liquid Extraction ☐Yes

CAS Number		ug/l or [✓ ug/Kg] (Circle One)
108-95-2	Phenol	160,000
111-44-4	bis(-2-Chloroethyl)Ether	4600 U
95-57-8	2-Chlorophenol	4600 U
541-73-1	1, 3-Dichlorobenzene	4600 U
106-46-7	1, 4-Dichlorobenzene	4600 U
100-51-6	Benzyl Alcohol	4600 U
95-50-1	1, 2-Dichlorobenzene	4600 U
95-48-7	2-Methylphenol	4600 U
39638-32-9	bis(2-chloroisopropyl)Ether	4600 U
106-44-5	4-Methylphenol	34,000
621-64-7	N-Nitroso-Di-n-Propylamine	460 U
67-72-1	Hexachloroethane	460 U
98-95-3	Nitrobenzene	460 U
78-59-1	Isophorone	460 U
88-75-5	2-Nitrophenol	460 U
105-67-9	2, 4-Dimethylphenol	460 U
65-85-0	Benzoic Acid	22000 U
111-91-1	bis(-2-Chloroethoxy)Methane	460 U
120-83-2	2, 4-Dichlorophenol	460 U
120-82-1	1, 2, 4-Trichlorobenzene	460 U
91-20-3	Naphthalene	460 U
106-47-8	4-Chloroaniline	460 U
87-68-3	Hexachlorobutadiene	460 U
59-50-7	4-Chloro-3-Methylphenol	460 U
91-57-6	2-Methylnaphthalene	460 U
77-47-4	Hexachlorocyclopentadiene	460 U
88-06-2	2, 4, 6-Trichlorophenol	460 U
95-95-4	2, 4, 5-Trichlorophenol	22000 U
91-58-7	2-Chloronaphthalene	460 U
88-74-4	2-Nitroaniline	22000 U
131-11-3	Dimethyl Phthalate	460 U
208-96-8	Acenaphthylene	460 U
99-09-2	3-Nitroaniline	22000 U

CAS Number		ug/l or [✓ ug/Kg] (Circle One)
83-32-9	Acenaphthene	460 U
51-28-5	2, 4-Dinitrophenol	22000 U
100-02-7	4-Nitrophenol	22000 U
132-64-9	Dibenzofuran	460 U
121-14-2	2, 4-Dinitrotoluene	460 U
606-20-2	2, 6-Dinitrotoluene	460 U
84-66-2	Diethylphthalate	460 U
7005-72-3	4-Chlorophenyl-phenylether	460 U
86-73-7	Fluorene	460 U
100-01-6	4-Nitroaniline	22000 U
534-52-1	4, 6-Dinitro-2-Methylphenol	22000 U
86-30-6	N-Nitrosodiphenylamine (1)	460 U
101-55-3	4-Bromophenyl-phenylether	460 U
118-74-1	Hexachlorobenzene	460 U
87-86-5	Pentachlorophenol	22000 U
85-01-8	Phenanthrene	460 U
120-12-7	Anthracene	460 U
84-74-2	Di-n-Butylphthalate	460 U
206-44-0	Fluoranthene	460 U
129-00-0	Pyrene	460 U
85-68-7	Butylbenzylphthalate	460 U
91-94-1	3, 3'-Dichlorobenzidine	4,300 U
56-55-3	Benzo(a)Anthracene	460 U
117-81-7	bis(2-Ethylhexyl)Phthalate	460 U
218-01-9	Chrysene	460 U
117-84-0	Di-n-Octyl Phthalate	460 U
205-99-2	Benzo(b)Fluoranthene	460 U
207-08-9	Benzo(k)Fluoranthene	460 U
50-32-8	Benzo(a)Pyrene	460 U
193-39-5	Indeno(1, 2, 3-cd)Pyrene	460 U
53-70-3	Dibenz(a, h)Anthracene	460 U
191-24-2	Benzo(g, h, i)Perylene	460 U

(1)-Cannot be separated from diphenylamine

Laboratory Name ECOLOGY & ENVIRONMENT INC.
Case No 6761

Sample Number
BD-459

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

CAS Number	Compound Name	Fraction	RT or Scan Number	Estimated Concentration (ug/l or [✓ ug/kg])
1.	HEXENE ISOMER	VOA	17.07	8 BJ
2.	UNKNOWN HYDROCARBON		21.11	74 J
3.	UNKNOWN HYDROCARBON		26.51	310 J
4.	UNKNOWN HYDROCARBON		27.64	62 J
5.	DIETHYLBENZENE ISOMER		29.43	1100 J
6.	TRIMETHYLBENZENE ISOMER		31.14	2600 J
7	ETHYLMETHYLBENZENE ISOMER		37.28	2600 J
8.	ETHYLMETHYLBENZENE ISOMER		41.40	1100 J
9.				
10. 69727	2-hydroxybenzoic acid	BNA	15.44	520 J
11.	hydroxybenzene methanol isomer	BNA	16.11	520 J
12.	unknown hydrocarbon	BNA	23.07	360 J
13.	methylene bis phenol isomer	BNA	25.53	920 J
14. 10544500	molecular sulfur	BNA	25.73	980 J
15.	unknown	BNA	26.26	8000 J
16.	methyl bis phenol isomer	BNA	26.35	3400 J
17.	unknown	BNA	27.15	4800 J
18.	unknown	BNA	27.81	600 J
19.	unknown	BNA	27.94	3600 J
20.	unknown	BNA	28.53	2400 J
21.	unknown	BNA	29.08	980 J
22.	unknown	BNA	33.81	680 J
23.	unknown hydrocarbon	BNA	34.91	640 J
24.	unknown hydrocarbon	BNA	36.62	880 J
25.				
26.	unknown *	BNA	14.46	7900 J
27.				
28				
29.				
30				

* from BD459 DL analysis

Laboratory Name ECOLOGY & ENVIRONMENT INC.
Case No 6761

Sample Number
BD-460

Organics Analysis Data Sheet
(Page 2)

Semivolatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared: 1-22-87
Date Analyzed: 1-26-87
Conc./Dil Factor: 2
Percent Moisture (Decanted) 7

GPC Cleanup ☐Yes ☒No
Separatory Funnel Extraction ☐Yes
Continuous Liquid - Liquid Extraction ☐Yes

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
108-95-2	Phenol	270	J
111-44-4	bis(-2-Chloroethyl)Ether	350	U
95-57-8	2-Chlorophenol	350	U
541-73-1	1,3-Dichlorobenzene	350	U
106-46-7	1,4-Dichlorobenzene	350	U
100-51-6	Benzyl Alcohol	350	U
95-50-1	1,2-Dichlorobenzene	350	U
95-48-7	2-Methylphenol	350	U
39638-32-9	bis(2-chloroisopropyl)Ether	350	U
106-44-5	4-Methylphenol	350	U
621-64-7	N-Nitroso-Di-n-Propylamine	350	U
67-72-1	Hexachloroethane	350	U
98-95-3	Nitrobenzene	350	U
78-59-1	Isophorone	350	U
88-75-5	2-Nitrophenol	350	U
105-67-9	2,4-Dimethylphenol	350	U
65-85-0	Benzoic Acid	1700	U
111-91-1	bis(-2-Chloroethoxy)Methane	350	U
120-83-2	2,4-Dichlorophenol	350	U
120-82-1	1,2,4-Trichlorobenzene	350	U
91-20-3	Naphthalene	350	U
106-47-8	4-Chloroaniline	350	U
87-68-3	Hexachlorobutadiene	350	U
59-50-7	4-Chloro-3-Methylphenol	350	U
91-57-6	2-Methylnaphthalene	350	U
77-47-4	Hexachlorocyclopentadiene	350	U
88-06-2	2,4,6-Trichlorophenol	350	U
95-95-4	2,4,5-Trichlorophenol	1700	U
91-58-7	2-Chloronaphthalene	350	U
88-74-4	2-Nitroaniline	1700	U
131-11-3	Dimethyl Phthalate	350	U
208-96-8	Acenaphthylene	350	U
99-09-2	3-Nitroaniline	1700	U

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
83-32-9	Acenaphthene	350	U
51-28-5	2,4-Dinitrophenol	1700	U
100-02-7	4-Nitrophenol	1700	U
132-64-9	Dibenzofuran	350	U
121-14-2	2,4-Dinitrotoluene	350	U
606-20-2	2,6-Dinitrotoluene	350	U
84-66-2	Diethylphthalate	350	U
7005-72-3	4-Chlorophenyl-phenylether	350	U
86-73-7	Fluorene	350	U
100-01-6	4-Nitroaniline	1700	U
534-52-1	4,6-Dinitro-2-Methylphenol	1700	U
86-30-6	N-Nitrosodiphenylamine (1)	350	U
101-55-3	4-Bromophenyl-phenylether	350	U
118-74-1	Hexachlorobenzene	350	U
87-86-5	Pentachlorophenol	350	U
85-01-8	Phenanthrene	350	U
120-12-7	Anthracene	350	U
84-74-2	Di-n-Butylphthalate	560	
206-44-0	Fluoranthene	350	U
129-00-0	Pyrene	350	U
85-68-7	Butylbenzylphthalate	350	U
91-94-1	3,3'-Dichlorobenzidine	710	U
56-55-3	Benzo(a)Anthracene	350	U
117-81-7	bis(2-Ethylhexyl)Phthalate	160	J
218-01-9	Chrysene	350	U
117-84-0	Di-n-Octyl Phthalate	350	U
205-99-2	Benzo(b)Fluoranthene	350	U
207-08-9	Benzo(k)Fluoranthene	350	U
50-32-8	Benzo(a)Pyrene	350	U
193-39-5	Indeno(1,2,3-cd)Pyrene	350	U
53-70-3	Dibenz(a,h)Anthracene	350	U
191-24-2	Benzo(g,h,i)Perylene	350	U

(1)-Cannot be separated from diphenylamine

Form I

7-85

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Laboratory Name ECOLOGY & ENVIRONMENT INC.
Case No 6761

Sample Number
BD-460

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

	CAS Number	Compound Name	Fraction	RT or Scan Number	Estimated Concentration (ug/l or [✓ ug/kg])
1.		HEXENE ISOMER	VOA	17.07	13 BJ
2.		HEXANE ISOMER	VOA	21.18	54 BJ
3.					
4.	10544500	molecular sulfur	BNA	25.73	200 J
5.	90302	nonAX A	BNA	27.19	640 J
6.					
7					
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Form 1, Part B

Laboratory Name ECOLOGY & ENVIRONMENT INC.
Case No 6761

Sample Number
BD-460 RE

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

	CAS Number	Compound Name	Fraction	~~RT~~ or Scan Number	Estimated Concentration (ug/l or [✓ ug/kg])
1.		HEXENE ISOMER	VOA	17.07	15 BJ
2.		HEXANE ISOMER		21.14	66 BJ
3.	108952	PHENOL		27.91	13 J
4.		UNKNOWN AROMATIC		29.23	33 J
5.		UNKNOWN AROMATIC		30.39	65 J
6.		UNKNOWN AROMATIC		32.37	200 J
7.					
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308

Laboratory Name ECOLOGY & ENVIRONMENT INC.

Case No: 6761

Sample Number
BD-461

Organics Analysis Data Sheet
(Page 2)

Semivolatile Compounds

Concentration: [✓ Low] Medium (Circle One)

Date Extracted/Prepared: 1-22-87

Date Analyzed: 1-29-87

Conc/Dil Factor: 2

Percent Moisture (Decanted) 8

GPC Cleanup ☐Yes ☒No

Separatory Funnel Extraction ☐Yes

Continuous Liquid - Liquid Extraction ☐Yes

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
108-95-2	Phenol	360	U
111-44-4	bis(-2-Chloroethyl)Ether	360	U
95-57-8	2-Chlorophenol	360	U
541-73-1	1, 3-Dichlorobenzene	360	U
106-46-7	1, 4-Dichlorobenzene	360	U
100-51-6	Benzyl Alcohol	360	U
95-50-1	1, 2-Dichlorobenzene	360	U
95-48-7	2-Methylphenol	360	U
39638-32-9	bis(2-chloroisopropyl)Ether	360	U
106-44-5	4-Methylphenol	360	U
621-64-7	N-Nitroso-Di-n-Propylamine	360	U
67-72-1	Hexachloroethane	360	U
98-95-3	Nitrobenzene	360	U
78-59-1	Isophorone	360	U
88-75-5	2-Nitrophenol	360	U
105-67-9	2, 4-Dimethylphenol	360	U
65-85-0	Benzoic Acid	1700	U
111-91-1	bis(-2-Chloroethoxy)Methane	360	U
120-83-2	2, 4-Dichlorophenol	360	U
120-82-1	1, 2, 4-Trichlorobenzene	360	U
91-20-3	Naphthalene	74	J
106-47-8	4-Chloroaniline	360	U
87-68-3	Hexachlorobutadiene	360	U
59-50-7	4-Chloro-3-Methylphenol	360	U
91-57-6	2-Methylnaphthalene	360	U
77-47-4	Hexachlorocyclopentadiene	360	U
88-06-2	2, 4, 6-Trichlorophenol	360	U
95-95-4	2, 4, 5-Trichlorophenol	1700	U
91-58-7	2-Chloronaphthalene	360	U
88-74-4	2-Nitroaniline	1700	U
131-11-3	Dimethyl Phthalate	360	U
208-96-8	Acenaphthylene	360	U
99-09-2	3-Nitroaniline	1700	U

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
83-32-9	Acenaphthene	360	U
51-28-5	2, 4-Dinitrophenol	1700	U
100-02-7	4-Nitrophenol	1700	U
132-64-9	Dibenzofuran	360	U
121-14-2	2, 4-Dinitrotoluene	360	U
606-20-2	2, 6-Dinitrotoluene	360	U
84-66-2	Diethylphthalate	360	U
7005-72-3	4-Chlorophenyl-phenylether	360	U
86-73-7	Fluorene	360	U
100-01-6	4-Nitroaniline	1700	U
534-52-1	4, 6-Dinitro-2-Methylphenol	1700	U
86-30-6	N-Nitrosodiphenylamine (1)	360	U
101-55-3	4-Bromophenyl-phenylether	360	U
118-74-1	Hexachlorobenzene	360	U
87-86-5	Pentachlorophenol	1700	U
85-01-8	Phenanthrene	360	U
120-12-7	Anthracene	360	U
84-74-2	Di-n-Butylphthalate	390	
206-44-0	Fluoranthene	360	U
129-00-0	Pyrene	360	U
85-68-7	Butylbenzylphthalate	360	U
91-94-1	3, 3'-Dichlorobenzidine	720	U
56-55-3	Benzo(a)Anthracene	360	U
117-81-7	bis(2-Ethylhexyl)Phthalate	360	U
218-01-9	Chrysene	360	U
117-84-0	Di-n-Octyl Phthalate	360	U
205-99-2	Benzo(b)Fluoranthene	360	U
207-08-9	Benzo(k)Fluoranthene	360	U
50-32-8	Benzo(a)Pyrene	360	U
193-39-5	Indeno(1, 2, 3-cd)Pyrene	360	U
53-70-3	Dibenz(a, h)Anthracene	360	U
191-24-2	Benzo(g, h, i)Perylene	360	U

(1)-Cannot be separated from diphenylamine

Laboratory Name ECOLOGY & ENVIRONMENT INC.

Case No 6761

Sample Number BD-461

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

	CAS Number	Compound Name	Fraction	RT or Scan Number	Estimated Concentration (ug/l or [✓ ug/kg])
1.		HEXENE ISOMER	VOA	17.07	15 BJ
2.		HEXANE ISOMER	VOA	21.14	58 BJ
3.					
4.		unknown hydrocarbon	BNA	21.48	360 J
5.		unknown hydrocarbon	BNA	21.57	380 J
6.		unknown hydrocarbon	BNA	22.87	220 J
7.	127639	1,1'-sulfonylbisbenzene	BNA	24.42	380 J
8.					
9.					
10.					
11.					
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Form 1, Part B

7/85

Laboratory Name Ecology & Environment Inc.
Case No: 6761

Sample Number
BD-462

Organics Analysis Data Sheet
(Page 2)

Semivolatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared: 1-22-87
Date Analyzed: 1-26-87
Conc/Dil Factor: 2
Percent Moisture (Decanted) 12

GPC Cleanup ☐Yes ☐No
Separatory Funnel Extraction ☐Yes
Continuous Liquid - Liquid Extraction ☐Yes

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
108-95-2	Phenol	380	U
111-44-4	bis(-2-Chloroethyl)Ether	380	U
95-57-8	2-Chlorophenol	380	U
541-73-1	1, 3-Dichlorobenzene	380	U
106-46-7	1, 4-Dichlorobenzene	380	U
100-51-6	Benzyl Alcohol	380	U
95-50-1	1, 2-Dichlorobenzene	380	U
95-48-7	2-Methylphenol	380	U
39638-32-9	bis(2-chloroisopropyl)Ether	380	U
106-44-5	4-Methylphenol	380	U
621-64-7	N-Nitroso-Di-n-Propylamine	380	U
67-72-1	Hexachloroethane	380	U
98-95-3	Nitrobenzene	380	U
78-59-1	Isophorone	380	U
88-75-5	2-Nitrophenol	380	U
105-67-9	2, 4-Dimethylphenol	380	U
65-85-0	Benzoic Acid	1800	U
111-91-1	bis(-2-Chloroethoxy)Methane	380	U
120-83-2	2, 4-Dichlorophenol	380	U
120-82-1	1, 2, 4-Trichlorobenzene	380	U
91-20-3	Naphthalene	160	J
106-47-8	4-Chloroaniline	380	U
87-68-3	Hexachlorobutadiene	380	U
59-50-7	4-Chloro-3-Methylphenol	380	U
91-57-6	2-Methylnaphthalene	210	J
77-47-4	Hexachlorocyclopentadiene	380	U
88-06-2	2, 4, 6-Trichlorophenol	380	U
95-95-4	2, 4, 5-Trichlorophenol	1800	U
91-58-7	2-Chloronaphthalene	380	U
88-74-4	2-Nitroaniline	1800	U
131-11-3	Dimethyl Phthalate	380	U
208-96-8	Acenaphthylene	380	U
99-09-2	3-Nitroaniline	1800	U

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
83-32-9	Acenaphthene	380	U
51-28-5	2, 4-Dinitrophenol	1800	U
100-02-7	4-Nitrophenol	1800	U
132-64-9	Dibenzofuran	380	U
121-14-2	2, 4-Dinitrotoluene	380	U
606-20-2	2, 6-Dinitrotoluene	380	U
84-66-2	Diethylphthalate	380	U
7005-72-3	4-Chlorophenyl-phenylether	380	U
86-73-7	Fluorene	380	U
100-01-6	4-Nitroaniline	1800	U
534-52-1	4, 6-Dinitro-2-Methylphenol	1800	U
86-30-6	N-Nitrosodiphenylamine (1)	380	U
101-55-3	4-Bromophenyl-phenylether	380	U
118-74-1	Hexachlorobenzene	380	U
87-86-5	Pentachlorophenol	1800	U
85-01-8	Phenanthrene	250	J
120-12-7	Anthracene	380	U
84-74-2	Di-n-Butylphthalate	730	
206-44-0	Fluoranthene	630	
129-00-0	Pyrene	610	
85-68-7	Butylbenzylphthalate	380	U
91-94-1	3, 3'-Dichlorobenzidine	750	U
56-55-3	Benzo(a)Anthracene	560	
117-81-7	bis(2-Ethylhexyl)Phthalate	380	U
218-01-9	Chrysene	750	
117-84-0	Di-n-Octyl Phthalate	380	U
205-99-2	Benzo(b)Fluoranthene	1700	
207-08-9	Benzo(k)Fluoranthene	380	U
50-32-8	Benzo(a)Pyrene	760	
193-39-5	Indeno(1, 2, 3-cd)Pyrene	630	
53-70-3	Dibenz(a, h)Anthracene	260	J
191-24-2	Benzo(g, h, i)Perylene	570	

(1)-Cannot be separated from diphenylamine

Laboratory Name Ecology & Environment Inc.

Case No 6761

Sample Number
BD-462

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

	CAS Number	Compound Name	Fraction	[✓ RT] or Scan Number	Estimated Concentration (ug/l or [✓ ug/kg])
1.		Hexene Isomer	VOA	17.05	11 BJ
2.		Hexane Isomer	VOA	21.13	48 BJ
3.					
4.		unknown hydrocarbon	BNA	11.25	220 J
5.		unknown hydrocarbon	BNA	16.91	400 J
6.		unknown hydrocarbon	BNA	18.54	260 J
7.		unknown hydrocarbon	BNA	20.09	220 J
8.		unknown hydrocarbon	BNA	21.56	360 J
9.		unknown hydrocarbon	BNA	21.64	400 J
10.		unknown	BNA	22.94	160 J
11.		unknown hydrocarbon	BNA	33.08	640 J
12.	57823	perylene	BNA	34.33	1600 J
13.		unknown hydrocarbon	BNA	34.92	980 J
14.		unknown hydrocarbon	BNA	36.41	760 J
15.		unknown	BNA	39.71	1000 J
16.					
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Laboratory Name ECOLOGY & ENVIRONMENT INC.
Case No 6761

Sample Number
BD-463

Organics Analysis Data Sheet
(Page 2)

Semivolatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared: 1-22-87
Date Analyzed: 1-29-87
Conc/Dil Factor: 2
Percent Moisture (Decanted) 20

GPC Cleanup ☐Yes ☒No
Separatory Funnel Extraction ☐Yes
Continuous Liquid - Liquid Extraction ☐Yes

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
108-95-2	Phenol	410	U
111-44-4	bis(-2-Chloroethyl)Ether	410	U
95-57-8	2-Chlorophenol	410	U
541-73-1	1, 3-Dichlorobenzene	410	U
106-46-7	1, 4-Dichlorobenzene	410	U
100-51-6	Benzyl Alcohol	410	U
95-50-1	1, 2-Dichlorobenzene	410	U
95-48-7	2-Methylphenol	410	U
39638-32-9	bis(2-chloroisopropyl)Ether	410	U
106-44-5	4-Methylphenol	410	U
621-64-7	N-Nitroso-Di-n-Propylamine	410	U
67-72-1	Hexachloroethane	410	U
98-95-3	Nitrobenzene	410	U
78-59-1	Isophorone	410	U
88-75-5	2-Nitrophenol	410	U
105-67-9	2, 4-Dimethylphenol	410	U
65-85-0	Benzoic Acid	2000	U
111-91-1	bis(-2-Chloroethoxy)Methane	410	U
120-83-2	2, 4-Dichlorophenol	410	U
120-82-1	1, 2, 4-Trichlorobenzene	410	U
91-20-3	Naphthalene	170	J
106-47-8	4-Chloroaniline	410	U
87-68-3	Hexachlorobutadiene	410	U
59-50-7	4-Chloro-3-Methylphenol	410	U
91-57-6	2-Methylnaphthalene	150	J
77-47-4	Hexachlorocyclopentadiene	410	U
88-06-2	2, 4, 6-Trichlorophenol	410	U
95-95-4	2, 4, 5-Trichlorophenol	2000	U
91-58-7	2-Chloronaphthalene	410	U
88-74-4	2-Nitroaniline	2000	U
131-11-3	Dimethyl Phthalate	410	U
208-96-8	Acenaphthylene	410	U
99-09-2	3-Nitroaniline	2000	U

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
83-32-9	Acenaphthene	410	U
51-28-5	2, 4-Dinitrophenol	2000	U
100-02-7	4-Nitrophenol	2000	U
132-64-9	Dibenzofuran	79	J
121-14-2	2, 4-Dinitrotoluene	410	U
606-20-2	2, 6-Dinitrotoluene	410	U
84-66-2	Diethylphthalate	410	U
7005-72-3	4-Chlorophenyl-phenylether	410	U
86-73-7	Fluorene	410	U
100-01-6	4-Nitroaniline	2000	U
534-52-1	4, 6-Dinitro-2-Methylphenol	2000	U
86-30-6	N-Nitrosodiphenylamine (1)	410	U
101-55-3	4-Bromophenyl-phenylether	410	U
118-74-1	Hexachlorobenzene	410	U
87-86-5	Pentachlorophenol	2000	U
85-01-8	Phenanthrene	1000	
120-12-7	Anthracene	160	J
84-74-2	Di-n-Butylphthalate	560	
206-44-0	Fluoranthene	3100	
129-00-0	Pyrene	2900	
85-68-7	Butylbenzylphthalate	410	U
91-94-1	3, 3'-Dichlorobenzidine	820	U
56-55-3	Benzo(a)Anthracene	2300	
117-81-7	bis(2-Ethylhexyl)Phthalate	410	U
218-01-9	Chrysene	2700	
117-84-0	Di-n-Octyl Phthalate	410	U
205-99-2	Benzo(b)Fluoranthene	3400	
207-08-9	Benzo(k)Fluoranthene	410	U
50-32-8	Benzo(a)Pyrene	1800	
193-39-5	Indeno(1, 2, 3-cd)Pyrene	1100	
53-70-3	Dibenz(a, h)Anthracene	360	J
191-24-2	Benzo(g, h, i)Perylene	950	

(1)-Cannot be separated from diphenylamine

Laboratory Name ECOLOGY & ENVIRONMENT INC.

Case No 6761

Sample Number
BD-463

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

CAS Number	Compound Name	Fraction	RT or Scan Number	Estimated Concentration (ug/l or [✓ ug/kg])
1.	HEXENE ISOMER	VOA	17.11	16 BJ
2.	HEXANE ISOMER	VOA	21.18	55 BJ
3.				
4.	unknown hydrocarbon	BNA	21.57	600 J
5.	unknown hydrocarbon	BNA	22.87	240 J
6.	methylphenanthrene isomer	BNA	24.01	190 J
7 10544500	molecular sulfur	BNA	25.66	480 J
8.	methyl pyrene isomer	BNA	27.84	920 J
9.	methyl pyrene isomer	BNA	28.13	460 J
10.	unknown PAH	BNA	28.39	220 J
11.	unknown PAH	BNA	29.43	380 J
12.	unknown PAH	BNA	29.82	540 J
13.	unknown PAH	BNA	30.06	440 J
14.	unknown PAH	BNA	31.75	540 J
15.	unknown PAH	BNA	34.24	2000 J
16.	unknown hydrocarbon	BNA	36.52	740 J
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Form 1, Part B

7 85

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Laboratory Name ECOLOGY & ENVIRONMENT INC.
Case No 6761

Sample Number
BD 464

Organics Analysis Data Sheet
(Page 2)

Semivolatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared: 1-22-87
Date Analyzed: 1-29-87
Conc/Dil Factor: 2
Percent Moisture (Decanted) 9

GPC Cleanup ☐Yes ☒No
Separatory Funnel Extraction ☐Yes
Continuous Liquid - Liquid Extraction ☐Yes

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
108-95-2	Phenol	360	U
111-44-4	bis(-2-Chloroethyl)Ether	360	U
95-57-8	2-Chlorophenol	360	U
541-73-1	1, 3-Dichlorobenzene	360	U
106-46-7	1, 4-Dichlorobenzene	360	U
100-51-6	Benzyl Alcohol	360	U
95-50-1	1, 2-Dichlorobenzene	360	U
95-48-7	2-Methylphenol	360	U
39638-32-9	bis(2-chloroisopropyl)Ether	360	U
106-44-5	4-Methylphenol	360	U
621-64-7	N-Nitroso-Di-n-Propylamine	360	U
67-72-1	Hexachloroethane	360	U
98-95-3	Nitrobenzene	360	U
78-59-1	Isophorone	360	U
88-75-5	2-Nitrophenol	360	U
105-67-9	2, 4-Dimethylphenol	360	U
65-85-0	Benzoic Acid	1800	U
111-91-1	bis(-2-Chloroethoxy)Methane	360	U
120-83-2	2, 4-Dichlorophenol	360	U
120-82-1	1, 2, 4-Trichlorobenzene	360	U
91-20-3	Naphthalene	99	J
106-47-8	4-Chloroaniline	360	U
87-68-3	Hexachlorobutadiene	360	U
59-50-7	4-Chloro-3-Methylphenol	360	U
91-57-6	2-Methylnaphthalene	360	U
77-47-4	Hexachlorocyclopentadiene	360	U
88-06-2	2, 4, 6-Trichlorophenol	360	U
95-95-4	2, 4, 5-Trichlorophenol	1800	U
91-58-7	2-Chloronaphthalene	360	U
88-74-4	2-Nitroaniline	1800	U
131-11-3	Dimethyl Phthalate	360	U
208-96-8	Acenaphthylene	360	U
99-09-2	3-Nitroaniline	1800	U

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
83-32-9	Acenaphthene	360	U
51-28-5	2, 4-Dinitrophenol	1800	U
100-02-7	4-Nitrophenol	1800	U
132-64-9	Dibenzofuran	360	U
121-14-2	2, 4-Dinitrotoluene	360	U
606-20-2	2, 6-Dinitrotoluene	360	U
84-66-2	Diethylphthalate	360	U
7005-72-3	4-Chlorophenyl-phenylether	360	U
86-73-7	Fluorene	360	U
100-01-6	4-Nitroaniline	1800	U
534-52-1	4, 6-Dinitro-2-Methylphenol	1800	U
86-30-6	N-Nitrosodiphenylamine (1)	360	U
101-55-3	4-Bromophenyl-phenylether	360	U
118-74-1	Hexachlorobenzene	360	U
87-86-5	Pentachlorophenol	1800	U
85-01-8	Phenanthrene	360	U
120-12-7	Anthracene	360	U
84-74-2	Di-n-Butylphthalate	600	
206-44-0	Fluoranthene	360	U
129-00-0	Pyrene	360	U
85-68-7	Butylbenzylphthalate	680	
91-94-1	3, 3'-Dichlorobenzidine	720	U
56-55-3	Benzo(a)Anthracene	360	U
117-81-7	bis(2-Ethylhexyl)Phthalate	260	J
218-01-9	Chrysene	360	U
117-84-0	Di-n-Octyl Phthalate	360	U
205-99-2	Benzo(b)Fluoranthene	360	U
207-08-9	Benzo(k)Fluoranthene	360	U
50-32-8	Benzo(a)Pyrene	360	U
193-39-5	Indeno(1, 2, 3-cd)Pyrene	360	U
53-70-3	Dibenz(a, h)Anthracene	360	U
191-24-2	Benzo(g, h, i)Perylene	360	U

(1)-Cannot be separated from diphenylamine

Laboratory Name ECOLOGY & ENVIRONMENT INC.
Case No 6761

Sample Number
BD-464

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

	CAS Number	Compound Name	Fraction	RT or Scan Number	Estimated Concentration (ug/l or [✓ ug/kg])
1.		Hexene Isomer	VOA	17.15	15 BJ
2.		Hexane Isomer	VOA	21.18	57 BJ
3.					
4.		unknown hydrocarbon	BNA	11.24	240 J
5.		unknown hydrocarbon	BNA	15.11	300 J
6.		unknown hydrocarbon	BNA	16.84	300 J
7.		unknown hydrocarbon	BNA	18.47	240 J
8.		unknown hydrocarbon	BNA	21.47	320 J
9.		unknown hydrocarbon	BNA	21.55	260 J
10.	127639	1,1'-sulfonyl bis benzene	BNA	24.42	320 J
11.	10544500	molecular sulfur	BNA	25.66	3000 J
12.	5097121	1,1'-sulfonylbis [2-methyl benzene	BNA	26.97	2100 J
13.		unknown phenol	BNA	27.31	520 J
14.		unknown phenol	BNA	27.68	5600 J
15.		unknown	BNA	28.43	300 J
16.					
17.					
18.					
19.					
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Form 1, Part B

Laboratory Name: Ecology & Environment Inc.
Case No: 6761

Sample Number
BD-465

Organics Analysis Data Sheet
(Page 2)

Semivolatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared: 1-22-87
Date Analyzed: 1-29-87
Conc/Dil Factor: 2
Percent Moisture (Decanted): 11

GPC Cleanup ☐Yes ☒No
Separatory Funnel Extraction ☐Yes
Continuous Liquid - Liquid Extraction ☐Yes

CAS Number		ug/l or [✓ ug/Kg] (Circle One)
108-95-2	Phenol	370 U
111-44-4	bis(-2-Chloroethyl)Ether	370 U
95-57-8	2-Chlorophenol	370 U
541-73-1	1,3-Dichlorobenzene	370 U
106-46-7	1,4-Dichlorobenzene	370 U
100-51-6	Benzyl Alcohol	370 U
95-50-1	1,2-Dichlorobenzene	370 U
95-48-7	2-Methylphenol	370 U
39638-32-9	bis(2-chloroisopropyl)Ether	370 U
106-44-5	4-Methylphenol	370 U
621-64-7	N-Nitroso-Di-n-Propylamine	370 U
67-72-1	Hexachloroethane	370 U
98-95-3	Nitrobenzene	370 U
78-59-1	Isophorone	370 U
88-75-5	2-Nitrophenol	370 U
105-67-9	2,4-Dimethylphenol	370 U
65-85-0	Benzoic Acid	1800 U
111-91-1	bis(-2-Chloroethoxy)Methane	370 U
120-83-2	2,4-Dichlorophenol	370 U
120-82-1	1,2,4-Trichlorobenzene	370 U
91-20-3	Naphthalene	62 J
106-47-8	4-Chloroaniline	370 U
87-68-3	Hexachlorobutadiene	370 U
59-50-7	4-Chloro-3-Methylphenol	370 U
91-57-6	2-Methylnaphthalene	370 U
77-47-4	Hexachlorocyclopentadiene	370 U
88-06-2	2,4,6-Trichlorophenol	370 U
95-95-4	2,4,5-Trichlorophenol	1800 U
91-58-7	2-Chloronaphthalene	370 U
88-74-4	2-Nitroaniline	1800 U
131-11-3	Dimethyl Phthalate	370 U
208-96-8	Acenaphthylene	370 U
99-09-2	3-Nitroaniline	1800 U

CAS Number		ug/l or [✓ ug/Kg] (Circle One)
83-32-9	Acenaphthene	370 U
51-28-5	2,4-Dinitrophenol	1800 U
100-02-7	4-Nitrophenol	1800 U
132-64-9	Dibenzofuran	370 U
121-14-2	2,4-Dinitrotoluene	370 U
606-20-2	2,6-Dinitrotoluene	370 U
84-66-2	Diethylphthalate	370 U
7005-72-3	4-Chlorophenyl-phenylether	370 U
86-73-7	Fluorene	370 U
100-01-6	4-Nitroaniline	1800 U
534-52-1	4,6-Dinitro-2-Methylphenol	1800 U
86-30-6	N-Nitrosodiphenylamine (1)	370 U
101-55-3	4-Bromophenyl-phenylether	370 U
118-74-1	Hexachlorobenzene	370 U
87-86-5	Pentachlorophenol	1800 U
85-01-8	Phenanthrene	370 U
120-12-7	Anthracene	370 U
84-74-2	Di-n-Butylphthalate	780
206-44-0	Fluoranthene	370 U
129-00-0	Pyrene	370 U
85-68-7	Butylbenzylphthalate	370 U
91-94-1	3,3'-Dichlorobenzidine	740 U
56-55-3	Benzo(a)Anthracene	370 U
117-81-7	bis(2-Ethylhexyl)Phthalate	370 U
218-01-9	Chrysene	370 U
117-84-0	Di-n-Octyl Phthalate	370 U
205-99-2	Benzo(b)Fluoranthene	370 U
207-08-9	Benzo(k)Fluoranthene	370 U
50-32-8	Benzo(a)Pyrene	370 U
193-39-5	Indeno(1,2,3-cd)Pyrene	370 U
53-70-3	Dibenz(a,h)Anthracene	370 U
191-24-2	Benzo(g,h,i)Perylene	370 U

(1)-Cannot be separated from diphenylamine

Form I

7/85

594

Laboratory Name ECOLOGY & ENVIRONMENT INC.

Case No 6761

Sample Number
BD-465

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

CAS Number	Compound Name	Fraction	[✓ RT] or Scan Number	Estimated Concentration (ug/l or [✓ ug/kg])
1.	HEXENE ISOMER	VOA	17.07	15 BJ
2.	HEXANE ISOMER	VOA	21.14	60 BJ
3.				
4.	unknown hydrocarbon	BNA	21.57	280 J
5.	unknown hydrocarbon	BNA	33.00	780 J
6.	unknown hydrocarbon	BNA	34.81	1500 J
7	unknown hydrocarbon	BNA	36.52	1300 J
8.				
9.				
10.				
11.				
12.				
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Form 1, Part B

7/85

Laboratory Name: Ecology & Environment Inc.
Case No: 6761

Sample Number
BI-458

Organics Analysis Data Sheet
(Page 2)

Semivolatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared: 1-22-87
Date Analyzed: 1-26-87
Conc./Dil Factor: 2
Percent Moisture (Decanted) 18

GPC Cleanup ☐Yes ☒No
Separatory Funnel Extraction ☐Yes
Continuous Liquid - Liquid Extraction ☐Yes

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
108-95-2	Phenol	2200	
111-44-4	bis(-2-Chloroethyl)Ether	400	U
95-57-8	2-Chlorophenol	400	U
541-73-1	1, 3-Dichlorobenzene	400	U
106-46-7	1, 4-Dichlorobenzene	400	U
100-51-6	Benzyl Alcohol	400	U
95-50-1	1, 2-Dichlorobenzene	400	U
95-48-7	2-Methylphenol	400	U
39638-32-9	bis(2-chloroisopropyl)Ether	400	U
106-44-5	4-Methylphenol	160	J
621-64-7	N-Nitroso-Di-n-Propylamine	400	U
67-72-1	Hexachloroethane	400	U
98-95-3	Nitrobenzene	400	U
78-59-1	Isophorone	400	U
88-75-5	2-Nitrophenol	400	U
105-67-9	2, 4-Dimethylphenol	400	U
65-85-0	Benzoic Acid	2000	U
111-91-1	bis(-2-Chloroethoxy)Methane	400	U
120-83-2	2, 4-Dichlorophenol	400	U
120-82-1	1, 2, 4-Trichlorobenzene	400	U
91-20-3	Naphthalene	400	U
106-47-8	4-Chloroaniline	400	U
87-68-3	Hexachlorobutadiene	400	U
59-50-7	4-Chloro-3-Methylphenol	400	U
91-57-6	2-Methylnaphthalene	47	J
77-47-4	Hexachlorocyclopentadiene	400	U
88-06-2	2, 4, 6-Trichlorophenol	400	U
95-95-4	2, 4, 5-Trichlorophenol	2000	U
91-58-7	2-Chloronaphthalene	400	U
88-74-4	2-Nitroaniline	2000	U
131-11-3	Dimethyl Phthalate	400	U
208-96-8	Acenaphthylene	400	U
99-09-2	3-Nitroaniline	2000	U

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
83-32-9	Acenaphthene	400	U
51-28-5	2, 4-Dinitrophenol	2000	U
100-02-7	4-Nitrophenol	2000	U
132-64-9	Dibenzofuran	400	U
121-14-2	2, 4-Dinitrotoluene	400	U
606-20-2	2, 6-Dinitrotoluene	400	U
84-66-2	Diethylphthalate	400	U
7005-72-3	4-Chlorophenyl-phenylether	400	U
86-73-7	Fluorene	400	U
100-01-6	4-Nitroaniline	2000	U
534-52-1	4, 6-Dinitro-2-Methylphenol	2000	U
86-30-6	N-Nitrosodiphenylamine (1)	400	U
101-55-3	4-Bromophenyl-phenylether	400	U
118-74-1	Hexachlorobenzene	400	U
87-86-5	Pentachlorophenol	2000	U
85-01-8	Phenanthrene	430	
120-12-7	Anthracene	400	U
84-74-2	Di-n-Butylphthalate	400	U
206-44-0	Fluoranthene	510	
129-00-0	Pyrene	680	
85-68-7	Butylbenzylphthalate	400	U
91-94-1	3, 3'-Dichlorobenzidine	800	U
56-55-3	Benzo(a)Anthracene	380	J
117-81-7	bis(2-Ethylhexyl)Phthalate	400	U
218-01-9	Chrysene	450	
117-84-0	Di-n-Octyl Phthalate	400	U
205-99-2	Benzo(b)Fluoranthene	790	
207-08-9	Benzo(k)Fluoranthene	400	U
50-32-8	Benzo(a)Pyrene	410	
193-39-5	Indeno(1, 2, 3-cd)Pyrene	360	J
53-70-3	Dibenz(a, h)Anthracene	400	U
191-24-2	Benzo(g, h, i)Perylene	320	J

Laboratory Name ECOLOGY & ENVIRONMENT INC.

Case No 6761

Sample Number
BI-458

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

	CAS Number	Compound Name	Fraction	RT or Scan Number	Estimated Concentration (ug/l or [✓ ug/kg])
1.		HEXENE ISOMER	VOA	17.23	27 BJ
2.		HEXANE ISOMER	VOA	21.30	100 BJ
3.					
4.	90028	2-Hydroxy-benzaldehyde	BNA	9.82	760 J
5.		Unknown hydrocarbon	↓	18.54	340 J
6.		Unknown hydrocarbon		20.08	360 J
7.		Unknown hydrocarbon		21.55	740 J
8.		Unknown hydrocarbon		21.63	680 J
9.		Unknown		22.98	1100 J
10.		Unknown hydrocarbon		24.28	310 J
11.	2467029	2,2' Methylene bis phenol		25.55	540 J
12.		Unknown hydrocarbon		26.56	1900 J
13.					
14.					
15.					
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Sample Number
BI-543

.Organics Analysis Data Sheet
(Page 1)

aboratory Name: Ecology & Environment Inc.
Case No: 6761
ab Sample ID No: 613
QC Report No:
ample Matrix: SOIL
Contract No: 68-01-7158
ata Release Authorized By:
Date Sample Received: 1-21-87

Volatile Compounds

Concentration: Low [✓ Medium] (Circle One)
Date Extracted/Prepared:
Date Analyzed: 1-29-87
Conc/Dil Factor: 2 pH 7.7
Percent Moisture: (Not Decanted) 12

CAS Number		ug/l or [✓ ug/Kg] (Circle One)	
74-87-3	Chloromethane	2300	U
74-83-9	Bromomethane	2300	U
'5-01-4	Vinyl Chloride	2300	U
'5-00-3	Chloroethane	2300	U
'5-09-2	Methylene Chloride	720	BJ
57-64-1	Acetone	3700	B
'5-15-0	Carbon Disulfide	1100	U
'5-35-4	1, 1-Dichloroethene	1100	U
'5-34-3	1, 1-Dichloroethane	1100	U
56-60-5	Trans-1, 2-Dichloroethene	1100	U
7-66-3	Chloroform	1100	U
07-06-2	1, 2-Dichloroethane	1100	U
8-93-3	2-Butanone	8600	B
1-55-6	1, 1, 1-Trichloroethane	1100	U
6-23-5	Carbon Tetrachloride	1100	U
08-05-4	Vinyl Acetate	2300	U
5-27-4	Bromodichloromethane	1100	U

CAS Number		ug/l or [✓ ug/Kg] (Circle One	
78-87-5	1, 2-Dichloropropane	1100	U
10061-02-6	Trans-1, 3-Dichloropropene	1100	U
79-01-6	Trichloroethene	1100	U
124-48-1	Dibromochloromethane	1100	U
79-00-5	1, 1, 2-Trichloroethane	1100	U
71-43-2	Benzene	1100	U
10061-01-5	cis-1, 3-Dichloropropene	1100	U
110-75-8	2-Chloroethylvinylether	2300	U
75-25-2	Bromoform	1100	U
108-10-1	4-Methyl-2-Pentanone	2300	U
591-78-6	2-Hexanone	2300	U
127-18-4	Tetrachloroethene	1100	U
79-34-5	1, 1, 2, 2-Tetrachloroethane	1100	U
108-88-3	Toluene	550	J
108-90-7	Chlorobenzene	1100	U
100-41-4	Ethylbenzene	1100	
100-42-5	Styrene	1100	U
	Total Xylenes	18,000	

Data Reporting Qualifiers

For reporting results to EPA, the following results qualifiers are used Additional flags or footnotes explaining results are encouraged However, the definition of each flag must be explicit.

lue	If the result is a value greater than or equal to the detection limit, report the value
J	Indicates compound was analyzed for but not detected Report the minimum detection limit for the sample with the U (e g , 10U) based on necessary concentration - dilution action (This is not necessarily the instrument detection limit) The footnote should read U-Compound was analyzed for but not detected The number is the minimum attainable detection limit for the sample
I	Indicates an estimated value This flag is used either when
C	This flag applies to pesticide parameters where the identification has been confirmed by GC MS Single component pesticides ≥10 ng ul in the final extract should be confirmed by GC MS
B	This flag is used when the analyte is found in the blank as well as a sample It indicates possible - probable blank contamination and warns the data user to take appropriate action
Other	Other specific flags and footnotes may be required to properly define the results If used, they must be fully described and such description attached to the data summary report

oratory Name ECOLOGY & ENVIRONMENT INC.
e No 6761

Sample Number BI-543

Organics Analysis Data Sheet
(Page 2)

Semivolatile Compounds

entration: [✓ Low] Medium (Circle One)
e Extracted/Prepared: 1-22-87
Analyzed: 1-29-87
nc/Dil Factor: 20
ent Moisture (Decanted) 12

GPC Cleanup ☐Yes ☒No
Separatory Funnel Extraction ☐Yes
Continuous Liquid - Liquid Extraction ☐Yes

S nber		ug/l or [✓ ug/Kg] (Circle One)
-95-2	Phenol	7500 U
1-44-4	bis(-2-Chloroethyl)Ether	7500 U
57-8	2-Chlorophenol	7500 U
-73-1	1, 3-Dichlorobenzene	7500 U
6-46-7	1, 4-Dichlorobenzene	7500 U
-51-6	Benzyl Alcohol	7500 U
-50-1	1, 2-Dichlorobenzene	7500 U
48-7	2-Methylphenol	7500 U
38-32-9	bis(2-chloroisopropyl)Ether	7500 U
6-44-5	4-Methylphenol	7500 U
-64-7	N-Nitroso-Di-n-Propylamine	7500 U
72-1	Hexachloroethane	7500 U
-95-3	Nitrobenzene	7500 U
59-1	Isophorone	7500 U
-75-5	2-Nitrophenol	7500 U
5-67-9	2, 4-Dimethylphenol	7500 U
35-0	Benzoic Acid	36000 U
1-91-1	bis(-2-Chloroethoxy)Methane	7500 U
-83-2	2, 4-Dichlorophenol	7500 U
-82-1	1, 2, 4-Trichlorobenzene	7500 U
-20-3	Naphthalene	98000
-47-8	4-Chloroaniline	7500 U
68-3	Hexachlorobutadiene	7500 U
-50-7	4-Chloro-3-Methylphenol	7500 U
57-6	2-Methylnaphthalene	12000
7-4	Hexachlorocyclopentadiene	7500 U
-06-2	2, 4, 6-Trichlorophenol	7500 U
35-4	2, 4, 5-Trichlorophenol	36000 U
-58-7	2-Chloronaphthalene	7500 U
-74-4	2-Nitroaniline	36000 U
-11-3	Dimethyl Phthalate	7500 U
8-96-8	Acenaphthylene	7500 U
-09-2	3-Nitroaniline	36000 U

CAS Number		ug/l or [✓ ug/Kg] (Circle One)
83-32-9	Acenaphthene	7500 U
51-28-5	2, 4-Dinitrophenol	36000 U
100-02-7	4-Nitrophenol	36000 U
132-64-9	Dibenzofuran	7500 U
121-14-2	2, 4-Dinitrotoluene	7500 U
606-20-2	2, 6-Dinitrotoluene	7500 U
84-66-2	Diethylphthalate	7500 U
7005-72-3	4-Chlorophenyl-phenylether	7500 U
86-73-7	Fluorene	7500 U
100-01-6	4-Nitroaniline	36000 U
534-52-1	4, 6-Dinitro-2-Methylphenol	36000 U
86-30-6	N-Nitrosodiphenylamine (1)	7500 U
101-55-3	4-Bromophenyl-phenylether	7500 U
118-74-1	Hexachlorobenzene	7500 U
87-86-5	Pentachlorophenol	36000 U
85-01-8	Phenanthrene	7500 U
120-12-7	Anthracene	7500 U
84-74-2	Di-n-Butylphthalate	7500 U
206-44-0	Fluoranthene	7500 U
129-00-0	Pyrene	7500 U
85-68-7	Butylbenzylphthalate	7500 U
91-94-1	3, 3'-Dichlorobenzidine	15000 U
56-55-3	Benzo(a)Anthracene	7500 U
117-81-7	bis(2-Ethylhexyl)Phthalate	7500 U
218-01-9	Chrysene	7500 U
117-84-0	Di-n-Octyl Phthalate	7500 U
205-99-2	Benzo(b)Fluoranthene	7500 U
207-08-9	Benzo(k)Fluoranthene	7500 U
50-32-8	Benzo(a)Pyrene	7500 U
193-39-5	Indeno(1, 2, 3-cd)Pyrene	7500 U
53-70-3	Dibenz(a, h)Anthracene	7500 U
191-24-2	Benzo(g, h, i)Perylene	7500 U

Laboratory Name Ecology & Environment, Inc
Case No 6761

Sample Number
BI-543

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

	CAS Number	Compound Name	Fraction	RT or Scan Number min	Estimated Concentration (ug/l or [✓ ug/kg])
1.		Hexene isomer	VOA	21.11	11,000BJ
2.		Unknown hydrocarbon		28.54	17,000 J
3.		Unknown hydrocarbon		28.81	10,000 J
4.		Unknown hydrocarbon		30.09	11,000 J
5.		Unknown hydrocarbon		33.31	41,000 J
6.		Unknown hydrocarbon		35.37	28,000 J
7.		Unknown hydrocarbon		36.11	16,000 J
8.		Ethylmethyl benzene isomer		40.04	150,000 J
9.		Ethylmethyl benzene isomer		41.47	120,000 J
10.		Unknown aromatic		43.92	38,000 J
11.					
12.		Ethyldimethylbenzene isomer	BNA	11.46	64000 J
13.		Ethyl dimethylbenzene isomer		11.56	100,000 J
14.		Unknown aromatic		12.11	54,000 J
15.		Ethyldimethyl benzene isomer		12.20	36,000 J
16.		Unknown hydrocarbon		13.26	22,000 J
17.					
18.					
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REFERENCE NO. 15

The National Register of Historic Places

1976

New York. *LAGRANGE TERRACE*, 428–434 Lafayette St., (12-12-76)
New York. *LIGHTHOUSE*, Welfare Island, (3-16-72) PH0030694
New York. *MACY, R. H., AND COMPANY STORE*, 151 W. 34th St., (6-2-78) NHL.
New York. *MADISON AVENUE FACADE OF THE SQUADRON A ARMORY*, Madison Ave. between 94th and 95th Sts., (3-24-72) PH0030708
New York. *METROPOLITAN LIFE INSURANCE COMPANY*, 1 Madison Ave., (6-2-78) NHL.
New York. *METROPOLITAN SAVINGS BANK (FIRST UKRAINIAN ASSEMBLY OF GOD)*, 9 E. 7th St., (12-12-76)
New York. *MILLS, FLORENCE, HOUSE*, 220 W. 135th St., (12-8-76) NHL.
New York. *MOONEY, EDWARD, HOUSE*, 18 Bowery, (12-12-76)
New York. *MOORE, WILLIAM H., HOUSE*, 4 E. 54th St., (3-16-72) PH0030716
New York. *MORGAN, PIERPONT, LIBRARY*, 33 E. 36th St., (11-13-66) PH0131903 NHL; G.
New York. *MORRIS-JUMEL MANSION*, 160th St. and Edgecombe Ave., (10-15-66) PH0132713 NHL; HABS.
New York. *MORRIS, LEWIS G., HOUSE*, 100 E. 85th St., (2-12-77)
New York. *MOUNT MORRIS PARK HISTORIC DISTRICT*, Bounded roughly by Lenox Ave., Mount Morris Park West, and W. 124th and W. 119th Sts., (2-6-73) PH0030724
New York. *MUNICIPAL BUILDING*, Chambers at Centre St., (10-18-72)
New York. *MUNICIPAL FERRY PIER*, 11 South St., (12-12-76) HAER.
New York. *NATIONAL CITY BANK*, 55 Wall St., (6-2-78) NHL.
New York. *NEW YORK AMSTERDAM NEWS BUILDING*, 2293 7th Ave., (5-11-76)
New York. *NEW YORK CANCER HOSPITAL*, 2 W. 106th St., (4-29-77)
New York. *NEW YORK COTTON EXCHANGE*, 1 Hanover Sq., (12-22-77) NHL.
New York. *NEW YORK LIFE BUILDING*, 51 Madison Ave., (6-2-78) NHL.
New York. *NEW YORK PUBLIC LIBRARY*, 5th Ave. and 42nd St., (10-15-66) PH0132675 NHL.
New York. *NEW YORK SHAKESPEARE FESTIVAL PUBLIC THEATER (ASTOR THEATER)*, 425 Lafayette St., (12-2-70) PH0030767 G.
New York. *NEW YORK STOCK EXCHANGE*, 11 Wall St., (6-2-78) NHL.
New York. *OCTAGON, THE*, Welfare Island, (3-16-72) PH0030791
New York. *OLD MERCHANT'S HOUSE (SEABURY TREDWELL HOUSE)*, 29 E. 4th St., (10-15-66) PH0132683 NHL; HABS; G.
New York. *OLD NEW YORK EVENING POST BUILDING*, 20 Vessy St., (8-16-77)
New York. *OLD ST. PATRICK'S CATHEDRAL COMPLEX*, Mott and Prince Sts., (8-29-77)
New York. *PLAYERS, THE*, 16 Gramercy Park, (10-15-66) PH0131911 NHL.
New York. *PLAZA HOTEL AND GRAND ARMY HOTEL*, 5th Ave. and 59th St., (11-29-78)
New York. *QUEENSBORO BRIDGE*, 59th St. (also in Queens County), (12-20-78)
New York. *RADIO CITY MUSIC HALL*, 1260 Avenue of the Americas, (5-8-78)
New York. *ROBESON, PAUL, HOME*, 555 Edgecombe Ave., (12-8-76) NHL.
New York. *SALMAGUNDI CLUB*, 47 5th Ave., (7-25-74) PH0030821
New York. *SCHERMERHORN ROW BLOCK (NEW YORK STATE MARITIME MUSEUM BLOCK)*, Block bounded by Front, Fulton, and South Sts., and Burling Slip, (2-18-71)
New York. *SCHOMBURG CENTER FOR RESEARCH IN BLACK CULTURE*, 103 W. 135th St., (9-21-78)
New York. *SCOTT, GEN. WINFIELD, HOUSE*, 24 W. 12th St., (11-7-73) PH0132411 NHL.
New York. *SEVENTH REGIMENT ARMORY*, 643 Park Ave., (4-14-75)
New York. *SINCLAIR, HARRY F., HOUSE*, 2 E. 79th St., (6-2-78) NHL.
New York. *SMALLPOX HOSPITAL*, Welfare Island, (3-16-72) PH0030830
New York. *SMITH, ABIGAIL ADAMS, HOUSE (STABLE)*, 421 E. 61st St., (1-12-73) PH0030848 G.
New York. *SMITH, ALFRED E., HOUSE*, 25 Oliver St., (11-28-72) PH0030856 NHL.
New York. *SNIFFEN COURT HISTORIC DISTRICT*, E. 36th St., between Lexington and 3rd Aves., (11-28-73) PH0030864
New York. *SOHO HISTORIC DISTRICT*, Roughly bounded by W. Broadway, Houston, Crosby, and Canal Sts., (6-29-78) NHL.
New York. *SOUTH STREET SEAPORT*, Bounded by Burling (John St.) and Peck Slips, and Water and South Sts., (10-18-72) PH0030872
New York. *SOUTH STREET SEAPORT HISTORIC DISTRICT (EXPANSION)*, Roughly bounded by East River, Brooklyn Bridge, Fletcher Alley, Pearl, and South Sts., (12-12-78)
New York. *ST. GEORGE'S EPISCOPAL CHURCH*, 3rd Ave. and E 16th St., (12-8-76) NHL.
New York. *ST. JAMES CHURCH*, 32 James St., (7-24-72) PH0030805
New York. *ST. MARK'S HISTORIC DISTRICT*, Roughly bounded by 2nd and 3rd Aves. and E. 9th and 11th Sts., (11-13-74) PH0031763
New York. *ST.-MARKS-IN-THE-BOWERY*, E. 10th St. and 2nd Ave., (6-19-72) PH0030813 HABS; G.
New York. *ST. NICHOLAS HISTORIC DISTRICT*, W. 138th and W. 139th Sts. (both sides) between 7th and 8th Aves., (10-29-75)
New York. *ST. PATRICK'S CATHEDRAL*, Bounded by 5th and Madison Aves., E 50th and E 51st Sts., (12-8-76) NHL.
New York. *ST. PAUL'S CHAPEL*, Broadway between Fulton and Vesey Sts., (10-15-66) PH0131920 NHL; HABS.
New York. *STATUE OF LIBERTY NATIONAL MONUMENT*, Liberty Island, New York Harbor, (10-15-66) (also in Hudson County, NJ)
New York. *STEWART, A. T., COMPANY STORE*, 280 Broadway, (6-2-78) NHL.
New York. *STRECKER MEMORIAL LABORATORY*, Welfare Island, (3-16-72) PH0030881
New York. *STUYVESANT-FISH HOUSE*, 21 Stuyvesant St., (7-31-72) PH0030899
New York. *SURROGATES' COURT (HALL OF RECORDS)*, 31 Chambers St., (1-29-72) PH0030902 NHL.
New York. *THEODORE ROOSEVELT BIRTHPLACE NATIONAL HISTORIC SITE*, 28 E. 20th St., (10-15-66)
New York. *THIRD JUDICIAL DISTRICT COURTHOUSE*, 6th Ave. and 10th St., (12-22-77) NHL.
New York. *TIFFANY AND COMPANY BUILDING*, 401 5th Ave., (6-2-78) NHL.
New York. *TILDEN, SAMUEL J., HOUSE*, 14–15 Gramercy Park South, (5-11-76)
New York. *TRINITY CHURCH AND GRAVEYARD*, Broadway and Wall St., (12-8-76) NHL.
New York. *TWEED COURTHOUSE (OLD NEW YORK COUNTY COURTHOUSE)*, 52 Chambers St., (9-25-74) PH0030911 NHL.
New York. *U.S. CUSTOMHOUSE*, Bowling Green, (1-31-72) PH0030929 NHL.
New York. *U.S. GENERAL POST OFFICE*, 8th Ave. between 31st and 33rd Sts., (1-29-72) PH0030937
New York. *VILLARD HOUSES*, 29 1/2 E. 50th St., 24–26 E. 51st St., and 451, 453, 455, and 457 Madison Ave., (9-2-75)
New York. *WATSON, JAMES, HOUSE (MISSION OF OUR LADY OF THE ROSARY)*, 7 State St., (7-24-72) PH0030945
New York. *WAVERTREE, PIER 17*, Foot of Fulton St., (6-13-78)
New York. *WOOLWORTH BUILDING*, 233 Broadway, (11-13-66) PH0132578 NHL.
New York. *YMCA BUILDING (CLAUDE MCKAY APARTMENT)*, 180 W 135th St., (12-8-76) NHL.
New York. *75 MURRAY STREET BUILDING NO. 75*, 75 Murray St., (4-3-73) PH0030759
New York City. *APTHORP APARTMENTS*, 2201–2219 Broadway, (1-30-78)
New York City. *HENRY STREET SETTLEMENT AND NEIGHBORHOOD PLAYHOUSE*, 263–267 Henry St. and 466 Grand St., (9-13-74) NHL.

niagara county

Lewiston. *FRONTIER HOUSE*, 460 Center St., (7-8-74) PH0040118
Lewiston. *LEWISTON MOUND*, Lewiston State Park, (1-21-74) PH0040126
Lewiston vicinity. *LEWISTON PORTAGE LANDING SITE*, (7-18-74) PH0040134
Lockport. *LOCKPORT INDUSTRIAL DISTRICT*, Bounded roughly by Erie Canal, Gooding, Clinton, and Water Sts., (11-11-75)
Lockport. *LOWERTOWN HISTORIC DISTRICT*, Roughly bounded by Erie Canal and New York Central RR., (6-4-73) PH0040142 HABS; G.
Lockport. *MOORE, BENJAMIN C., MILL (LOCKPORT CITY HALL; HOLLY WATER WORKS)*, Pine St. on the Erie Canal, (6-19-73) PH0040151 G.
Lockport. *UNION STATION*, 95 Union Ave., (12-2-77)
Niagara Falls. *ADAMS POWER PLANT TRANSFORMER HOUSE*, Buffalo Ave. near Portage Rd., (6-11-75)
Niagara Falls. *DEVEAUX SCHOOL COMPLEX*, 2900 Lewiston Rd., (6-5-74) PH0040100
Niagara Falls. *NIAGARA FALLS PUBLIC LIBRARY*, 1022 Main St., (6-5-74) PH0040169
Niagara Falls. *NIAGARA RESERVATION*, (10-15-66) PH0132420 NHL.
Niagara Falls. *U.S. CUSTOMHOUSE*, 2245 Whirlpool St., (7-16-73) PH0040177 HABS.
Niagara Falls. *WHITNEY MANSION*, 335 Buffalo Ave., (1-17-74) PH0040185
Youngstown vicinity. *OLD FORT NIAGARA*, N of Youngstown on NY 18, (10-15-66) PH0132438 NHL.

REFERENCE NO. 16

ecology and environment, inc.

195 SUGG ROAD, P.O. BOX D, BUFFALO, NEW YORK 14225, TEL. 716-632-4491, TELEX 91-9183

International Specialists in the Environment

RECEIVED
OCT 01 1987

September 28, 1987

Mr. John Burmaster
Niagara County Water Department
7227 Williams Road
Niagara Falls, New York 14304

Dear Mr. Burmaster:

Ecology and Environment, Inc. has been contracted by the New York State Department of Environmental Conservation to conduct Phase I investigations on several potential hazardous waste sites in Niagara County. A culmination of each investigation is a Phase I report, including a Hazard Ranking Score (HRS) for each site. Part of the report concerns information regarding water usage in the county the sites are located.

Information that I have gathered indicates that:

- o The Niagara County water intake is located between Buckhorn Island State Park and Navy Island and draws primarily water from the Chippawa Channel of the Niagara River.

The City of Niagara Falls has two intakes:

- o One located in the east branch of the Niagara River. This intake is not in use due to closure by the New York State Department of Health after detection of contamination.
- o The second intake is located between Navy Island and Buckhorn Island State Park and draws from the west (Chippawa) Channel of the Niagara River. This is the smaller of the two intakes.

The DEC requires that all information contained in the report be fully documented. I would like to request that you review the information, make any changes necessary, and sign this letter to acknowledge that you are in agreement with the information.

I certify that the above information is correct to the best of my knowledge.

Signature ______________________ Date ______________

I can only attest to the location of the Niagara County Water District's intakes, I have no factual knowledge of the City of Niagara Falls facilities

John W. Burmaster
10/2/87

ecology and environment, inc.
BUFFALO CORPORATE CENTER
368 PLEASANTVIEW DRIVE, LANCASTER, NEW YORK 14086, TEL. 716/684-8060
International Specialists in the Environment

November 17, 1988

Mr. Joe Agnell
Niagara Falls Water Plant
53 Buffalo Avenue
Niagara Falls, New York 14302

Dear Mr. Agnell:

Ecology and Environment, Inc., (E & E) has been contracted by the New York State Department of Environmental Conservation (NYSDEC) to conduct Phase I investigations on several potential hazardous waste sites in Niagara County. As part of the report, E & E must locate water intakes. Based on our telephone conversation, you informed me that the City of Niagara Falls has two intakes:

- One located in the ~~east~~ west branch of the Niagara River. This intake is not in use due to closure by the New York State Department of Health after detection of contamination.
- The second intake is located between Niagara Falls and Grand Island and draws from the ~~west~~ east channel of the Niagara River. This is the smaller of the two intakes and was formerly used as the emergency intake.

The NYSDEC requires that all information contained in the report be fully documented. I would like to request that you review the information, make any changes necessary, and sign this letter to acknowledge that you are in agreement with the information.

I certify that the above information is correct to the best of my knowledge.

Joseph C. Agnello
Signature
See corrections above

11/18/88
Date

Thank you for your prompt attention to this matter. If you have any questions, please call me at (716) 684-8060.

Sincerely,
Peggy Farrell
Margaret J. Farrell
Project Manager

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION

01 State	02 Site Number
NY	932012

II. SITE NAME AND LOCATION

01 Site Name (Legal, common, or descriptive name of site)	02 Street, Route No., or Specific Location Identifier
Dussault Foundry	2 Washburn St.

03 City	04 State	05 Zip Code	06 County	07 County Code	08 Cong. Dist.
Lockport	NY	14094	Niagara		

09 Coordinates

Latitude 43° 10' 26"

Longitude 78° 41' 12"

10 Type of Ownership (Check one)

[X] A. Private [ ] B. Federal ______ [ ] C. State [ ] D. County

[ ] E. Municipal [ ] F. Other ______ [ ] G. Unknown

III. INSPECTION INFORMATION

01 Date of Inspection

6 / 4 / 87

Month Day Year

02 Site Status

[ ] Active

[X] Inactive

03 Years of Operation

1914 | 1986 [ ] Unknown

Beginning Year Ending Year

04 Agency Performing Inspection (Check all that apply)

[ ] A. EPA [ ] B. EPA Contractor ______ (Name of Firm) [ ] C. Municipal [ ] D. Municipal Contractor ______ (Name of Firm)

[ ] E. State [X] F. State Contractor E & E* (Name of Firm) [ ] G. Other ______ (Specify)

05 Chief Inspector	06 Title	07 Organization	08 Telephone No.
Dennis Sutton	Geologist, team leader	E & E	(716) 633-9881

09 Other Inspectors	10 Title	11 Organization	12 Telephone No.
Jon Nickerson	Geologist, site safety	E & E	(716) 633-9881
			( )
			( )
			( )
			( )

13 Site Representatives Interviewed	14 Title	15 Address	16 Telephone No.
James W. Maxwell	President	2 Washburn St.	(716) 433-3851
			( )
			( )
			( )
			( )

17 Access Gained By (Check one)	18 Time of Inspection	19 Weather Conditions
[X] Permission [ ] Warrant	0900	Clear, sunny and warm, wind 0-5 mph

IV. INFORMATION AVAILABLE FROM

01 Contact	02 Of (Agency/Organization)	03 Telephone No.
Walter E. Demick	NYSDEC	(518) 457-9538

04 Person Responsible for Site Inspection Form	05 Agency	06 Organization	07 Telephone No.	08 Date
Mike Hanchak		E & E	(716) 633-9881	6 / 10 / 87 Month Day Year

EPA Form 2070-13 (7-81)

*Ecology and Environment, Inc.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 State NY	02 Site Number 932012

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 Physical States (Check all that apply)

☒ A. Solid
☒ B. Powder, Fines
☐ C. Sludge
☐ D. Other ______ (Specify)
☐ E. Slurry
☒ F. Liquid
☐ G. Gas

02 Waste Quantity at Site (Measure of waste quantities must be independent)

Tons ______
Cubic Yards Approx. 10,000
No. of Drums Approx. 75

03 Waste Characteristics (Check all that apply)

☒ A. Toxic
☒ B. Corrosive
☐ C. Radioactive
☐ D. Persistent
☐ E. Soluble
☐ F. Infectious
☐ G. Flammable
☐ H. Ignitable
☐ I. Highly volatile
☐ J. Explosive
☐ K. Reactive
☐ L. Incompatible
☐ M. Not applicable

III. WASTE TYPE

Category	Substance Name	01 Gross Amount	02 Unit of Measure	03 Comments
SLU	Sludge			Foundry sand (approximately 10,000 cubic yds.) presently landfilled on site Contains phenols and heavy metals; drum piles noted on site, labels not visible. Approximately 75 drums, kerosene stored in 250 gallon above-ground tank, soil nearby is visibly stained.
OLW	Oily waste			
SOL	Solvents			
PSD	Pesticides			
OCC	Other organic chemicals			
IOC	Inorganic chemicals			
ACD	Acids			
BAS	Bases			
MES	Heavy Metals	Unknown		

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 Category	02 Substance Name	03 CAS Number	04 Storage/Disposal Method	05 Concentration	06 Measure of Concentration
	Phenolic binders		Landfill	1	%
	Unknown		75 drums		
	Kerosene		250 gal tank		
	Paints and Thinners				
	Propane		Storage tanks		

V. FEEDSTOCKS (See Appendix for CAS Numbers)

Category	01 Feedstock Name	02 CAS Number	Category	01 Feedstock Name	02 CAS Number
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Advanced Environmental Systems - sampling analysis
DEC official records
Niagara County Department of Health Official Records
EPA Official Records

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 State NY	02 Site Number 932012

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 [X] A. Groundwater Contamination — 02 [ ] Observed (Date) [X] Potential [ ] Alleged
03 Population Potentially Affected Unknown — 04 Narrative Description:

Potential for groundwater contamination may exist. Landfill is unlined and surface runoff may enter groundwater system. There are no known wells in the area.

01 [X] B. Surface Water Contamination — 02 [ ] Observed (Date) [X] Potential [ ] Alleged
03 Population Potentially Affected Unknown — 04 Narrative Description:

Potential for surface water contamination exists. Landfill is not capped and runoff may enter nearby Erie Canal.

01 [X] C. Contamination of Air — 02 [X] Observed (Date 6-4-87) [ ] Potential [ ] Alleged
03 Population Potentially Affected Unknown — 04 Narrative Description:

Contamination of air detected on PID on day of inspection. Ambient levels read at 1.2 ppm and 0.6 ppm above off-site background at two different times and locations. No readings reported from waste pile. A reading of 55 ppm was recorded near the kerosene storage tank.

01 [X] D. Fire/Explosive Conditions — 02 [ ] Observed (Date) [X] Potential [ ] Alleged
03 Population Potentially Affected Unknown — 04 Narrative Description:

Potential appears to be high, drums of unknown material noted throughout site. Paint containers and hydrocarbon spills noted on site.

01 [X] E. Direct Contact — 02 [ ] Observed (Date) [X] Potential [ ] Alleged
03 Population Potentially Affected Unknown — 04 Narrative Description:

Site is not fenced, potential for direct contact is high for foundry workers, and access to site is unrestricted. Waste is not covered.

01 [X] F. Contamination of Soil — 02 [ ] Observed (Date 6/4/87) [ ] Potential [ ] Alleged
03 Area Potentially Affected 5 (Acres) — 04 Narrative Description:

Disposal area is not lined, foundry sand and drums are in direct contact with the soil. Foundry sand is evident over almost the entire facility grounds.

01 [ ] G. Drinking Water Contamination — 02 [ ] Observed (Date) [ ] Potential [ ] Alleged
03 Population Potentially Affected — 04 Narrative Description:

None

01 [X] H. Worker Exposure/Injury — 02 [ ] Observed (Date) [X] Potential [ ] Alleged
03 Workers Potentially Affected Unknown — 04 Narrative Description:

Potential for worker exposure is great, sand covers a large area on site where workers walk, no protective clothing or respirators were observed being worn on date of inspection.

01 [X] I. Population Exposure/Injury — 02 [ ] Observed (Date) [X] Potential [ ] Alleged
03 Population Potentially Affected Unknown — 04 Narrative Description:

Potential for population exposure exists, site is not fenced and waste is not covered.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 State NY	02 Site Number 932012

II. HAZARDOUS CONDITIONS AND INCIDENTS (Cont.)

01 [X] J. Damage to Flora 02 [X] Observed (Date 6/4/87) [ ] Potential [ ] Alleged
04 Narrative Description:

Damage to flora is evident where sand is landfilled, sand covers vegetation and no vegetation was noted in this area.

01 [X] K. Damage to Fauna 02 [ ] Observed (Date ________) [X] Potential [ ] Alleged
04 Narrative Description:

Potential for damage to fauna exists; site is not fenced and sand is not covered.

01 [ ] L. Contamination of Food Chain 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleged
04 Narrative Description:

No apparent potential.

01 [X] M. Unstable Containment of Wastes (Spills/Runoff/Standing liquids, Leaking drums) 02 [X] Observed (Date 6/4/87) [ ] Potential [ ] Alleged
03 Population Potentially Affected Unknown 04 Narrative Description:

Sand is stockpiled in piles - no cover or dust control was noted. 55-gallon metal drums were observed scattered and lying on the ground.

01 [X] N. Damage to Offsite Property 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleged
04 Narrative Description:

Offsite property damage is a possibility. Metal 55-gallon drums were observed at the base of the Niagara Escarpment. No dust control was noted and sand may migrate to adjacent properties.

01 [X] O. Contamination of Sewers, Storm Drains, WWTPs 02 [ ] Observed (Date ________) [X] Potential [ ] Alleged
04 Narrative Description: There is a potential for contamination of storm sewers since a sewer line crosses the foundry property and the system eventually enters Eighteen Mile Creek.

01 [X] P. Illegal/Unauthorized Dumping 02 [X] Observed (Date 12/86) [ ] Potential [ ] Alleged
04 Narrative Description:

In December 1986, NYSDEC cited Dussault Foundry for operating a solid waste management facility without a valid operational permit since 1978.

05 Description of Any Other Known, Potential, or Alleged Hazards

III. TOTAL POPULATION POTENTIALLY AFFECTED 36,044 (within 3 miles of site)

IV. COMMENTS

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E & E site inspection, June 4, 1987
Advanced Environmental Systems sample analysis results 1981, 1986
USGS 7.5 minute topographic map, Lockport, NY Quad.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 932012

II. PERMIT INFORMATION

01 Type of Permit Issued (Check all that apply)	02 Permit Number	03 Date Issued	04 Expiration Date	05 Comments
[ ] A. NPDES				
[ ] B. UIC				
[ ] C. AIR				
[ ] D. RCRA				
[ ] E. RCRA Interim Status				
[ ] F. SPCC Plan				
[X] G. State (Specify)	47-19-7	10/3/86	No expiration date	Application for disposal
[ ] H. Local (Specify)		6/30/88		approved.
[ ] I. Other (Specify)			6/30/89	Waste transporter
[X] J. None				

III. SITE DESCRIPTION

01 Storage Disposal (Check all that apply)	02 Amount	03 Unit of Measure	04 Treatment (Check all that apply)	05 Other
[ ] A. Surface Impoundment			[ ] A. Incineration	[X] A. Buildings On Site
[X] B. Piles	10,000	cubic yards	[ ] B. Underground Injection	
[X] C. Drums, Above Ground	Approx. 75	55 gallon	[ ] C. Chemical/Physical	
[X] D. Tank, Above Ground	1	250 gallon	[ ] D. Biological	
[ ] E. Tank, Below Ground			[ ] E. Waste Oil Processing	
[ ] F. Landfill			[ ] F. Solvent Recovery	06 Area of Site
[ ] G. Landfarm			[ ] G. Other Recycling Recovery	
[ ] H. Open Dump			[X] H. Other None (Specify)	5 Acres (total area of plant)
[ ] I. Other ______ (Specify)				

07 Comments - The majority of the drums appeared to be empty; however, this was not verified during the site inspection.

IV. CONTAINMENT

01 Containment of Wastes (Check one)

[ ] A. Adequate, Secure [ ] B. Moderate [ ] C. Inadequate, Poor [X] D. Insecure, Unsound, Dangerous

02 Description of Drums, Diking, Liners, Barriers, etc.

Numerous discarded drums and drum piles, approximately 75 total, scattered on site. No liner under the landfill area. Site not fenced, no barriers evident.

V. ACCESSIBILITY

01 Waste Easily Accessible: [X] Yes [ ] No

02 Comments:

Site not fenced, waste not covered

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E & E site inspection 6/87

Niagara County Health Department Files, Niagara Falls, NY

Dussault Foundry Files, Lockport, NY

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 State	02 Site Number
NY	932012

II. DRINKING WATER SUPPLY

01 Type of Drinking Supply (Check as applicable)	Surface	Well	02 Status: Endangered	Affected	Monitored	03 Distance to Site
Community	A. [X]	B. [ ]	A. [ ]	B. [ ]	C. [X]	A 15 (mi)
Non-community	C. [ ]	D. [ ]	D. [ ]	E. [ ]	F. [ ]	B NA (mi

III. GROUNDWATER

01 Groundwater Use in Vicinity (Check one)

[ ] A. Only Source for Drinking

[ ] B. Drinking (Other sources available) Commercial, Industrial, Irrigation (No other water sources available)

[X] C. Commercial, Industrial, Irrigation (Limited other sources available)

[X] D. Not Used, Unuseable

02 Population Served by Groundwater 0

03 Distance to Nearest Drinking Water well NA (mi)

04 Depth to Groundwater	05 Direction of Groundwater Flow	06 Depth to Aquifer of Concern	07 Potential Yield of Aquifer	08 Sole Source Aquifer
5-10 (ft)	NW	5-10 (ft)	Unknown (gpd)	[ ] Yes [X] N

09 Description of Wells (Including usage, depth, and location relative to population and buildings)

There are no known wells on site

10 Recharge Area

[X] Yes

[ ] No

Comments: Recharge by precipitation

11 Discharge Area

[X] Yes

[ ] No

Comments: Discharge via Niagara Escarpment

IV. SURFACE WATER

01 Surface Water (Check one)

[X] A. Reservoir Recreation Drinking Water Source

[ ] B. Irrigation Economically Important Resources

[ ] C. Commercial, Industrial

[ ] D. Not Currently Used

02 Affected/Potentially Affected Bodies of Water

Name:	Affected	Distance to Site
Erie Canal	[ ]	500 (ft
Eighteen Mile Creek	[ ]	500 (ft
	[ ]	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 Total Population Within

One (1) Mile of Site	Two (2) Miles of Site	Three (3) Miles of Site
A. 16,231 No. of Persons	B. 29,020 No. of Persons	C. 36,044 No. of Persons

02 Distance to Nearest Population 500 (ft)

03 Number of Buildings Within Two (2) Miles of Site 11,381

04 Distance to Nearest Off-Site Building 500 (ft)

05 Population Within Vicinity of Site (Provide narrative description of nature of population within vicinity of site, e.g., rural, village, densely populated urban area)

Densely populated residential/commercial industrialized area

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 State	02 Site Number
NY	932012

VI. ENVIRONMENTAL INFORMATION

01 Permeability of Unsaturated Zone (Check one)

☐ A. $10^{-6} - 10^{-8}$ cm/sec ☒ B. $10^{-4} - 10^{-6}$ cm/sec ☐ C. $10^{-4} - 10^{-3}$ cm/sec ☐ D. Greater Than 10^{-3} cm/sec

02 Permeability of Bedrock (Check one)

☐ A. Impermeable (Less than 10^{-6} cm/sec)
☐ B. Relatively Impermeable ($10^{-4} - 10^{-6}$ cm/sec)
☒ C. Relatively Permeable ($10^{-2} - 10^{-4}$ cm/sec)
☐ D. Very Permeable (Greater than 10^{-2} cm/sec)

03 Depth to Bedrock: 5-10 (ft)

04 Depth of Contaminated Soil Zone: Unknown (ft)

05 Soil pH: 5.6 - 7.3

06 Net Precipitation: 4 (in)

07 One Year 24-Hour Rainfall: 2.1 (in)

08 Slope
Site Slope: 19 %
Direction of Site Slope: North
Terrain Average Slope: 19 %

09 Flood Potential
Site is in NA Year Floodplain

10 ☐ Site is on Barrier Island, Coastal High Hazard Area, Riverine Floodway

11 Distance to Wetlands (5 acre minimum)
ESTUARINE A. NA (mi)
OTHER B. 3/4 (mi)

12 Distance to Critical Habitat (of Endangered Species)
NA (mi)
Endangered Species: NA

13 Land Use in Vicinity

Distance to:

COMMERCIAL/INDUSTRIAL A. 500 (ft)
RESIDENTIAL AREAS, NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES B. <.10 (mi)
AGRICULTURAL LANDS
PRIME AG LAND C. 0.8 (mi)
AG LAND D. 0.8 (mi)

14 Description of Site in Relation to Surrounding Topography

This site is located directly atop the Niagara Escarpment in the City of Lockport, New York. The Erie Canal is located approximately 500 feet north and the Niagara River is located approximately 18 miles west of this site. The site is in an industrial/residential area of the city characterized by railroad tracks, other business and private residences.

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

USGS 7.5 minute topographic map, Lockport, New York quadrangle
NYSDEC Region 9 files, Buffalo, NY
Johnson, Richard H., 1964, Groundwater in the Niagara Falls Area, New York, State of New York Conservation Department, Water Resource Commission, Bulletin GW-53
Barrett, K.W., S.S. Chang, S.A. Hans, A.M. Platt, 1982, Uncontrolled Hazardous Waste Site Ranking System Users Manual, MITRE Corporation
Higgins, B.A., P.S. Puglia, R.P. Leonard, T.D. Yoakun, W.A. Wirtz, 1972, Soil Survey of Niagara County, New York, USDA Soil Conservation Service

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 932012

II. SAMPLES TAKEN

Sample Type	01 Number of Samples Taken	02 Samples Sent to	03 Estimated Date Results Availabl
Groundwater			
Surface Water			
Waste			
Air			
Runoff			
Spill			
Soil			
Vegetation			
Other	None		

III. FIELD MEASUREMENTS TAKEN

01 Type	02 Comments
Air Monitoring	A photoionization detector was used while onsite; readings of 1.2 ppm and 0.6 ppm above background were recorded in the ambient air. A reading of 55 ppm was recorded near the kerosene storage tank.

IV. PHOTOGRAPHS AND MAPS

01 Type ☒ Ground ☐ Aerial

02 In Custody of E & E
(Name of organization or individual)

03 Maps
☒ Yes
☐ No

04 Location of Maps
NYSDEC Region 9, Buffalo, New York

V. OTHER FIELD DATA COLLECTED (Provide narrative description of sampling activities)

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E & E onsite inspection, June 1987.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 7 - OWNER INFORMATION

01 State NY	02 Site Number 932012

II. CURRENT OWNER(S)			PARENT COMPANY (If applicable)		
01 Name Dussault Foundry	02 D+B Number		08 Name	09 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.) 2 Washburn Street	04 SIC Code		10 Street Address (P.O. Box, RFD #, etc.)	11 SIC Code	
05 City Lockport	06 State NY	07 Zip Code 14094	12 City	13 State	14 Zip Code
01 Name	02 D+B Number		08 Name	09 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		10 Street Address (P.O. Box, RFD #, etc.)	11 SIC Code	
05 City	06 State	07 Zip Code	12 City	13 State	14 Zip Code
01 Name	02 D+B Number		08 Name	09 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		10 Street Address (P.O. Box, RFD #, etc.)	11 SIC Code	
05 City	06 State	07 Zip Code	12 City	13 State	14 Zip Code
01 Name	02 D+B Number		08 Name	09 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		10 Street Address (P.O. Box, RFD #, etc.)	11 SIC Code	
05 City	06 State	07 Zip Code	12 City	13 State	14 Zip Code
III. PREVIOUS OWNER(S) (List most recent first)			IV. REALTY OWNER(S) (If applicable, list most recent first)		
01 Name	02 D+B Number		01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code
01 Name	02 D+B Number		01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code
01 Name	02 D+B Number		01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Niagara County Health Department, New York, Files
E & E Site Inspection, June 1987

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION

01 State NY	02 Site Number 932012

II. CURRENT OPERATOR (Provide if different from owner)

01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code
08 Years of Operation	09 Name of Owner	

OPERATOR'S PARENT COMPANY (If applicable)

10 Name	11 D+B Number	
12 Street Address (P.O. Box, RFD #, etc.)	13 SIC Code	
14 City	15 State	16 Zip Code

III. PREVIOUS OPERATOR(s) (List most recent first; provide only if different from owner)

01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code
08 Years of Operation	09 Name of Owner During This Period	
01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code
08 Years of Operation	09 Name of Owner During This Period	
01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code
08 Years of Operation	09 Name of Owner During This Period	

PREVIOUS OPERATORS' PARENT COMPANIES (If applicable)

10 Name	11 D+B Number	
12 Street Address (P.O. Box, RFD #, etc.)	13 SIC Code	
14 City	15 State	16 Zip Code
10 Name	11 D+B Number	
12 Street Address (P.O. Box, RFD #, etc.)	13 SIC Code	
14 City	15 State	16 Zip Code
10 Name	11 D+B Number	
12 Street Address (P.O. Box, RFD #, etc.)	13 SIC Code	
14 City	15 State	16 Zip Code

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 932012

II. ON-SITE GENERATOR

01 Name Dussault Foundry		02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.) 2 Washburn Ave.		04 SIC Code
05 City Lockport	06 State NY	07 Zip Code 14094

III. OFF-SITE GENERATOR(S)

01 Name		02 D+B Number	01 Name		02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code	03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code
01 Name		02 D+B Number	01 Name		02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code	03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code

IV. TRANSPORTER(S) (transporters listed below have hauled waste from Dussault Foundry)

01 Name Farley Trucking		02 D+B Number	01 Name		02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.) 270 State Road		04 SIC Code	03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code
05 City Lockport	06 State NY	07 Zip Code 14094	05 City	06 State	07 Zip Code
01 Name Browning-Ferris Industries		02 D+B Number	01 Name		02 D+B Number
03 Street Address (P.O. Box, RFD #, etc.) 2321 Kenmore Ave.		04 SIC Code	03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code
05 City Buffalo	06 State NY	07 Zip Code	05 City	06 State	07 Zip Code

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

E & E site inspection, June 1987
Dussault Foundry Records, Lockport, New York

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION

01 State NY

02 Site Number 932012

II. PAST RESPONSE ACTIVITIES

01 [ ] A. Water Supply Closed 02 Date ____ 03 Agency ____
04 Description:

01 [ ] B. Temporary Water Supply Provided 02 Date ____ 03 Agency ____
04 Description:

01 [ ] C. Permanent Water Supply Provided 02 Date ____ 03 Agency ____
04 Description:

01 [ ] D. Spilled Material Removed 02 Date ____ 03 Agency ____
04 Description:

01 [ ] E. Contaminated Soil Removed 02 Date ____ 03 Agency ____
04 Description:

01 [ ] F. Waste Repackaged 02 Date ____ 03 Agency ____
04 Description:

01 [X] G. Waste Disposed Elsewhere 02 Date present 03 Agency NYSDEC
04 Description:
Landfilled sand is currently being removed and sent to the Niagara County Landfill

01 [ ] H. On Site Burial 02 Date ____ 03 Agency ____
04 Description:

01 [ ] I. In Situ Chemical Treatment 02 Date ____ 03 Agency ____
04 Description:

01 [ ] J. In Situ Biological Treatment 02 Date ____ 03 Agency ____
04 Description:

01 [ ] K. In Situ Physical Treatment 02 Date ____ 03 Agency ____
04 Description:

01 [ ] L. Encapsulation 02 Date ____ 03 Agency ____
04 Description:

01 [ ] M. Emergency Waste Treatment 02 Date ____ 03 Agency ____
04 Description:

01 [ ] N. Cutoff Walls 02 Date ____ 03 Agency ____
04 Description:

01 [ ] O. Emergency Diking/Surface Water Diversion 02 Date ____ 03 Agency ____
04 Description:

01 [ ] P. Cutoff Trenches/Sump 02 Date ____ 03 Agency ____
04 Description:

01 [ ] Q. Subsurface Cutoff Wall 02 Date ____ 03 Agency ____
04 Description:

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION

01 State	02 Site Number
NY	932012

II. PAST RESPONSE ACTIVITIES (Cont.)

01 [ ] R. Barrier Walls Constructed 02 Date ______ 03 Agency ______
04 Description:

01 [ ] S. Capping/Covering 02 Date ______ 03 Agency ______
04 Description:

01 [ ] T. Bulk Tankage Repaired 02 Date ______ 03 Agency ______
04 Description:

01 [ ] U. Grout Curtain Constructed 02 Date ______ 03 Agency ______
04 Description:

01 [ ] V. Bottom Sealed 02 Date ______ 03 Agency ______
04 Description:

01 [ ] W. Gas Control 02 Date ______ 03 Agency ______
04 Description:

01 [ ] X. Fire Control 02 Date ______ 03 Agency ______
04 Description:

01 [ ] Y. Leachate Treatment 02 Date ______ 03 Agency ______
04 Description:

01 [ ] Z. Area Evacuated 02 Date ______ 03 Agency ______
04 Description:

01 [ ] 1. Access to Site Restricted 02 Date ______ 03 Agency ______
04 Description:

01 [ ] 2. Population Relocated 02 Date ______ 03 Agency ______
04 Description:

01 [ ] 3. Other Remedial Activities 02 Date ______ 03 Agency ______
04 Description:

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION

01 State	02 Site Number
NY	932012

II. ENFORCEMENT INFORMATION

01 Past Regulatory/Enforcement Action [X] Yes [ ] No

02 Description of Federal, State, Local Regulatory/Enforcement Action

In March 1985, NYSDEC notified the foundry that it was listed in the NYSDEC Division of Solid and Hazardous Waste Registry as a suspected hazardous site.

In December 1986, NYSDEC cited Dussault for operating a landfill without a permit and ordered Dussault to close the landfill area, and remove landfilled foundry sand. This removal action is currently underway, but has not been completed.

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

NYSDEC, Region 9, Buffalo, New York, Files

D162

6. ASSESSMENT OF DATA ADEQUACY AND RECOMMENDATIONS

After assessing the information gathered for this site and applying it to an HRS worksheet, it is determined that the existing information for the groundwater and air routes is not adequate to accurately score the site, and that further investigations are necessary to determine a proper HRS score.

E & E recommends the following actions to be taken at this site to gather further information and more accurately score this site:

- Air monitoring to determine if air emissions are being released, and, if so, identify and quantify them and determine their source. This recommendation is made because ambient air quality readings on the HNu photoionizer were above background levels during the site inspection.

- Sampling of rain water runoff for organics, inorganics, petroleum hydrocarbons and metals. This recommendation is made because E & E personnel noted and photographed runoff runnels on the north edge of the site. Upstream and downstream sampling of the Erie Canal may be considered to determine if any contaminants are reaching the canal.

- Installing groundwater monitoring wells, and collecting and analyzing groundwater samples, to determine if contaminants are entering the groundwater system and migrating off site.

Based on available sample analysis, E & E also recommends that immediate remedial actions be initiated at this site including additional sampling of waste material, sand, and underlying soil, continued removal of foundry sand, conducting a drum inventory, developing proper storage facilities, or removal of the drums.

7. REFERENCES

Barrett, K.W., S.S. Chung, S.A. Hans, A.M. Platt, 1982, Uncontrolled Hazardous Waste Site Ranking System, A Users Manual, MITRE Corporation.

Bielen, G., 1987, Potential Hazardous Waste Site Inspection Reports, NUS Corporation.

Borzynski, Leonard, July 1985, Testing of Foundry Sand, Advanced Environmental Systems, Inc.

Ecology and Environment site inspection, June 1987.

Federal Emergency Management Agency Flood Plain Map, C-PN-3605030002B.

Goddard, C.N., 1985, Notification of the Dussault Foundry inclusion on the registry of inactive hazardous waste disposal sites in New York State.

Higgins, B.A., P.S. Puglia, R.P. Leonard, T.D. Youkum, W.A. Wirtz, 1972, Soil Survey of Niagara County, New York, USDA Soil Conservation Service.

Johnston, R.H., 1964, Groundwater in the Niagara Falls Area, New York, State of New York Conservation Department, Water Resources Commission, Bulletin GW-53.

Maxwell, James, June 1987, personnel communication, president, Dussault Foundry.

Mitrey, R.J., 1985, personal correspondence to Kenneth Moss of Niagara County Refuse Disposal District.

New York State Department of Environmental Conservation, Division of Solid and Hazardous Waste, Inactive Hazardous Waste Disposal Report.

Rakoczynski, R.W., February 1981, Dussault Foundry Waste Survey, Advanced Environmental System, Inc.

Spagnoli, J.J., 1986, NYSDEC correspondence to Dussault Foundry Corp.

USEPA, Federal Plaza, New York, New York, Laboratory Analysis for Soil Samples Obtained from Dussault Foundry Site.

USGS 7.5 Minute Topographical Map, Lockport, New York Quadrangle.

Wendel Engineers, October 1986, Dussault Foundry Solid Waste Disposal Area Closure Plan.

APPENDIX A

PHOTOGRAPHIC RECORDS

ecology and environment, inc.

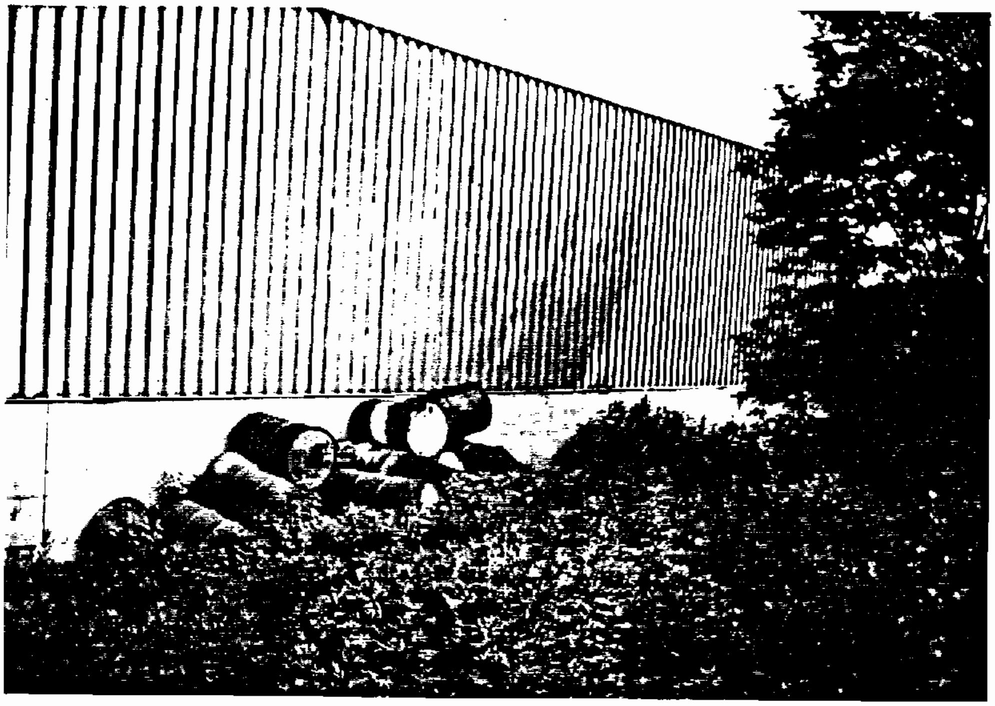
PHOTOGRAPHIC RECORD

Client: NYSDEC

E & E Job No.: ND2031

Camera: Make ANSCO

SN:



Photographer: J. Nickerson

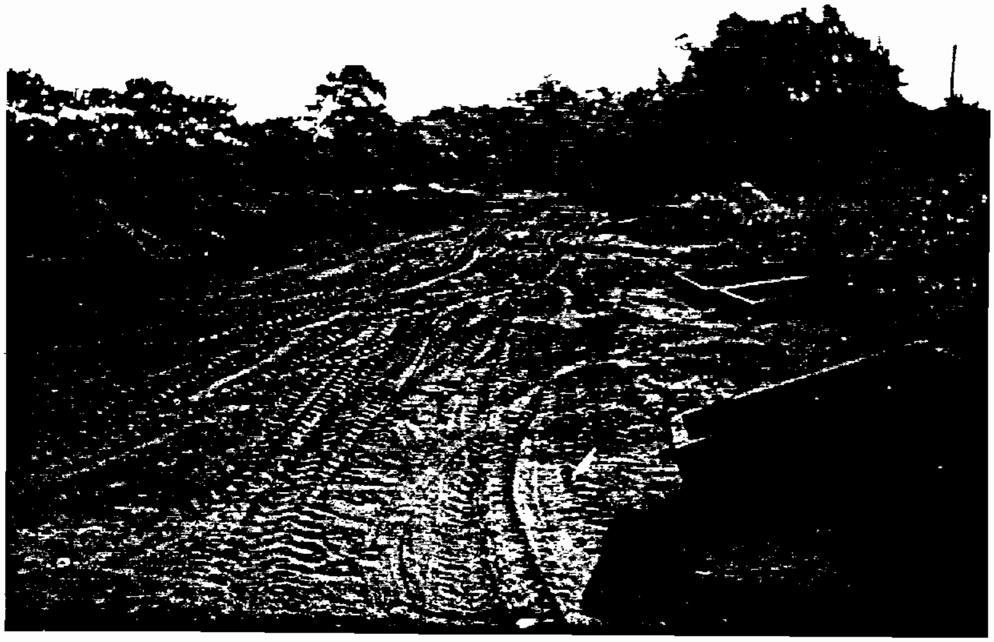
Date/Time: 6/4/87 09:58

Lens: Type:

SN:

Frame No.: 3

Comments*: Drum pile outside Dussault Foundry shipping building, looking north, near east end of site.



Photographer: J. Nickerson

Date/Time: 6/4/87 10:00

Lens: Type:

SN:

Frame No.: 4

Comments*: Sand fill area looking east from east end of site showing sand fill and metal scrap of Dussault Foundry.

*Comments to include location

ecology and environment, inc.

PHOTOGRAPHIC RECORD

Client: NYSDEC

E & E Job No.: ND2031

Camera: Make ANSCO

SN:

Photographer: J. Nickerson

Date/Time: 6/4/87 10:00

Lens: Type:

SN:

Frame No.: 5

Comments*: Sand removal area showing metal scrap, foundry sand and sand berm looking east on east end of site at Dussault Foundry.

Photographer: J. Nickerson

Date/Time: 6/4/87 10:00

Lens: Type:

SN:

Frame No.: 6

Comments*: Sand removal area showing sand, sand berm, drums, metal scrap, tires and wood scrap looking northeast near east end of Dussault Foundry grounds. Note vehicular traffic on site.

*Comments to include location

D1626

ecology and environment, inc.

PHOTOGRAPHIC RECORD

Client: NYSDEC

E & E Job No.: ND2031

Camera: Make ANSCO

SN:

Photographer: J. Nickerson

Date/Time: 6/4/87 10:00

Lens: Type:

SN:

Frame No.: 7

Comments*: East end of shipping and receiving building near sand disposal area. Photo shows metal scrap drums, tires, wood scrap looking north at east end of Dussault Foundry grounds.

Photographer: J. Nickerson

Date/Time: 6/4/87 10:09

Lens: Type:

SN:

Frame No.: 8

Comments*: Sand disposal looking east at south end of fill area showing sand, metal scrap, slag, wood scrap, located at east end of Dussault Foundry.

*Comments to include location

D1626

PHOTOGRAPHIC RECORD

Client: NYSDEC

E & E Job No.: ND2031

Camera: Make ANSCO

SN:

Photographer: J. Nickerson

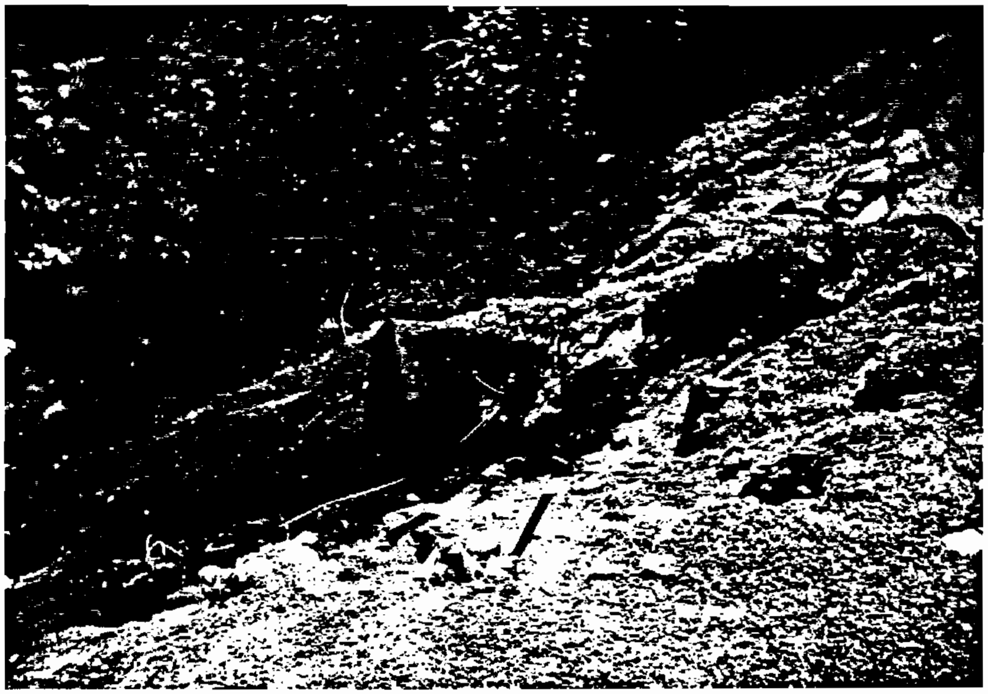
Date/Time: 6/4/87 10:15

Lens: Type:

SN:

Frame No.: 9

Comments*: Drums from Dussault Foundry dumped over sand berm at edge of Niagara Escarpment on northeast end of foundry grounds; residence in background.



Photographer: J. Nickerson

Date/Time: 6/4/87 10:17

Lens: Type:

SN:

Frame No.: 10

Comments*: Drum buried in foundry sand berm on north east edge of Dussault Foundry property.

*Comments to include location

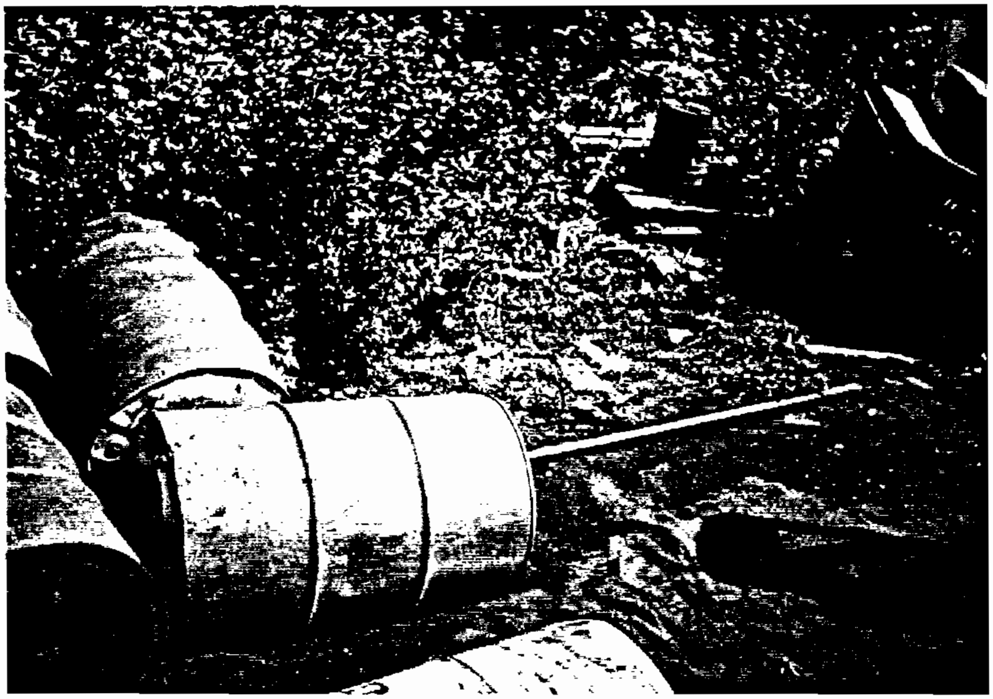
PHOTOGRAPHIC RECORD

Client: NYSDEC

E & E Job No.: ND2031

Camera: Make ANSCO

SN:



Photographer: J. Nickerson

Date/Time: 6/4/87 10:20

Lens: Type:

SN:

Frame No.: 11

Comments*: Drum pile showing stained soil at west end of fill area, near sand berm.

Photographer: J. Nickerson

Date/Time: 6/4/87 10:22

Lens: Type:

SN:

Frame No.: 12

Comments*: Metal scrap and foundry sand - looking east from behind shipping and receiving building on north edge of Dussault property.

*Comments to include location

Client: NYSDEC

E & E Job No.: ND2031

Camera: Make ANSCO

SN:

Photographer: J. Nickerson

Date/Time: 6/4/87 10:20

Lens: Type:

SN:

Frame No.: 13

Comments*: Aboveground 250 gal. kerosene storage tank, stained foundry sand, propane tanks and metal scrap looking east from north side of foundry building.

Photographer: J. Nickerson

Date/Time: 6/4/87 10:35

Lens: Type:

SN:

Frame No.: 14

Comments*: Metal scrap, runoff runnel in hillside on north edge of property showing migration of rainwater offsite.

*Comments to include location

ecology and environment, inc.

PHOTOGRAPHIC RECORD

Client: NYSDEC

E & E Job No.: ND2031

Camera: Make ANSCO

SN:

Photographer: J. Nickerson

Date/Time: 6/4/87 10:38

Lens: Type:

SN:

Frame No.: 15

Comments*: Drums of Isopropyl alcohol stored on east end of central foundry building, note foundry sand on ground.

Photographer: J. Nickerson

Date/Time: 6/4/87 10:40

Lens: Type:

SN:

Frame No.: 16

Comments*: Sand precipitator, sand and dust in driveway area between the shipping building and foundry works on south side of buildings.

*Comments to include location

ecology and environment, inc.

PHOTOGRAPHIC RECORD

Client: NYSDEC E & E Job No.: ND2031

Camera: Make ANSCO SN:

Photographer: J. Nickerson

Date/Time: 6/4/87 10:44

Lens: Type:

SN:

Frame No.: 17

Comments*: Waste metal and wood, drums, sand, storage tanks located on south side of foundry buildings near west end of grounds. Photo taken near railroad tracks in front of foundry.

Photographer: J. Nickerson

Date/Time: 6/4/87 10:45

Lens: Type:

SN:

Frame No.: 18

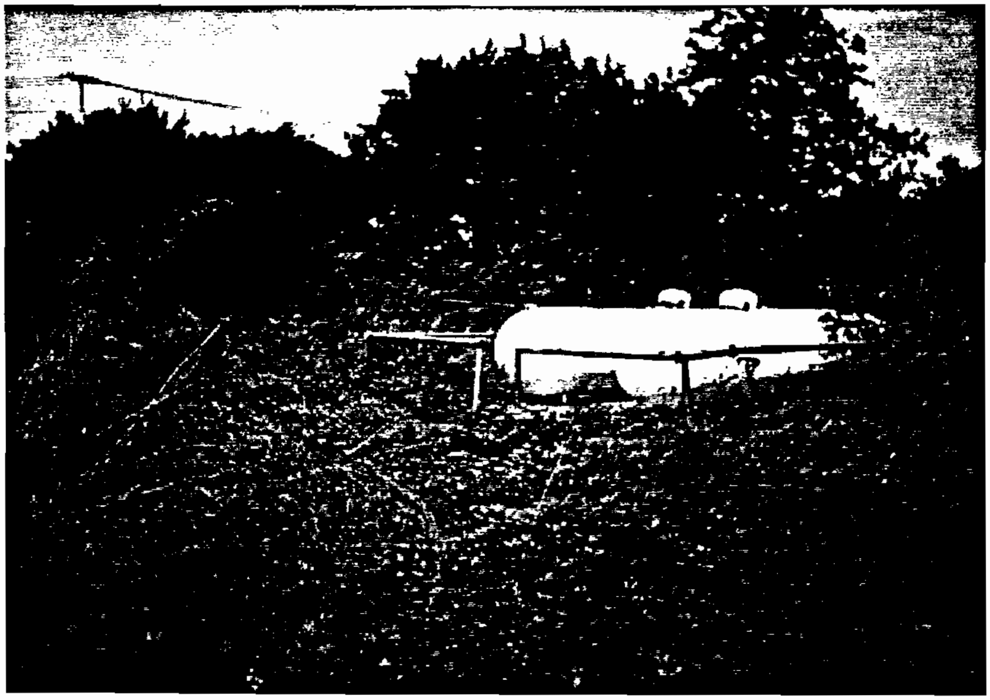
Comments*: Drums and waste on south side of foundry buildings looking west showing garage building.

*Comments to include location

PHOTOGRAPHIC RECORD

Client: NYSDEC E & E Job No.: ND2031

Camera: Make ANSCO SN:



Photographer: J. Nickerson

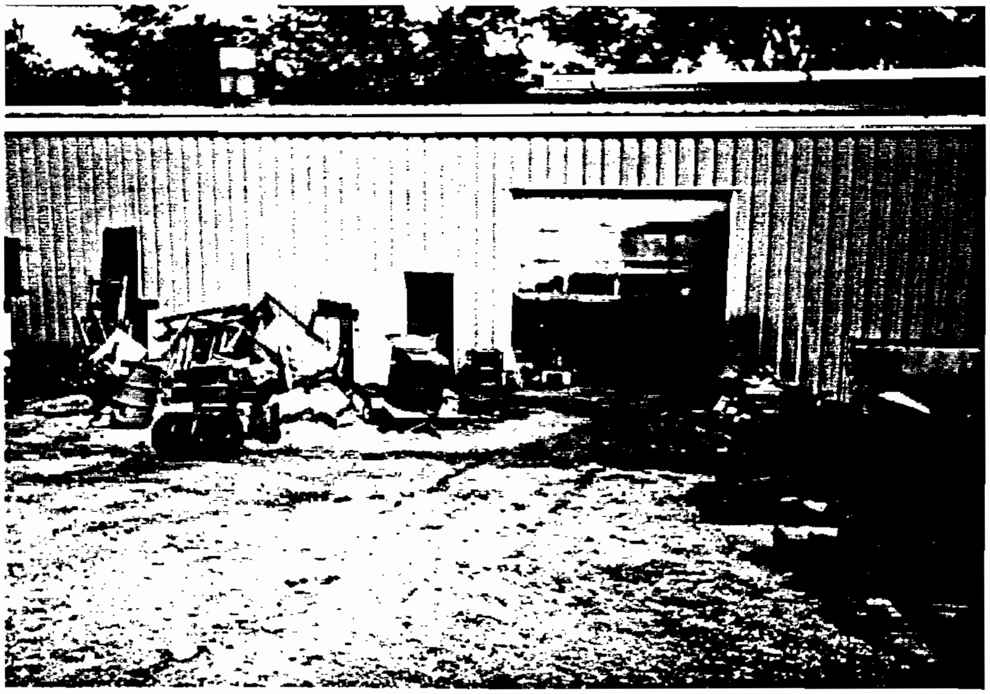
Date/Time: 6/4/87 10:50

Lens: Type:

SN:

Frame No.: 19

Comments*: West end of foundry grounds showing former sand fill area with metal scrap and propane tanks.



Photographer: J. Nickerson

Date/Time: 6/4/87 11:00

Lens: Type:

SN:

Frame No.: 20

Comments*: Photo showing south side of garage building, note drums, metal scrap, sand, and slag and stained soil.

*Comments to include location

APPENDIX B

UPDATED INACTIVE HAZARDOUS WASTE DISPOSAL SITE REGISTRY FORM

47-15-11 (10/83)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DIVISION OF SOLID AND HAZARDOUS WASTE

INACTIVE HAZARDOUS WASTE DISPOSAL SITE REPORT

Priority Code: 2a Site Code: 932012

Name of Site: Dussault Foundry Region: 9

Street Address: 2 Washburn Street

Town/City: Lockport County: Niagara

Name of Current Owner of Site: Dussault Foundry

Address of Current Owner of Site: 2 Washburn, Lockport

Type of Site: ☐ Open Dump ☐ Structure ☐ Lagoon
☒ Landfill ☐ Treatment Pond

Estimated Size: 5 acre(s)

Site Description:

The Dussault Foundry landfill is a private industrial landfill, approximately 1 acre in area on a 5-acre site, operated by Dussault. This landfill was previously used to dispose of spent foundry sand. Phenols and semivolatile and volatile organics have been detected in the sand and soil on site following laboratory analysis. The sand fill is presently being removed and disposed of at the Niagara County landfill.

The site is located atop the Niagara Escarpment at the foot of Washburn Street in the City of Lockport, New York. The site slopes generally toward the north and has an average elevation of 600 feet. The landfill area is approximately 30 feet higher than the surrounding terrain. A sand berm is situated on the edge of the escarpment, which has been subject to some rill erosion. No standing water was noted on site.

Hazardous Waste Disposed: ☐ Confirmed ☒ Suspected

Type and Quantity of Hazardous Wastes Disposed:

Type	Quantity (Pounds, Drums, Tons, Gallons)
Phenolic foundry sand	20,000 cubic yards
Miscellaneous drums of unknown materials	Approximately 75 drums
Metal scrap	Unknown

Time Period Site was Used for Hazardous Waste Disposal:

, 1914 To , 1986

Owner(s) During Period of Use: Dussault Foundry

Site Operator During Period of Use: Dussault Foundry

Address of Site Operator: 2 Washburn Street, Lockport

Analytical Data Available: [ ] Air [ ] Surface Water [ ] Groundwater
[X] Soil [ ] Sediment [ ] None

Contravention of Standards: [ ] Groundwater [ ] Drinking Water
[ ] Surface Water [ ] Air

Soil Type: Hilton-Ovid-Ontario Association (silty loam)

Depth to Groundwater Table: 5-10 feet

Legal Action: Type: operating at landfill without a permit [X] State [ ] Federal

Status: [X] In Progress [ ] Completed

Remedial Action: [ ] Proposed [ ] Under Design
[X] In Progress [ ] Completed

Nature of Action: Removal of phenolic sands to Niagara County Landfill

Assessment of Environmental Problems:

Assessment of Health Problems:

Person(s) Completing This Form:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION	NEW YORK STATE DEPARTMENT OF HEALTH
Name:	Name:
Title:	Title:
Name:	Name:
Title:	Title:
Date:	Date:

APPENDIX C

PHOTOCOPIED REFERENCES

NUS CORPORATION
A Halliburton Company

FILE COPY

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
EXECUTIVE SUMMARY

Dussault Foundry
Site Name

NYD002115301
EPA Site ID Number

Lockport, New York
Address

02-8611-60
TDD Number

SITE DESCRIPTION

DRAFT

The Dussault Foundry site is an active steel foundry approximately one acre in size located in City of Lockport, Dutchess county. The site is bounded to the north by the Erie Canal and to the south by a paved road. Railroad tracks run parallel to the road across the front of the site. The facility includes several large operations buildings, an office building, and a shipping and receiving building. More than fifty, 55-gallon drums are scattered about the site. There are two approximately 2,000-gallon aboveground storage tanks on site. Various machinery and metal scrap is on the site. Phenolic foundry sand waste was dumped in several areas around the site.

The New York Department of Environmental Conservation (NYDEC) had given the foundry until March 1, 1986 to completely remove the foundry sand waste. Sand waste is still present on site as of January 21, 1987.

On January 21, 1987, ten (10) soil samples were collected from several areas on site.

HAZARD RANKING SCORE: Pending while waiting for analytical results.

Prepared by: Gary Bielen of NUS Corporation **Date:** March 30, 1987

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)
Dussault Foundry

02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
2 Washburn Street

03 CITY
Lockport

04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST.
NY	14094	Niagara	063	36

09 COORDINATES

LATITUDE	LONGITUDE
4 3° 1 0' 0 5". N	0 7 8° 4 1' 1 0". W

10 TYPE OF OWNERSHIP (Check one)
X A. PRIVATE _ B. FEDERAL _ C. STATE
_ D. COUNTY _ E. MUNICIPAL _ F. OTHER
_ G. UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION
1/ 21 /87
MONTH DAY YEAR

02 SITE STATUS
X ACTIVE
_ INACTIVE

03 YEARS OF OPERATION
1914 / Present _ UNKNOWN
BEGINNING YEAR ENDING YEAR

04 AGENCY PERFORMING INSPECTION (Check all that apply)
_ A. EPA X B. EPA CONTRACTOR NUS Corporation (Name of firm) _ C. MUNICIPAL _ D. MUNICIPAL CONTRACTOR (Name of firm)
_ E. STATE _ F. STATE CONTRACTOR (Name of firm) _ G. OTHER (Specify)

05 CHIEF INSPECTOR	06 TITLE	07 ORGANIZATION	08 TELEPHONE NO.
Gary Bielen	Environmental Scientist	NUS Corporation	(201) 225-6160

09 OTHER INSPECTORS	10 TITLE	11 ORGANIZATION	12 TELEPHONE NO.
Alan Cherepon	Geologist	NUS Corporation	(201) 225-6160
Steve Maybury	Environmental Scientist	NUS Corporation	(201) 225-6160
Dan de Bruijn	Chemist	NUS Corporation	(201) 225-6160
Ed Leonard	Biologist	NUS Corporation	(201) 225-6160

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13 SITE REPRESENTATIVES INTERVIEWED	14 TITLE	15 ADDRESS	16 TELEPHONE NO.
James Maxwell	President	2 Washburn Street	(716) 625-8238

17 ACCESS GAINED BY (Check one)	18 TIME OF INSPECTION	19 WEATHER CONDITIONS
X PERMISSION _ WARRANT	0850	Sunny, 20-30°F, Wind 0-2 mph.

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NO.
Diana Messina	U.S. EPA, Region 2, Edison, NJ	(201) 321-6776

04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NO.	08 DATE (MONTH DAY YEAR)
Gary Bielen	U.S. EPA	NUS Corp., FIT 2	(201) 225-6160	3/ 26 /87

PART 2 - WASTE INFORMATION

NY D0021153C1

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

X A. SOLID
_ B. POWDER, FINES
_ C. SLUDGE
_ D. OTHER ____________ (Specify)
_ E. SLURRY
X F. LIQUID
_ G. GAS

02 WASTE QUANTITY AT SITE

(Measures of waste quantities must be independent)

TONS 20,100
CUBIC YARDS 50+
NO. OF DRUMS ____

03 WASTE CHARACTERISTICS (Check all that apply)

X A. TOXIC
_ B. CORROSIVE
_ C. RADIOACTIVE
_ D. PERSISTENT
_ E. SOLUBLE
_ F. INFECTIOUS
_ G. FLAMMABLE
_ H. IGNITABLE
_ I. HIGHLY VOLATIL
_ J. EXPLOSIVE
X K. REACTIVE
_ L. INCOMPATIBLE
_ M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

DRAFT

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE O CONCENTRA
OCC	Phenols	108-95-2	Stockpiled sand	20	mg/l

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUM
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (See specific references, e.g., state files, sample analysis, reports)

Dussault Foundry Solid Waste Disposal Area Closure Plan prepared by Wendel Engineers, P.C. 1986.

EPA FORM 2070-13 (7-81)

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION
01 STATE 02 SITE NUMBER
NY D002115301

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 A. GROUNDWATER CONTAMINATION 02 OBSERVED (DATE: ________) _ POTENTIAL _ ALLEGE
03 POPULATION POTENTIALLY AFFECTED: 34,490 04 NARRATIVE DESCRIPTION

A potential for ground water contamination does exist due to the phenolic sands that were deposited on site. Leachate the sand piles could enter the ground water. The population around the site receives their drinking water from intakes the Niagara River and these intakes are more than three miles away.

01 X B. SURFACE WATER CONTAMINATION 02 OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 34,490 04 NARRATIVE DESCRIPTION

A potential for surface water contamination exists due to the phenolic sands that were deposited on site. Leachate from the sand piles could possibly enter the Erie Canal, which is 2,100 feet to the north of the site. The surface water is used for drinking it is used for recreational boating and canal tours from April to September.

01 X C. CONTAMINATION OF AIR 02 OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 37,786 04 NARRATIVE DESCRIPTION

A potential for contamination of the air exists due to the phenolic sands that were deposited on site. During our site inspection, readings on one of our air monitoring instruments fluctuated from 0.5 to 1 ppm. We located a vent pipe comi from the shipping and receiving building, which was possibly the source of this air emission. A DEC inspection report mentions an air emission which occurred during the inspection.

01 X D. FIRE/EXPLOSIVE CONDITIONS 02 OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 33,502 04 NARRATIVE DESCRIPTION

A potential does exist for fire and explosion due to the moderate fire hazard of the phenols in the sand. No spontaneous heating can occur, but if heated, toxic fumes are produced.

01 X E. DIRECT CONTACT 02 OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 85 04 NARRATIVE DESCRIPTION

A potential for direct contact exists due to the phenolic sands that were disposed of on site. The foundry is still open and workers can come in contact with these phenolic sands.

01 X F. CONTAMINATION OF SOIL 02 OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
03 AREA POTENTIALLY AFFECTED: 1 (ACRES) 04 NARRATIVE DESCRIPTION

A potential for soil contamination does exist because the phenolic sands are disposed of directly on the soil surface. Additionally drums found on site are stored directly on the soil surface; these could leak and contaminate the soil.

01 G. DRINKING WATER CONTAMINATION 02 OBSERVED (DATE: ________) _ POTENTIAL _ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 0 04 NARRATIVE DESCRIPTION

A potential for drinking water contamination does not exist because the population in the area receives its drinking wate from the Niagara River; the surface intakes are more than three miles away from the site.

01 X H. WORKER EXPOSURE/INJURY 02 OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: 85 04 NARRATIVE DESCRIPTION

A potential for worker exposure/injury does exist due to the phenolic sands disposed of on site. The foundry is still ope and workers can potentially come in contact with these sands.

01 X I. POPULATION EXPOSURE/INJURY 02 OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 37,786 04 NARRATIVE DESCRIPTION

A potential for population exposure/injury can occur due to the phenolic sands deposited on site. Leachate from the sand pile could enter the Erie Canal and affect the surface water in the area. The surrounding population could be affected b air emissions coming from one of the buildings on site. The worker population can come in contact with the phenolic sand piles that are located in several areas on site.

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 X J. DAMAGE TO FLORA 02 _ OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
04 NARRATIVE DESCRIPTION

A potential exists for damage to the flora due to the phenolic sands deposited on site. These sands are deposited d[illegible]ec on the ground and possibly could affect the trees and smaller shrubs in the area.

01 X K. DAMAGE TO FAUNA 02 _ OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
04 NARRATIVE DESCRIPTION (Include name(s) of species)

A potential exists due to the phenolic sands deposited on site. The phenols could leach to the surface water in the [illegible]re and affect various fish species.

01 X L. CONTAMINATION OF FOOD CHAIN 02 _ OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
04 NARRATIVE DESCRIPTION

A potential exists as leachate from the sand piles may migrate off-site and enter the Erie Canal. These substances could affect the recreational fishing by bioaccumulating in the food chain.

01 X M. UNSTABLE CONTAINMENT OF WASTES 02 _ OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
(Spills/runoff/standing liquids/leaking drums)
03 POPULATION POTENTIALLY AFFECTED: 85 04 NARRATIVE DESCRIPTION

A potential exists due to the phenolic sands deposited on site. There is no containment system to control these sands a[illegible] the phenols could migrate into the soil and/or surface water.

01 X N. DAMAGE TO OFFSITE PROPERTY 02 _ OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
04 NARRATIVE DESCRIPTION

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A potential exists for off-site property damage due to the piles of phenolic sands that were deposited on site. Some pile[illegible] are located close to a steep embankment and the phenols could move off-site and affect the adjacent property.

01 X O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs 02 _ OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
04 NARRATIVE DESCRIPTION

A potential exists because the phenolic sands are not properly contained on site and these sands could enter the drains or sewers in the streets, which are to the north and south of the site.

01 X P. ILLEGAL/UNAUTHORIZED DUMPING 02 _ OBSERVED (DATE: ________) X POTENTIAL _ ALLEGED
04 NARRATIVE DESCRIPTION

A potential exists due to the accessibility of the site. There are no fences which could help prevent illegal/unauthor[illegible]ed dumping.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: 37,786

IV. COMMENTS

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Telecon note between Gary Bielen of NUS Corporation and Pete Sharkey of Lockport Water Department, dated 3/25/87.
Initial evaluation of Industrial and Hazardous Waste Sites Inspection Report done by the New York Department of Environmental Conservation 8/28/79.
Telecon note between Dussault Foundry Secretary and Gary Bielen of NUS Corporation dated 3/26/87 concerning number of employees.
General Software Corporation. 1984. Draft Graphical Exposure Modeling System (GEMS) User's Guide prepared for the U[illegible] Environmental Protection Agency, Office of Pesticides and Toxic Substances. Landover, Maryland.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION
01 STATE 02 SITE NUMBER
NY DCC21153C1

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED (Check all that apply)	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
_ A. NPDES				
_ B. UIC				
_ C. AIR				
_ D. RCRA				
_ E. RCRA INTERIM STATUS				
_ F. SPCC PLAN				
X G. STATE (Specify)	Part 364 Regulations	11/85	3/86	Permit to allow truck to haul sand waste.
_ H. LOCAL (Specify)				
_ I. OTHER (Specify)				
_ J. NONE				

DRAFT

III. SITE DESCRIPTION

01 Storage/Disposal (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE	04 TREATMENT (Check all that apply)	05 OTHER
A. SURFACE IMPOUNDMENT			_ A. INCINERATION	X A. BUILDINGS ON SITE
X B. PILES	20,000	Cubic Yards	_ B. UNDERGROUND INJECTION	2
X C. DRUMS, ABOVE GROUND	50+	55-gallon	_ C. CHEMICAL/PHYSICAL	
X D. TANK, ABOVE GROUND	2	2,000 gallon	_ D. BIOLOGICAL	06 AREA OF SITE
_ E. TANK, BELOW GROUND			_ E. WASTE OIL PROCESSING	
_ F. LANDFILL			_ F. SOLVENT RECOVERY	
_ G. LANDFARM			X G. OTHER RECYCLING/RECOVERY	1
_ H. OPEN DUMP			_ H. OTHER ________ (Specify)	(Acres)
_ I. OTHER ________ (Specify)				

07 COMMENTS

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

_ A. ADEQUATE, SECURE _ B. MODERATE X C. INADEQUATE, POOR _ D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC.

No liners or runoff controls are present at the site. There are more than fifty 55-gallon drums found in various areas o site. There is no method of containment around any of the drum storage areas found on site.

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: X YES _ NO

02 COMMENTS

There are no fences around the waste storage areas to prevent accessibility.

VI SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Dussault Foundry Solid Waste Disposal Area Closure Plan prepared by Wendel Engineers, P.C. 1986.

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as applicable) | 02 STATUS | 03 DISTANCE TO SITE

	SURFACE	WELL	ENDANGERED	AFFECTED	MONITORED	
COMMUNITY	A. X	B. _	A. _	B. _	C. _	A. >3 (mi
NON-COMMUNITY	C. _	D. _	D. _	E. _	F. _	B. ____ (mi

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

_ A. ONLY SOURCE FOR DRINKING

_ B. DRINKING (Other sources available) COMMERCIAL, INDUSTRIAL, IRRIGATION (No other weter sources available)

_ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available)

X D. NOT USED, UNUSEABL

02 POPULATION SERVED BY GROUND WATER: 0

03 DISTANCE TO NEAREST DRINKING WATER WELL: > 3 (mi)

04 DEPTH TO GROUNDWATER	05 DIRECTION OF GROUNDWATER FLOW	06 DEPTH TO AQUIFER OF CONCERN	07 POTENTIAL YIELD OF AQUIFER	08 SOLE SOURCE AQUIF
30 (ft)	Westerly	Unknown (ft)	43,200 (gpd)	_ YES X _O

09 DESCRIPTION OF WELLS (Including useage, depth, and location relative to population and buildings)

No ground water is used within a 3-mile radius of the site.

DRAFT

10 RECHARGE AREA

_ YES COMMENTS
_ NO

11. DISCHARGE AREA

X YES COMMENTS Surface runoff moves north toward t Erie Canal which empties into the Niagara River.
_ NO

IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

X A. RESERVOIR, RECREATION DRINKING WATER SOURCE

_ B. IRRIGATION, ECONOMICALLY IMPORTANT RESOURCES

_ C. COMMERCIAL, INDUSTRIAL

_ D. NOT CURRENTLY USED

02 AFFECTED/POTENTIALLY AFFECTED BODIES OF WATER

NAME:		AFFECTED	DISTANCE TO SITE
Erie Canal	Potentially affected		2,100 feet (mi)
			(mi)
			(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 TOTAL POPULATION WITHIN

ONE (1) MILE OF SITE	TWO (2) MILES OF SITE	THREE (3) MILES OF SITE
A. ____ NO. OF PERSONS	B. ____ NO. OF PERSONS	C. ____ NO. OF PERSONS

02 DISTANCE TO NEAREST POPULATION: 500 feet (ı)

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE: 600

04 DISTANCE TO NEAREST OFF-SITE BUILDING: 500 feet (mi)

05 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site. e.g., rural, village, densely populated urban area)

PART 6 - SAMPLE AND FIELD INFORMATION

01 STATE 02 SITE NUMBER
NY 0CC211E3CI

II. SAMPLES TAKEN

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER			
SURFACE WATER			
WASTE		Organic Lab: Ecology and Environment C/O Gary Hahn 4285 Genessee Street Buffalo, New York 14225	6/87
AIR			
RUNOFF			
SPILL			
SOIL	10	Inorganic Lab: Century Labs Inc. C/O Ken Bond 1501 Grandview Avenue Thorofare, New Jersey 08086	6/87
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS
HNu photoionization	10 ppm in hole near sample NY50-S2.
OVA flame ionization	7 ppm in hole near NY50-S2, had a reading of 0.6 ppm in hole near NY50-S3, and 5 ppm in pipe.

DRAFT

IV. PHOTOGRAPHS AND MAPS

01 TYPE X GROUND _ AERIAL

02 IN CUSTODY OF NUS Corporation, Edison, New Jersey
(Name of organization or individual)

03 MAPS
X YES
_ NO

04 LOCATION OF MAPS
NUS Corporation, Edison, New Jersey

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

NUS Corporation, FIT 2 Field Notebook Number 0016, January 21, 1987.

I. SOURCES OF INFORMATION (Cite specific references. e.g., state files, sample analysis, reports)

NUS Corporation, FIT 2 Field Notebook Number C016, January 21, 1987.

PART 7 - OWNER INFORMATION

01 STATE 02 SITE NUMBER
NY D002115301

II. CURRENT OWNER(S)

01 NAME: Dussault Foundry
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.): 2 Washburn Street
04 SIC CODE
05 CITY: Lockport
06 STATE: NY
07 ZIP CODE: 14094

PARENT COMPANY (If applicable)

08 NAME: Not applicable
09 D + B NUM
10 STREET ADDRESS (P.O. Box, RFD#, etc.)
11 SIC CO
12 CITY
13 STATE: -
14 ZIP CO

01 NAME
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE
08 NAME
09 D + B NUMB
10 STREET ADDRESS (P.O. Box, RFD#, etc.)
11 SIC CODE
12 CITY
13 STATE
14 ZIP COD

01 NAME
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE
08 NAME
09 D + B N BE
10 STREET ADDRESS (P.O. Box, RFD#, etc.)
11 SIC CODE
12 CITY
13 STATE
14 ZIP CODE

01 NAME
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE
08 NAME
09 D + B NUMBE
10 STREET ADDRESS (P.O. Box, RFD#, etc.)
11 SIC CODE
12 CITY
13 STATE
14 ZIP CODE

III. PREVIOUS OWNER(S) (List most recent first)

01 NAME: Not applicable
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

01 NAME
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

01 NAME
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

IV. REALTY OWNER(S) (If applicable; list most recent first)

01 NAME: Not applicable
02 D + B NU ER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

01 NAME
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

01 NAME
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION
01 STATE 02 SITE NUMBER
NY 0002115301

II. CURRENT OPERATOR(S)

01 NAME Not applicable	02 D + B Number		
03 STREET ADDRESS (P.O. Box, RFD#, etc.)	04 SIC CODE		
05 CITY	06 STATE	07 ZIP CODE	
08 YEARS OF OPERATION	09 NAME OF OWNER		

OPERATOR'S PARENT COMPANY (If applicable)

10 NAME Not applicable	11 D + B NUMB	
12 STREET ADDRESS (P.O. Box, RFD#, etc.)	13 SIC CODE	
14 CITY	15 STATE	16 ZIP CODE

III. PREVIOUS OPERATOR(S) (List most recent first: Provide only if different from owner)

01 NAME Not applicable	02 D + B Number		
03 STREET ADDRESS (P.O. Box, RFD#, etc.)	04 SIC CODE		
05 CITY	06 STATE	07 ZIP CODE	
08 YEARS OF OPERATION	09 NAME OF OWNER		

PREVIOUS OPERATOR'S PARENT COMPANIES (If applicable)

10 NAME Not applicable	11 D + B NUMBE	
12 STREET ADDRESS (P.O. Box, RFD#, etc.)	13 SIC CODE	
14 CITY	15 STATE	16 ZIP CODE

DRAFT

01 NAME	02 D + B Number		
03 STREET ADDRESS (P.O. Box, RFD#, etc.)	04 SIC CODE		
05 CITY	06 STATE	07 ZIP CODE	
08 YEARS OF OPERATION	09 NAME OF OWNER		

10 NAME	11 D + B NUMBEF	
12 STREET ADDRESS (P.O. Box, RFD#, etc.)	13 SIC CODE	
14 CITY	15 STATE	16 ZIP CODE

01 NAME	02 D + B Number		
03 STREET ADDRESS (P.O. Box, RFD#, etc.)	04 SIC CODE		
05 CITY	06 STATE	07 ZIP CODE	
08 YEARS OF OPERATION	09 NAME OF OWNER		

10 NAME	11 D + B NUMBER	
12 STREET ADDRESS (P.O. Box, RFD#, etc.)	13 SIC CODE	
14 CITY	15 STATE	16 ZIP CODE

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

01 STATE 02 SITE NUMBER
NY D002115301

II ON-SITE GENERATOR

01 NAME
Not applicable
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

III OFF-SITE GENERATOR(S)

01 NAME
Not applicable
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

01 NAME
02 D + B NUMBE
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC COD
05 CITY
06 STATE
07 ZIP COOF

01 NAME
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

01 NAME
02 D + B NUMBE
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

DRAFT

IV. TRANSPORTER(S)

01 NAME
Not applicable
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

01 NAME
02 D + B NU ER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

01 NAME
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

01 NAME
02 D + B NUMBER
03 STREET ADDRESS (P.O. Box, RFD#, etc.)
04 SIC CODE
05 CITY
06 STATE
07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

II. PAST RESPONSE ACTIVITIES

01 ___ A. WATER SUPPLY CLOSED 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 ___ B. TEMPORARY WATER SUPPLY PROVIDED 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 ___ C. PERMANENT WATER SUPPLY PROVIDED 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 ___ D. SPILLED MATERIAL REMOVED 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 ___ E. CONTAMINATED SOIL REMOVED 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 ___ F. WASTE REPACKAGED 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 X G. WASTE DISPOSED ELSEWHERE 02 DATE: 8/16/85 03 AGENCY: NYDEC
04 DESCRIPTION

The foundry is in the process of removing the sand wastes to the Niagara County Landfill.

01 ___ H. ON SITE BURIAL 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 ___ I. IN SITU CHEMICAL TREATMENT 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

DRAFT

No previous history.

01 ___ J. IN SITU BIOLOGICAL TREATMENT 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 ___ K. IN SITU PHYSICAL TREATMENT 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 ___ L. ENCAPSULATION 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 ___ M. EMERGENCY WASTE TREATMENT 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 ___ N. CUTOFF WALLS 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 ___ O. EMERGENCY DIKING/SURFACE WATER DIVERSION 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 ___ P. CUTOFF TRENCHES/SUMP 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

01 ___ Q. SUBSURFACE CUTOFF WALL 02 DATE: ________ 03 AGENCY: ________
04 DESCRIPTION

No previous history.

II. PAST RESPONSE ACTIVITIES

01 ___ R. BARRIER WALLS CONSTRUCTED 02 DATE: __________ 03 AGENCY: __________
04 DESCRIPTION

No previous history.

01 ___ S. CAPPING/COVERING 02 DATE: __________ 03 AGENCY: __________
04 DESCRIPTION

No previous history.

01 ___ T. BULK TANKAGE REPAIRED 02 DATE: __________ 03 AGENCY: __________
04 DESCRIPTION

No previous history.

01 ___ U. GROUT CURTAIN CONSTRUCTED 02 DATE: __________ 03 AGENCY: __________
04 DESCRIPTION

No previous history.

01 ___ V. BOTTOM SEALED 02 DATE: __________ 03 AGENCY: __________
04 DESCRIPTION

No previous history.

01 ___ W. GAS CONTROL 02 DATE: __________ 03 AGENCY: __________
04 DESCRIPTION

No previous history.

01 ___ X. FIRE CONTROL 02 DATE: __________ 03 AGENCY: __________
04 DESCRIPTION

No previous history.

01 ___ Y. LEACHATE TREATMENT 02 DATE: __________ 03 AGENCY: __________
04 DESCRIPTION

No previous history.

DRAFT

01 ___ Z. AREA EVACUATED 02 DATE: __________ 03 AGENCY: __________
04 DESCRIPTION

No previous history.

01 ___ 1. ACCESS TO SITE RESTRICTED 02 DATE: __________ 03 AGENCY: __________
04 DESCRIPTION

No previous history.

01 ___ 2. POPULATION RELOCATED 02 DATE: __________ 03 AGENCY: __________
04 DESCRIPTION

No previous history.

01 X 3. OTHER REMEDIAL ACTIVITIES 02 DATE: 8/16/85 03 AGENCY: NYDEC
04 DESCRIPTION

The foundry is in the process of removing the sand wastes to the Niagara County Landfill. The Department of Environment Conservation granted Dussault Foundry an extension for the total removal of the sand to March 1, 1986. The sand waste i still present on site.

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Memorandum from Robert J. Mitrey P.E. (Sanitary Engineer) to James Maxwell concerning the removal of the foundry sand, dated August 29, 1985.
Memorandum from Robert J. Mitrey P.E. to James Maxwell granting the extension for removal of the foundry sands, dat January 8, 1986.

SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION
01 STATE 02 SITE NUMBE
NY D002115301

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY/ENFORCEMENT ACTION X YES _ NO

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY/ENFORCEMENT ACTION

Dussault Foundry had received an extension from the New York Department of Environmental Conservation for the complete removal of the sand wastes from its facility. The foundry was given until March 1, 1986 to properly remove these sanc wastes. Our inspection, done on January 21, 1987, revealed that the sand waste was still present on site.

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, report)

- Memorandum from Robert J. Mitrey, P.E. to James Maxwell granting the extention for removal of the foundry sands, dated January 8, 1986.

w York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-0001

Henry G. William
Commissioner

APR 3 1985

[illegible] APR 08 1985

Dussault Foundry
2 Washburn Street
Lockport, NY 14094

Dear Sir or Madam:

As mandated by Section 27-1305 of the Environmental Conservation Law (ECL, copy enclosed), the Department of Environmental Conservation (DEC) must maintain a registry of all disposal sites suspected or known to contain hazardous wastes. The ECL also mandates that this Department notify by certified mail the owner of all or any part of each site or area included in the registry of inactive hazardous waste disposal sites.

Our records indicate that you are the owner or part owner of the site listed below. Therefore, this letter constitutes notification of the inclusion of such site in the registry of inactive hazardous waste disposal sites in New York State.

DEC Site #: 932012
Site Name: Dussault Foundry
Site Address: Lockport, NY

Enclosed is a copy of the New York State Department of Environmental Conservation, Division of Solid and Hazardous Waste, inactive hazardous waste disposal site report form as it appears in the registry and Annual Report, and explanation of the site classifications. The law allows the owner and/or operator of a site listed in the registry to petition the Commissioner of the Department of Environmental Conservation for deletion of such site, modification of site classification, or modification of any information regarding such site, by submitting a written statement setting forth the grounds of the petition. Such petition may be addressed to:

Mr. Henry G. Williams
Commissioner
Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233-0001

Section 27-1317 (copy enclosed) mandates that subsequent to the adoption of regulations by DEC, no person may substantially change the manner in which an inactive hazardous waste disposal site listed in the registry is used, without notifying the Department and, pursuant to Section 1389-d of the Public Health Law, the Department of Health. As of this date the referenced regulations have not been adopted. You will receive a copy of the regulations once promulgated.

For additional information, please contact Mr. Robert Olazagasti, Supervisor, Site Control Section, Bureau of Hazardous Site Control at (518) 457-0747.

Sincerely,

Charles N Goddard

Charles N. Goddard, P.E.
Chief
Bureau of Hazardous Site Control
Division of Solid and Hazardous Waste

Enclosures

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

Henry G. Williams
Commissioner

November 26, 1985

Mr. Kenneth Moss
Niagara County Refuse Disposal District
Bewley Building
Lockport, New York 14094

Dear Mr. Moss:

Dussault Factory Foundry Sands

This Department is in receipt of your application to accept for disposal the foundry sands generated at the above referenced facility. Based on the information submitted, this material is approved for disposal at your facility.

In the event that significant changes in the information presented on this application occur, you shall immediately notify this Department in writing. Such changes shall include, but are not limited to: change in process, change in facility name or address, change in waste composition, change in hauler.

Enclosed is a copy of the approved application. If you have any questions, please contact this office at 716/847-4585.

Very truly yours,

Robert J. Mitrey, P.E.
Associate Sanitary Engineer

JPG:vas

Enclosure

cc: Mr. Maurice Vaughan
Mr. James Maxwell ✓

ORDERED:

I. THAT immediately upon service of a conformed copy of this Order upon Respondent, Respondent shall be bound as hereinafter provided.

II. THAT Respondent shall be bound by the terms and conditions as set forth in Schedule A attached to this Order and made a part hereof.

III. THAT all further violations by Respondent in contravention of the aforementioned standards shall constitute continuing violations of the Environmental Conservation Law and an action for further penalties for future violations will be instituted by the Department if the Respondent fails to adhere to and fully comply with this Order and Schedule A.

IV. THAT should there be an unusual or extraordinary occurrence or deviation from normal operating procedures resulting in a potentially hazardous condition, which violates any of the terms and conditions of Schedule A, the Respondent shall immediately notify the Department at 600 Delaware Avenue, Buffalo, New York 14202-1073, (716/847-4590), and within (10) ten days after such occurrence submit to the Department, as provided in VII below, a report detailing the circumstances and causes of the occurrence, remedial actions and steps taken to prevent recurrence.

V. THAT for the purpose of insuring compliance with this Order, duly authorized representatives of the State of New York shall be permitted access to inspect the facilities being constructed, owned, operated, maintained and/or controlled by the Respondent for the purpose of inspecting the discharge therefrom of any liquid, refuse or other waste to take split samples of any discharge, liquid, refuse or other waste and for the purposes of determining the status of compliance with the terms of this Order and Schedule A.

STATE OF NEW YORK : DEPARTMENT OF ENVIORNMENTAL CONSERVATION

In the Matter of a Violation of Article 27 of the Environmental Conservation Law and 6 New York Codes, Rules and Regulation Part 360

DUSSAULT FOUNDRY CORP.
2 Washburn Street
Lockport, New York 14094

(Niagara County)

Respondent

ORDER
ON
CONSENT

FILE
NO. 86-163
R9-1940-86-11

WHEREAS:

1. Pursuant to Environmental Conservation Law (ECL) Section 27-0703 of Article 27 and 6 New York Codes, Rules and Regulations (NYCRR) Part 360, requirements were established by the Department of Environmental Conservation to impose conditions on the operation of solid waste managemen facilities of New York State.

2. Respondent owns, operates, and/or maintains control of a solid waste management facility in the State of New York subject to ECL Article 27 and 6 NYCRR Part 360, to wit: its solid waste management facility located on Washburn Street, Town of Lockport, New York.

3. The Respondent has violated the ECL, 6 NYCRR Part 360.2(b) in that it operated a solid waste management facility without a valid operationa permit. To wit: since 1978 Respondent received foundry sands at its unpermitted industrial landfill.

4. Respondent has affirmatively waived its rights to a hearing on these matters as provided by law and has consented to the issuing and entering of this Order pursuant to the provisions of Environmental Conservation Law and has agreed to be bound by the provisions, terms and conditions contained herein.

NOW, having considered this matter and being duly advised, it is

VI. THAT all reports and submissions herein required shall be made to the Principal Solid Waste Engineer of the Region 9 office of the Department at 600 Delaware Avenue, Buffalo, New York 14202-1073.

VII. THAT the provisions, terms and conditions of this Order and Schedule A shall be deemed to bind Respondent, and in their corporate capacities, its officers, directors, agents, servants, employees, successors and assigns and all persons, firms and corporations acting under or for it, including but not limited to those who may carry on any or all of the operations now being conducted by Respondent.

DATED: Buffalo, New York
December 24, 1986

HENRY G. WILLIAMS, Commissioner
New York State Department of
Environmental Conservation

John J. Spagnoli
Regional Director

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

CLASSIFICATION CODE: 2a REGION: 9 SITE CODE: 932 1
EPA ID: NYD00211

NAME OF SITE : Dussault Foundry
STREET ADDRESS: 2 Washburn Street
TOWN/CITY: COUNTY: ZIP:
Lockport Niagara

SITE TYPE: Open Dump-X Structure- Lagoon- Landfill- Treatment Pon
ESTIMATED SIZE: 1 +- Acres

SITE OWNER/OPERATOR INFORMATION:
CURRENT OWNER NAME....: Dussalt Foundry
CURRENT OWNER ADDRESS.: 2 Washington Street, Lockport, NY 14094
OWNER(S) DURING USE...: Dussault Foundry
OPERATOR DURING USE...: Dussault Foundry
OPERATOR ADDRESS......: 2 Washburn Street, Lockport, NY 14094
PERIOD ASSOCIATED WITH HAZARDOUS WASTE: From To

SITE DESCRIPTION:
In the past, foundry sand was dumped adjacent to plant and sold to l ca contractors for fill. Plans for stabilization of area and proper closure submitted and under review by department.

HAZARDOUS WASTE DISPOSED: Confirmed-X Suspected-

TYPE	QUANTITY (units)
Foundry Sand	50 Tons/yr
Scrap Iron	

SITE CODE: 932012

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

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

LEGAL ACTION:

TYPE..: State- Federal-
STATUS: Negotiation in Progress- Order Signed-

REMEDIAL ACTION:

Proposed- Under design- In Progress- Completed-
NATURE OF ACTION:

GEOTECHNICAL INFORMATION:
SOIL TYPE:
GROUNDWATER DEPTH: ¶50'

ASSESSMENT OF ENVIRONMENTAL PROBLEMS:

No environmental problems anticipated from storage and/or disposal of foundry sand at this site.

ASSESSMENT OF HEALTH PROBLEMS:

Medium	Contaminants Available	Migration Potential	Potentially Exposed Population	Need for Investigation
Air	Likely	Highly Likely	Yes	High
Surface Soil	Likely	Highly Likely	Yes	High
Groundwater	Likely	Unlikely	Yes	Medium
Surface Water	Likely	Unlikely	Yes	Medium

Health Department Site Inspection Date : 9/85

MUNICIPAL WASTE ID:

SITE CODE: 932012

ANALYTICAL DATA AVAILABLE:

Air- Surface Water- Groundwater- Soil- Sediment- None-X

CONTRAVENTION OF STANDARDS:

Groundwater- Drinking Water- Surface Water- Air-

LEGAL ACTION:

TYPE..: State- Federal-
STATUS: In Progress- Completed-

REMEDIAL ACTION:

Proposed- Under Design- In Progress- Completed-
NATURE OF ACTION:

GEOTECHNICAL INFORMATION:
SOIL TYPE:
GROUNDWATER DEPTH: >50'

ASSESSMENT OF ENVIRONMENTAL PROBLEMS:

No environmental problems anticipated from storage and/or disposal of foundry sand at this site.

ASSESSMENT OF HEALTH PROBLEMS:

Insufficient information.

PERSON(S) COMPLETING THIS FORM:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION	NEW YORK STATE DEPARTMENT OF HEALTH
NAME.: John S. Tygert, P.E.	NAME.: R. Tramontano
TITLE: Senior Sanitary Engr.	TITLE: Bur. Tox. Subst. Assess.
NAME.: Robert A. Olazagasti	NAME.:
TITLE: Solid Waste Management Spec.	TITLE:
DATE.: 01/24/85	DATE.: 01/24/85

TESTING OF FOUNDRY SAND

Report Prepared For

DUSSAULT FOUNDRY CORPORATION

By

ADVANCED ENVIRONMENTAL SYSTEMS, INC.

Leonard Borzynski
Technical Evaluation

July 16, 1985
AES Report AXB

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: TEST CONTROL WET CHEMISTRY
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: DUSSAULT FOUNDRY A.E.S. JOB CODE 01AXB

ANALYSIS	TYPE	ORIGINAL CONC.	ADDED CONC.	EXPECTED CONC.	REPORTED CONC.	PERCENT RECOVERY	95% CONFID INTERVA
PHENOLS	SPIKE	0.31	0.6	0.91	0.53	58.2	

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: WET CHEMISTRY DUPLICATE
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: DUSSAULT FOUNDRY   A.E.S. JOB CODE 01AXB

ANALYSIS	SAMPLE	ORIGINAL CONC.	DUPL. CONC.	AVERAGE CONC.	RANGE	REL. % DIFF.
PHENOLS	1731	.344	.275	.3095	.069	22.39

Relative Percent Difference =
Range/Average X 100

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: RESULTS - WET CHEMISTRY
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: DUSSAULT FOUNDRY A.E.S. JOB CODE 01AXB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION
				1731 FOUNDRY SD 07/02/85 EP EXTRACT
PHENOLS	420.1	3	0.1	0.3

DEC [illegible]

.3 ppm ok

Suggested 100 ppb

[illegible] Paul [illegible] DEC

Bob [illegible]

Call for [illegible] Tiga

DEC has jurisdiction [illegible] local Health Dept

847-4590
~~847-4565~~

Marlene Cheryl Moyer
MARLENE C. MOYER
WET CHEMISTRY DIVISION

SCOPE OF WORK

A sample of foundry sand was collected by Mr. James Maxwell and delivered to the AES laboratory on the same day, July 2, 1985.

In order to test the potential for Total Recoverable Phenolics to leach out of the sand, the sample was extracted at pH 5.0 for 24 hours, filtered and analyzed. This Extraction Procedure is specified in EPA SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 2nd Edition (1982).

ANALYTICAL METHODOLOGIES REFERENCE LIST

Routine Analyses are Performed in Accordance with Protocols Found in the Following Numbered Sources. These Numbers Correspond to those Listed in the Laboratory Report Under the Reference ("REF") Column.

1 - EPA 600/D-80-021, "Guidelines Establishing Test Procedures for the Analysis of Pollutants; Proposed Regulations", Federal Register 44(233), December 3, 1979.

2 - EPA 600/D-80-022, "Guidelines Establishing Test Procedures for the Analysis of Pollutants; Proposed Regulations, Correction", Federal Register 44(244), December 18, 1979.

3 - EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", (1983)

4 - EPA 600/4-79-057, "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", (1982)

5 - EPA-SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", second edition (1982)

6 - "Standard Methods for the Examination of Water and Wastewater", 15th Edition, (1980)

7 - New York State Institute of Toxicology Analytical Handbook, October 1982

8 - NIOSH Manual of Analytical Methods, second edition 1977

9 - "The Analysis of Polychlorinated Biphenyls in Transformer Fluid and Waste Oil", EPA Environmental Monitoring and Support Laboratory, draft, June 24, 1980

"Dussault Foundry -
Waste Survey"

prepared for

Advanced Environmental Systems, Inc.

submitted by

Waste Resource Associates, Inc.

February 20, 1981

Prepared by:

Randolph W. Rakoczynski

Randolph W. Rakoczynski
Vice President
Engineering Services

Introduction

On Thursday, February 12, 1981, Mr. J. Maxwell (Dussault), Mr. K. Knight (AES) and Mr. R. Rakoczynski (WRA) toured the operations at the Dussault Foundry in Lockport, New York.

Waste Generation

The following individual waste streams were identified during the facility tour:

Furnace Slag

The slag produced by a electrical-induction coil furnace used to melt pig iron, carbon and ferro-silicon to produce molten iron for casting.

Spent Foundry Sand

Fines from the classification of spent foundry sand used in forming molds for castings.

Paint Spray Booth

The residue accumulated in the sump of a water-mist booth from the spray painting of finished castings.

Grinding Dust

The dust generated, from the shot blasting and grinding of finished castings.

Containers (55-gallon drums)

The empty containers from the following raw materials used in the operation.

- Chem-res catalyst (C-2006 & C-2075)
- Chem-res binder (201 & 203)
  (The above are phenol-modified furfuranol alcohol compounds)
- Kold-kure JB
- Toluene
- Lacquer
- Hydraulic oil
- Motor oil

Hazardous Determination

After reviewing data generated by AES for the EP Toxicity testing of the spent foundry sand, the only potential hazardous wastes generated are the empty containers from "Toluene" and "Lacquer".

Recommendations

Toluene Containers

Since these are deposit containers which are returned to the vendor for refilling, they are considered "recycled" and hence exempted from regulation.

2.0 EXISTING CONDITIONS

2.1 LOCATION

The Dussault Foundry is located in the City of Lockport, Niagara County, New York. The foundry property straddles the Niagara Escarpment which runs through the City of Lockport. Foundry buildings are mainly located above the escarpment with a storage building occupying lands at the base of the escarpment. The location of the foundry is illustrated on Map 1, Site Plan, enclosed. The property is located in an industrial portion of the City of Lockport, immediately south of the Erie Barge Canal.

2.2 SURFICIAL AND GEOLOGIC CONDITIONS

The outstanding physical feature at the Dussault Foundry site is the Niagara Escarpment. United States Geological Survey maps indicate that in the vicinity of Dussault Foundry, the crest of the escarpment has an elevation of approximately 595 feet AMSL and the base has an elevation approximately of 515 feet AMSL. The escarpment makes a further drop some distance to the north of the site.

Typically the strata of the Niagara Escarpment consists of a few feet of glacial till underlain by the bedrock. Above the escarpment the initial layer of bedrock is Lockport Dolomite. Records of soil borings for sewer construction in the area indicate that in the vicinity of Dussault Foundry, on the crest of the escarpment, the till overlying the bedrock ranges in depth from five to ten feet.

2.3 SUBSURFACE UTILITIES

2.3.1 ABANDONED RACEWAYS

Along the edge of the escarpment, there are many abandoned raceways and conduits. These were used historically to divert water from above the locks of the Erie Canal in Lockport and provide power for industries located below the Niagara Escarpment. Discussions with City of Lockport Engineering Staff indicate that the current location and condition of most of these conduits is unknown. Information on the possible location of these, gathered from old maps, is plotted on Map 1.

2.3.2 STORM SEWERAGE

Eighteenmile Creek, which drains northward to Lake Ontario, has its headwaters in the Lockport area. One tributary of this creek begins immediately north of the Erie Canal and accepts discharge from an underground conduit carrying water from the southern part of Lockport. This conduit forms part of Lockport's storm sewer system. The conduit passes along the eastern edge of the Dussault Foundry property as shown on Map 1.

2.3.3 SANITARY SEWERAGE

In older portions of the City of Lockport, as in the vicinity of the Dussault Foundry, a combined storm/sanitary sewer system serves the area. One such line traverses the Dussault Foundry property as it runs northerly along Washburn Street, then easterly along the former Garden Street and thence into a large collector sewer running northerly along Exchange Street as shown on Map 1. During periods of dry flow the sewer carries sanitary sewage into the large collector sewer. During periods of rain

The sewer carries both storm and sanitary sewage, with excess flow overflowing via a diversion chamber into the storm water conduit leading to Eighteenmile Creek.

2.4 WASTE DISPOSAL

2.4.1 CHARACTER OF WASTE

Waste disposed at the Dussault Foundry site consists of spent foundry sand. The sand contains phenolic compounds used as hardening agents in the mold process. The spent sand is dry and generally black in color.

Two samples of the spent foundry sand were collected at the site and analyzed for phenols using the Extraction Procedure (EP) Toxicity Test*. This analysis indicated phenol concentrations of 0.66 ppm and 0.1 ppm respectively.

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* Federal Register/Vol. 45, No. 98/May 19, 1980, Appendix II

LABORATORY REPORT

RESULTS

Table 1. Analysis of EP Extracts for Metals and Phenols
(Expressed as milligrams per liter or ppm)

Analysis	Dust Sand Collector 1/22/81	Landfill SAMPLE #1	Landfill SAMPLE #2	Dust Collector 1/26/81
Arsenic	0.01	<0.01	<0.01	<0.01
Barium	0.30	<0.20	<0.20	<0.20
Cadmium	<0.03	<0.03	<0.03	<0.03
Chromium	<0.10	<0.10	<0.10	<0.10
Lead	<0.25	<0.25	<0.25	<0.25
Mercury	<0.001	<0.001	<0.001	<0.001
Selenium	<0.01	<0.01	<0.01	<0.01
Silver	<0.05	<0.05	<0.05	<0.05
Phenols, Total	0.88	0.66	0.01	1.4

LABORATORY REPORT

QUALITY ASSURANCE

I. Precision

Analyses for metals were performed in triplicate. The results are an average of the triplicate integrations.

As a check on the precision of the phenol analysis, sample "Landfill #1" was run in duplicate. The results of this analysis are listed in Table 2.

Table 2. Duplicate Analysis of "Landfill #1"
(Expressed as milligrams per liter or ppm)

Analysis	Run 1	Run 2	Average	Range	Critical Range
Phenols	0.659	0.660	0.659	0.001	0.075

QUALITY ASSURANCE (cont'd)

II. Accuracy

Table 3. Results of Spiked Samples or EPA Test Standard (Expressed as milligrams per liter)

Analysis	Type	Original Conc.	Added Conc.	Expected Conc.	Reported Conc.	Acceptable 95% Confidence Limits
Arsenic	EPA	0.061	-	0.061	0.065	0.042 - 0.087
	Spike	<0.01	0.025	0.025-0.035	0.038	0.018 - 0.050
Barium	Spike	<0.2	2.5	2.5 - 2.7	2.57	1.75 - 3.85
Cadmium	EPA	0.059	-	0.059	0.055	0.041 - 0.084
	EPA	0.027	-	0.027	0.025	0.019 - 0.039
Chromium	EPA	0.065	-	0.065	0.075	0.045 - 0.093
	Spike	<0.10	0.10	0.10 - 0.2	0.10	0.070 - 0.285
Lead	EPA	0.383	-	0.383	0.375	0.268 - 0.547
	Spike	<0.25	2.5	2.5 - 2.75	2.32	1.75 - 3.92
Mercury	EPA	0.0044	-	0.0044	0.0043	0.002 - 0.008
Selenium	Spike	<0.01	0.025	0.025-0.035	0.028	0.017 - 0.05
Silver	Spike	<0.05	0.100	0.100-0.200	0.100	0.07 - 0.285
Phenol	Spike	0.876	0.2	1.076	1.18	0.97 - 1.20

DUSSAULT FOUNDRY
SOLID WASTE DISPOSAL AREA
CLOSURE PLAN

PREPARED BY
WENDEL ENGINEERS, P.C.

10/86

Introduction

This plan will serve to develop and identify the steps and procedures proposed ~~by~~ Dussault Foundry for the Closure of the onsite waste foundry sand stockpile. This plan has been prepared at the request of the owner in order to comply with the requirements on NYSDEC Region 9 and Niagara County Health Dept. in resolving the concern of the previously stockpiled foundry sand.

~~Historical Review~~

Dussault Foundry is located on Washburn St. in the city of Lockport along the edge of the Niagara escarpment. The company has been operating a foundry operation at that faciliy since 1914. The area of concern is primarily located immediately east of the foundry buildings. ~~It consists~~ of a ~~sand~~ stockpile ~~consisting~~ of aproximately 20,100 cy ~~exhibiting the contours as depicted on the attached drawing no. DUS-84-1.~~

Foundry sand is created when clean sand has been impregnated with resins to form molds and cores for the foundry operations. These sands account for nearly all foundry waste and where practicle can be recylcled a number of times thereby significantly reducing the total of landfill waste leaving the foundry. Dussault Foundry recycles approximately 90 % of all of the sand used during normal foundry operations. The weekly addition of approximately 15 - 20 tons of clean sand to recycled sand balancas the foundry sand requiremnts. Conversely, a similar amount of sand is discarded from the molding process.

The typical flow cycle for materaials used in the molding process in foundry operations is detailed below:

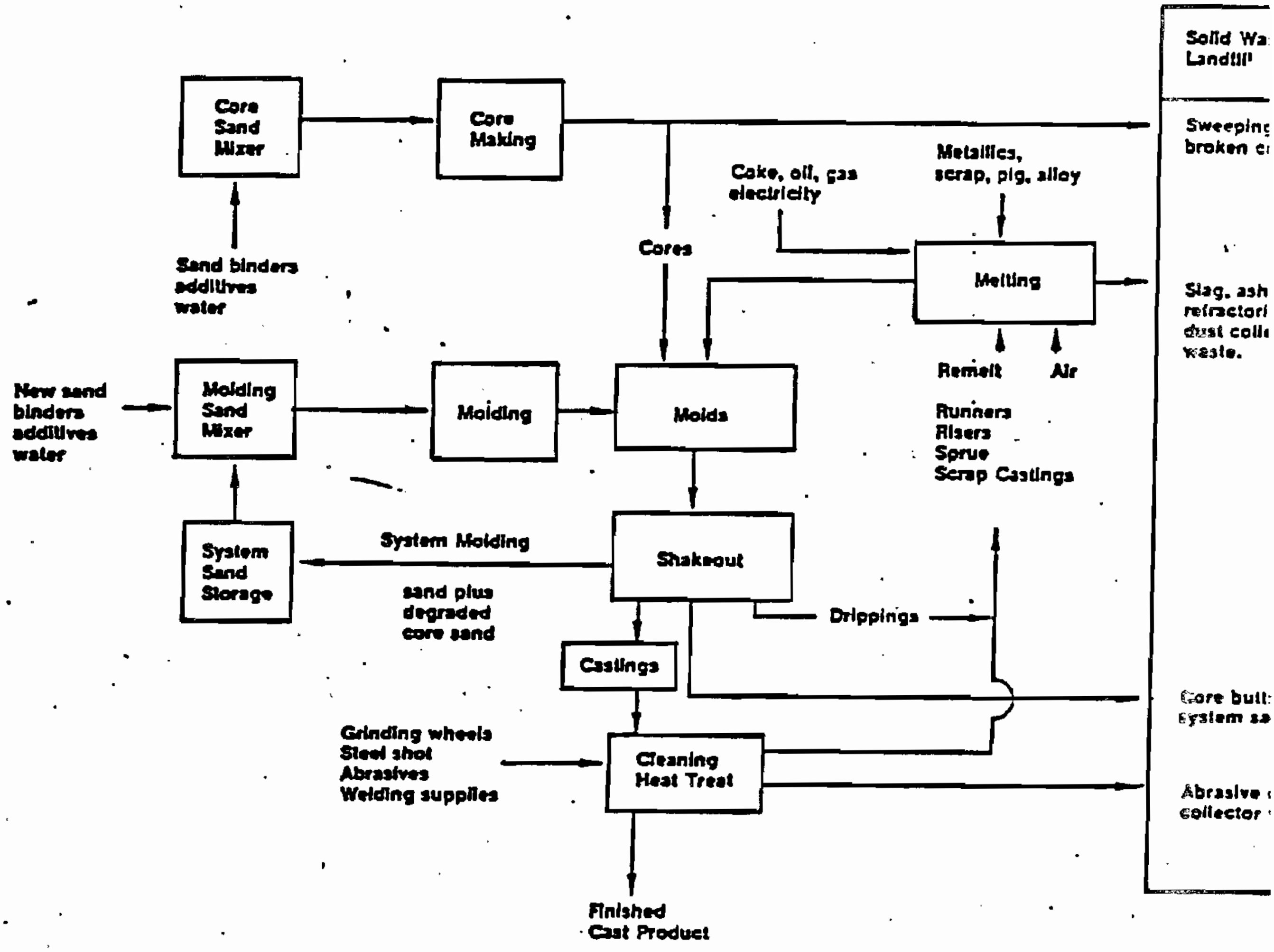


Fig. 1. Flow of materials in green sand foundry processing.

Coremaking and molding usually produce over 75% of the solid wastes generated by sand foundries. Melting operations generate most of the remainder with minor contributions from cleaning and heat treating processes and dust collectors.

Material Test Data

Dussault Foundry has over a period of years tested the foundry sand stockpiled at the facility. This information has been included as an appendex to this report. The most recent testing was conducted by Beak Consultants of Toronto at the direction of Wendel Engineers.

A composite sample was collected from the pile by a Wendel representative. Three individual samples from various depths were combined to form a composite sample of approximately 10 kg. This sample was hand delivered to Beak in Akron and analyzed for the parameter phenol. Review of the analytical data indicates that present levels of phenols in the sand are 20 ug/g, less than levels indicated in earlier test of July 1985, and February 1981 by AES. (see appendix)

Summary of Onsite Landfill Volumes

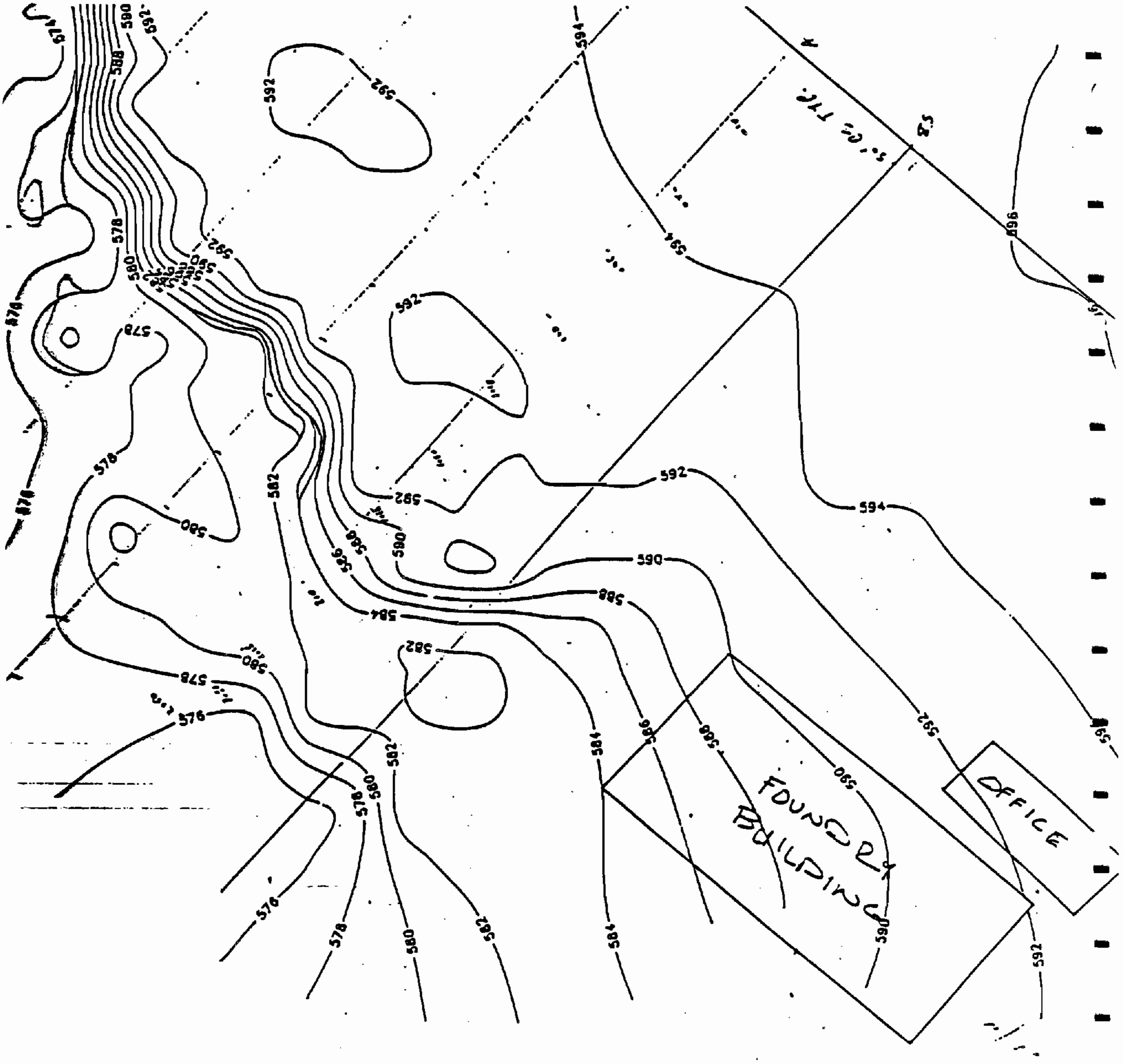
Survey of the existing pile as conducted on 10/86 indicated that approximately 20,100 cy of material existed in the onsite stockpile. The data was gathered using a Wild T-1000 Electronic Total Station and Maptech automated contour package.

A planimetric volume takeoff of the pile and review of test pit data indicated the limits of the closure operation. Excavation of the onsite material for transport to the approved disposal facility, Lockport Landfill, operated by Niagara County Refuse Disposal District will be initiated upon review and approval of this plan.

Evaluation of Cost Estimates

An estimate of closure cost for the removal of sands from the onsite storage pile to the Lockport Landfill facility has been completed. The total volume of sand from the storgae pile would approximate 1005 round trips to the disposal facility assuming a 20 cy truck was used for the material transfer. At present, Farley Trucking has been permitted under Part 364 Regulations to haul material from the site to the Landfill. Dussault Foundry will similarly permit their disposal truck to accommodate disposal of generated waste from the site as required.

As previously stated, approximately 1000 trips to the landfill is required to fulfill Dussaults disposal obligations. A a rate of $12.00 / trip, the total cost for disposal is estimated to be $12,000--$15,000.00. The cost of restoration of the disturbed area has been estimated at roughly $3,200.00, of which approximately $2,500 .00 would be used for the development of a compacted stone laydown area as indicated on Drawing Dus-86-2.



DUSSAULT FND
SAND STOCKPILE
CONTOURS 10/86

~~0~~47-15-11 (10/83)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DIVISION OF SOLID AND HAZARDOUS WASTE

INACTIVE HAZARDOUS WASTE DISPOSAL SITE REPORT

PRIORITY CODE: ______ SITE CODE: 932012

NAME OF SITE: Dussault Foundry REGION: 9

STREET ADDRESS: 2 Washburn St

TOWN/CITY: Lockport COUNTY: Niagara

NAME OF CURRENT OWNER OF SITE: Dussault Foundry

ADDRESS OF CURRENT OWNER OF SITE: 2 Washburn St

TYPE OF SITE: OPEN DUMP ☒ STRUCTURE ☐ LAGOON ☐

LANDFILL ☐ TREATMENT POND ☐

ESTIMATED SIZE: 1 ACRE~~S~~

SITE DESCRIPTION:

HAZARDOUS WASTE DISPOSED: CONFIRMED ☒ SUSPECTED ☐

TYPE AND QUANTITY OF HAZARDOUS WASTES DISPOSED:

TYPE	QUANTITY (POUNDS, DRUMS, TONS, GALLONS)
Volatile organics	
semivolatile organics	

TIME PERIOD SITE WAS USED FOR HAZARDOUS WASTE DISPOSAL:

________________, 19 14 TO December, 19 86

OWNER(S) DURING PERIOD OF USE: Dussault Foundry

SITE OPERATOR DURING PERIOD OF USE: Dussault Foundry

ADDRESS OF SITE OPERATOR: 2 Washburn St, Lockport NY

ANALYTICAL DATA AVAILABLE: AIR ☐ SURFACE WATER ☐ GROUNDWATER ☐
SOIL ☒ SEDIMENT ☐ NONE ☐

CONTRAVENTION OF STANDARDS: GROUNDWATER ☐ DRINKING WATER ☐
SURFACE WATER ☐ AIR ☐

SOIL TYPE: Clays, Silts, Loams

DEPTH TO GROUNDWATER TABLE: unknown, approx 5ft

LEGAL ACTION: TYPE: cited for operating landfill STATE ☒ FEDERAL ☐

STATUS: IN PROGRESS ☒ COMPLETED ☐

REMEDIAL ACTION: PROPOSED ☒ UNDER DESIGN ☐
IN PROGRESS ☒ COMPLETED ☐

NATURE OF ACTION: removal of foundry sand to permitted landfill
closure of foundry fill area

ASSESSMENT OF ENVIRONMENTAL PROBLEMS:

ASSESSMENT OF HEALTH PROBLEMS:

PERSON(S) COMPLETING THIS FORM:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION	NEW YORK STATE DEPARTMENT OF HEALTH
NAME ________	NAME ________
TITLE ________	TITLE ________
NAME ________	NAME ________
TITLE ________	TITLE ________
DATE: ________	DATE: ________

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

03403106

CITY OF
LOCKPORT,
NEW YORK
NIAGARA COUNTY

PANEL 2 OF 3
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
360503 0002 B

EFFECTIVE DATE:
FEBRUARY 4, 1981

federal emergency management agency
federal insurance administration

KEY TO MAP

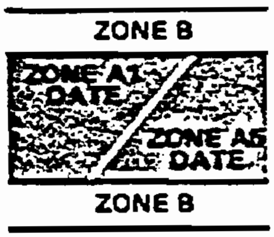
500-Year Flood Boundary

100-Year Flood Boundary

Zone Designations* With Date of Identification e.g., 12/2/74

100-Year Flood Boundary

500-Year Flood Boundary



Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7 ×
River Mile	• M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
AO	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION: