EA REPORT DEC63A

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

RCA - RIVERHEAD
TOWN OF SOUTHAMPTON, SUFFOLK COUNTY
NEW YORK I.D. NO. 152012

Prepared for

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

Prepared by

EA Science and Technology
R.D. 2, Goshen Turnpike
Middletown, New York 10940

A Division of EA Engineering, Science, and Technology, Inc.

June 1987

CONTENTS

1. Executive Summary

1. EXECUTIVE SUMMARY

The RCA - Riverhead site (New York I.D. No. 152012, EPA No. NY D980506786) is an inactive open dump located on a 2,056-acre tract of land 2 mi south of the community of Riverhead along the Riverhead-Quogue Road in the Town of Southampton, Suffolk County, New York (Figures 1-1 and 1-2; Photos 1-1 through 1-4). RCA Corporation owned and operated the site from 1927 until 1975. In 1978, the site, as well as the surrounding 2,056 acres, was donated to the New York State Department of Environmental Conservation (NYSDEC). In 1980, a team from the NYSDEC inspected the site and found municipal refuse and electronic parts, including capacitors containing 100 percent Aroclor 1254 (PCB). Wire, cable reels, and poles were also found. Soil samples collected at the site contained PCB concentrations up to 98 ppm. Downgradient surface water and ground-water samples were collected and analyzed, and found to contain less than 1 ppb of PCB. RCA agreed to remove contaminated soil and waste material from the site, however, and there is not enough evidence to prove that this was accomplished in late 1984.

The preliminary HRS scores for this site are as follows: Migration Score (S_M) = 29.50 (S_{gw} = 50.41, S_{sw} = 7.97, S_a = 0), Fire and Explosion Score (S_{FE}) = N/A, and Direct Contact Score (S_{DC}) = 25.0. There are insufficient data available to prepare a final HRS score for this site. In order to prepare a final HRS score for this site, analytical data regarding the HSL quality of the ground water will be necessary, thus requiring performance of a Phase II investigation. The proposed Phase II study would include the installation of three test borings/observation wells and the collection and analysis of ground-water samples. If contaminant releases are confirmed, the maximum attainable S_M is 34.86.

Site Coordinates:

Latitude: 40° 50' 42"
Longitude: 72° 42' 55"

RCA - RIVERHEAD

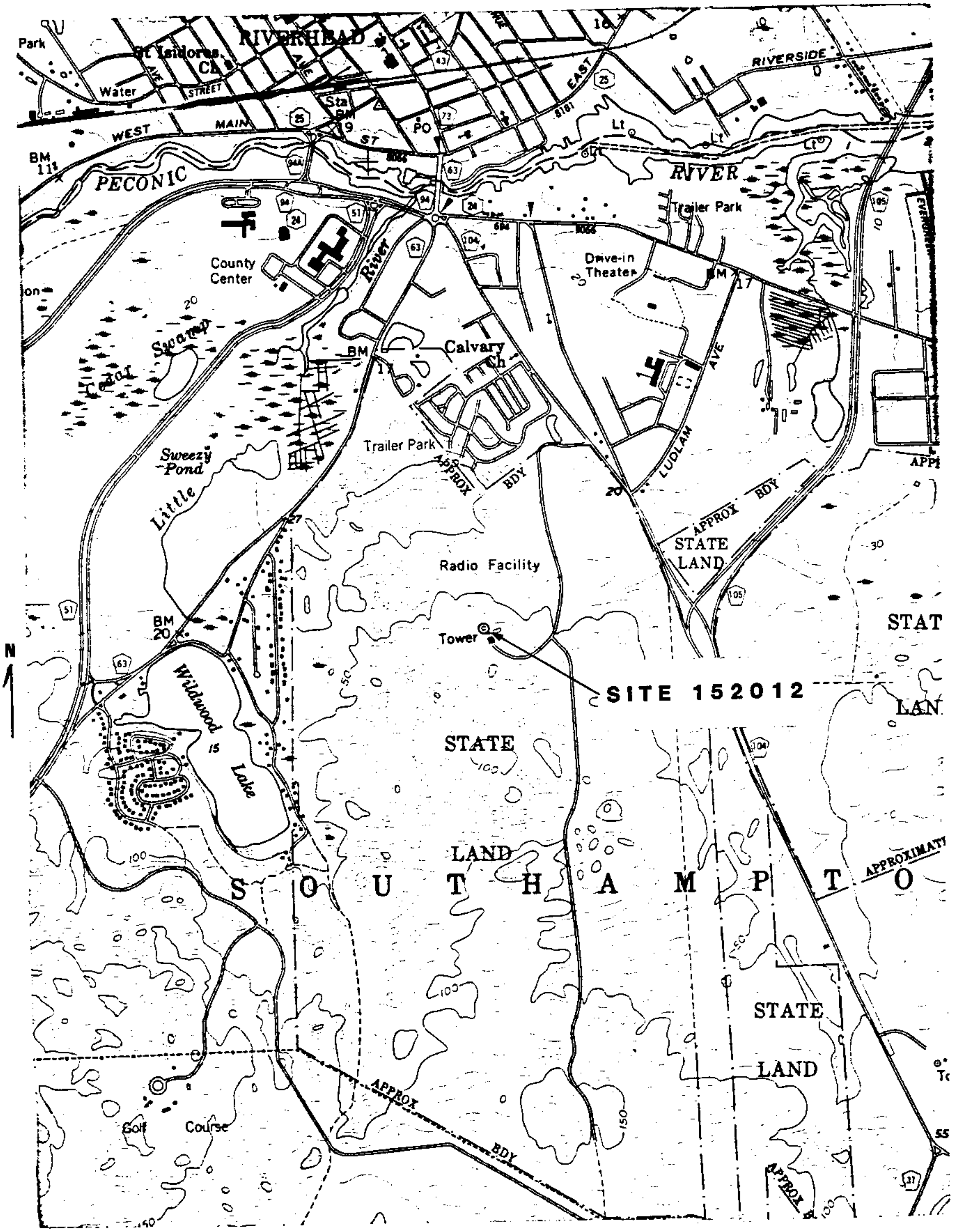


Figure 1-1.

RIVERHEAD QUAD.

Scale 1:24,000

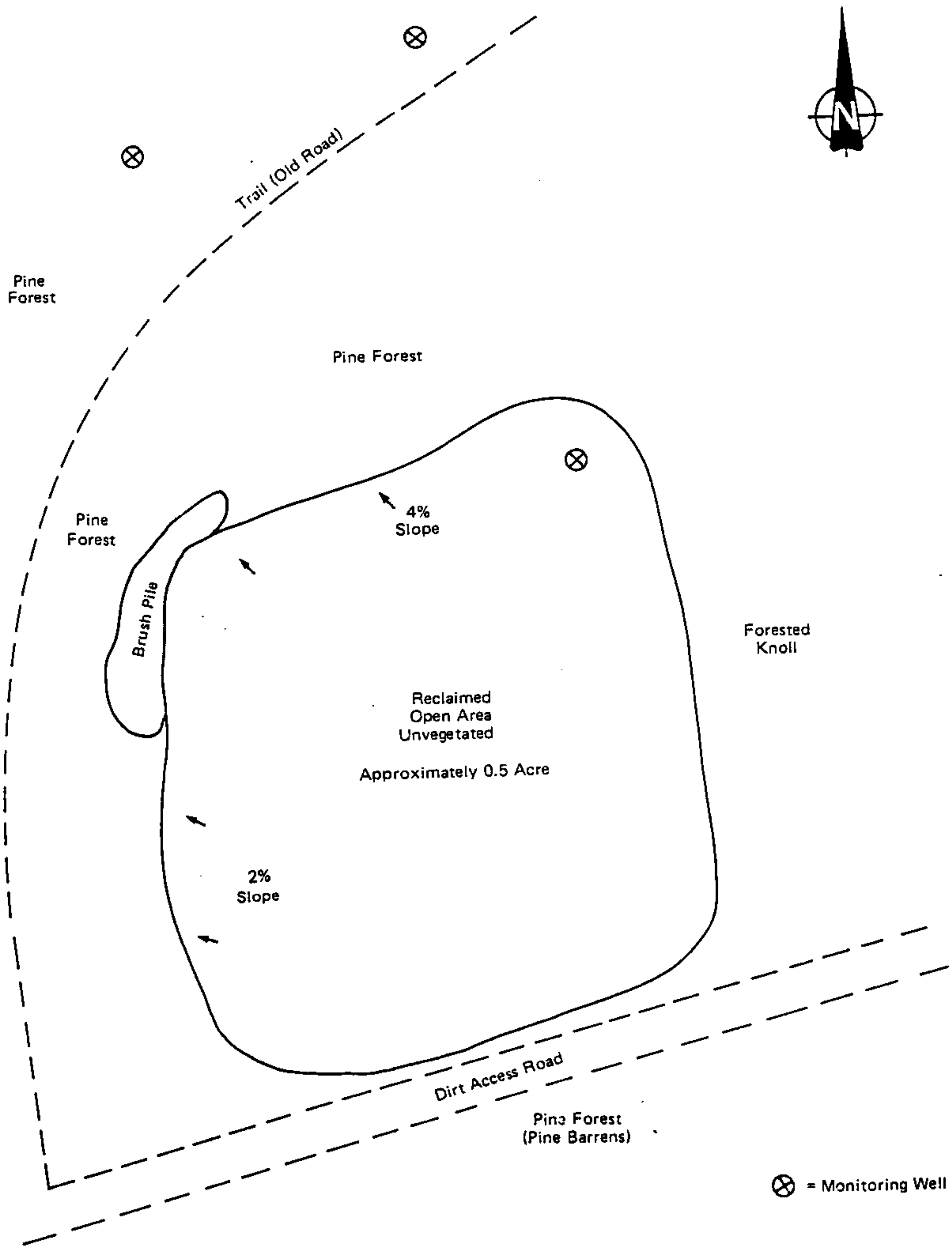


Figure 1-2. Site sketch. RCA – Riverhead Site, 23 January 1986. (Not to scale)


1-1


1-2


1-3

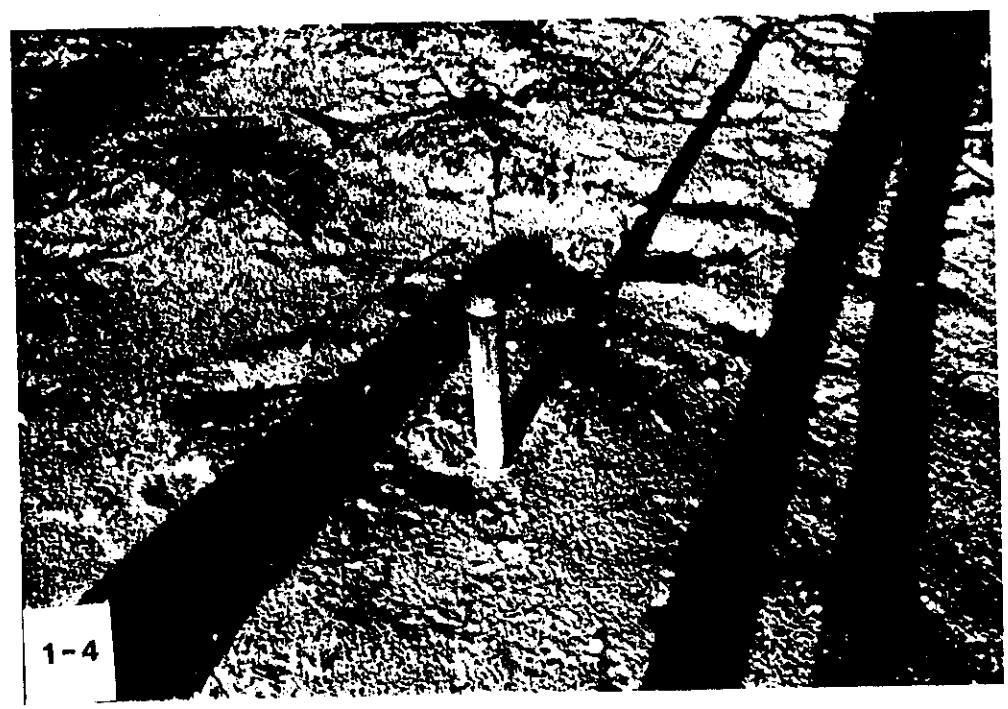

1-4

PHOTO LOG - RCA - RIVERHEAD SITE

Photo	Description
1-1	This is the view facing northwest from the dirt access road which passes by the site. The site is unvegetated and there are still signs of earth-moving activity. A piezometer can be seen near the center of the picture.
1-2	Another view of the same area facing southeast. The roadway is along the treeline.
1-3	This photo shows the site from yet another angle facing north. The site is completely surrounded by a low pine forest. Soil is sandy.
1-4	A closeup view of the piezometer onsite.

2. Purpose

2. PURPOSE

The RCA - Riverhead site is listed on the New York State Registry of Inactive Hazardous Waste Sites because it was an open dump where RCA disposed of electrical components which contained PCB.

The goal of the Phase I investigation of this site was to: (1) obtain available records on the site history from state, federal, county, and local agencies; (2) obtain information on site topography, geology, local surface water and ground-water use, previous contamination assessments, and local demographics; (3) interview site owners, operators, and other groups or individuals knowledgeable of site operations; (4) conduct a site inspection to observe current conditions; and (5) prepare a Phase I report. The Phase I report includes a preliminary Hazard Ranking Score (HRS), an assessment of the available information, and a recommended work plan for Phase II studies.

3. SCOPE OF WORK

`CA - Riverhead site involved a site

`, as well as record searches and

·iduals were contacted:

'ormation Received

`terview

-erview

Contact	Information Received
Ms. Karen Chytalo New York State Department of Environmental Conservation Region 1 Stony Brook, New York 11790 (516) 751-7900 ext. 301	Phone interview, selected files
Mr. Anthony Candela, P.E. Senior Sanitary Engineer New York State Department of Environmental Conservation Division of Solid Waste SUNY Campus - Building 40 Stony Brook, New York 11794 (516) 751-7900	Selected files
Mr. James H. Pim, P.E. Suffolk County Department of Health Services Hazardous Materials Management 15 Horseblock Place Farmingville, New York 11738 (516) 451-4634	Interview and site file
Mr. Steve Carey/Mr. Dennis Moran Suffolk County Department of Health Services Bureau of Water Resources 225 Rabro Drive East Hauppauge, New York 11788 (516) 348-2893	Ground-water use; public water supplies and ground-water monitoring information
Mr. Dan Fricke Suffolk County Cooperative Extension Association 264 Griffing Avenue Riverhead, New York 11901 (516) 727-7850	Ground-water and surface water use for irrigation
Mr. William Schickler/Mr. Robert Bowen Suffolk County Water Authority Sunrise Highway and Pond Road Oakdale, New York 11769 (516) 589-5200	Public water supply and distribution
Mr. Doug Pica New York State Department of Environmental Conservation Division of Water SUNY Campus - Building 40 Stony Brook, New York 11794 (516) 751-7900	Ground-water use for irrigation

Contact	Information Received
Mr. Allan S. Connell District Conservationist U.S. Department of Agriculture Soil Conservation Survey 127 East Main Street Riverhead, New York 11901	Ground-water use for irrigation
Mr. Ken Jones Fire Marshal Town of Southampton 116 Hampton Road Southampton, New York 11968 (516) 283-6020	Information regarding the threat of fire and/or explosion at the site
Mr. Kevin Walter, P.E. New York State Department of Environmental Conservation Division of Hazardous Waste Enforcement 50 Wolf Road Albany, New York 12233-0001 (518) 457-5637	No file/information
Mr. John Iannotti, P.E. New York State Department of Environmental Conservation Bureau of Remedial Action 50 Wolf Road Albany, New York 12233-0001 (518) 457-5637	Selected files
Mr. Earl Barcomb, P.E. New York State Department of Environmental Conservation Landfill Operations Vatrano Road Albany, New York 12205 (518) 457-2051	No file/information
Mr. Peter Skinner, P.E. New York State Attorney General's Office Room 221 Justice Building Albany, New York 12224 (518) 474-2432	No file/information
Mr. Ron Tramontano/Mr. Charlie Hudson New York State Department of Health Bureau of Toxic Substance Assessment Nelson A. Rockefeller Empire State Plaza Corning Tower Building, Room 342 Albany, New York 12237 (518) 473-8427	Selected files

Contact	Information Received
Mr. James Covey, P.E. New York State Department of Health Nelson A. Rockefeller Empire State Plaza Corning Tower Building Albany, New York 12237 (518) 473-4637	Community Water Supply Atlas
Mr. Rocky Paggione, Atty./ Mr. Louis A. Evans, Atty. New York State Department of Environmental Conservation Division of Environmental Enforcement 202 Mamaroneck Avenue White Plains, New York 10601-5381 (914) 761-6660	No file/information
Mr. Marsden Chen, P.E. New York State Department of Environmental Conservation Bureau of Site Control 50 Wolf Road Albany, New York 12233-0001 (518) 457-0639	Site file (EPA form)
Mr. Perry Katz U.S. Environmental Protection Agency Region II Room 757 26 Federal Plaza New York, New York 10278 (212) 264-4595	Selected files

SITE ASSESSMENT - RCA (RIVERHEAD)

tive, open dump site located on a 2,056-acre

e community of Riverhead along the

hampton, Suffolk County. The actual

The site and surrounding 2,056

The dump site was utilized by

uding the dump site, were

by the NYSDEC in 1980

parts including

re contained wire,

analyzed by

) (Appendix

-theast

tain

4. Site Assessment

Department of Health Services (SCDHS) laboratory for the following parameters: conductivity, pH, alkalinity, chloride, sulfate, T.C., nitrate, nitrite, ammonia, O-PO_4-P, dissolved solids, iron, manganese, magnesium, calcium, sodium, and potassium (Appendix 1.1-5). Evidently, seven samples were sent to the NYSDEC lab at Stony Brook for PCB analysis. Analysis was performed on three samples from Well No. 1 (72-ft, 62-ft, and 52-ft recovery depths) and three samples from Well No. 2 (72-ft, 62-ft, and 52-ft recovery depths). No concentration of PCB was detected at or above the detection limit of 1 ppb (Appendix 1.1-6). In 1981, RCA agreed to arrange for their consultant (Betz, Converse, and Murdoch [BCM]) to test the concentration of PCBs in the soil at the landfill, and to arrange for all waste materials to be transported to the Brookhaven Landfill if the tests indicated the waste was not considered hazardous (Appendix 1.1-7). The NYSDEC agreed that after the material was removed there would be no need for ground-water monitoring (Appendix 1.1-7). BCM contacted the NYSDEC to make arrangements for collecting and testing the soil at the RCA - Riverhead site (Appendix 1.1-8). BCM sampled at the site in October 1981. Six soil samples were collected by BCM/NYSDEC and submitted to the BCM laboratory and subjected to the following analysis:

- EPA toxic extraction procedure (TEP)
- EP Toxic metals on leachate
- EP Toxic pesticide on leachate
- PCB scan on whole sample (sample leached with hexane)
- Total organic carbon analysis on whole sample

None of the metals or pesticides exceeded EPA maximum concentrations for EP Toxicity. The maximum PCB concentration in any of the samples was found to be 17 ppm (in a composite debris sample from the "west" portion of the site) (Appendix 1.1-9). The NYSDEC then requested that the TEP leachate derived from these same debris/soil samples be analyzed for PCB, even though samples contained less than 50 ppm PCB. BCM resampled the debris piles and analyzed these samples for total PCB and PCB in the TEP leachates. No PCBs were detected in the leachate, however, analysis of the "west" pile composite debris sample contained 98 ppm total PCB. BCM sampled again more intensively in 1983, collecting seven composite soil and debris samples. This time the highest concentration of PCB in any composite sample was found to be 29 ppb (Appendix 1.1-9). BCM recommended that all bulky debris and soil be excavated and removed from the site and that, after all contaminated material was removed from the site, samples of the underlying soils should be collected in a 4 x 5 grid (20 grab samples) using a 20-ft square spacing... and that these 20 grab samples should be combined into one (1) composite sample for total PCB analysis to confirm the absence of PCB (50 ppm threshold).

In 1984, the contaminated materials were reportedly removed by agents of RCA, however, there is not enough evidence to prove that this was accomplished (Appendixes 1.1-10, 1.1-11, and 1.1-12). The composite sample analysis of the underlying soils indicates a residual concentration of <6.75 ug/kg total PCB (Appendix 1.1-11).

4.2 SITE TOPOGRAPHY

The RCA Riverhead site is located near the center of Long Island in Suffolk County at an elevation of approximately 60 ft above mean sea level (Appendix 1.2-1). The regional slope is north and west and northeast at 1-4 percent. The site slope ranges from 1 to 4 percent northeast. The site is bordered on the north, east, and west by stands of pitch pine and scrub oak. The south border is formed by a dirt access road (EA Site Inspection). The site is approximately 0.5 acres in size and located in the center of 2,056 acres of pine barrens that are presently owned by NYSDEC. The 2,056 acres are used as a recreation area. A permit is required to enter the 2,056-acre tract, and the road leading into it is gated, however, the site itself is not separated from the rest of the area by any barrier. The site has been completely cleared and leveled (EA Site Inspection). The nearest surface waterbody is Wildwood Lake, located approximately 3,800 ft west-southwest of the site (Appendix 1.2-1). The nearest well to the RCA Landfill is a private well located 6,200 ft northeast of the site (Appendix 1.2-1). The nearest commercial building is located approximately 5,000 ft north of the site along County Route 113 (Appendix 1.2-1). The nearest residence is a trailer near the junction of County Route 113 and the entrance road to the NYSDEC property, 2,900 ft north-northeast of the site (Appendix 1.2-1).

4.3 SITE HYDROGEOLOGY

The site is directly underlain by Pleistocene Age glacial deposits. This deposit is then in turn underlain by Cretaceous Age Magothy Formation, the Clay Member and Lloyd Sand Member of the Raritan Formation, and finally by Precambrian Age gneiss and schist bedrock (Appendixes 1.3-1 and 1.3-2). The ground surface elevation at the site is approximately 60-70 ft above mean sea level. The Pleistocene deposits are estimated to be 100 ft in thickness (Appendix 1.3-3), and largely comprised of sand and gravel at least to a depth of about 70 ft below grade (Appendix 1.1-5).

Water pumped from aquifers underlying Suffolk County is the sole source of water for public supply, agriculture, and industry (Appendix 1.3-4). The glacial and Magothy aquifers act as a single hydrologic unit (Appendix 1.3-4).

Apparently only the glacial aquifer portion has been developed for water supply within 3 mi of the site, however, both the glacial and Magothy aquifers are designated as the aquifer of concern.

Recharge to the upper glacial aquifer is derived from precipitation. The average annual precipitation in the area is approximately 45 in. of which approximately 22 in. is estimated to infiltrate to the water table (Appendix 1.3-5). The remainder of the precipitation is returned to the atmosphere by evaporation and transpiration, except for a small amount of runoff to stream. Recharge to the Magothy aquifer is derived entirely from the downward movement of water from the overlying glacial aquifer.

Site specific permeability data are not available. However, infiltration tests performed in the upper Pleistocene glacial deposits in the vicinity of the Brookhaven National Laboratory (Warren et al. 1968) indicate that water may move from the land surface to the water table at rates of up to 30 ft/day (Appendix 1.3-5). Warren et al (1968) also reports an average porosity value of 0.33 and vertical permeabilities ranging from 75 to 350 gpd/ft^2 for the saturated portion of the upper Pleistocene glacial deposits (upper glacial aquifer).

Based upon the March 1985 ground-water table contour map (SCDHS), the ground water is estimated to be approximately 50 ft below ground surface, and the regional ground-water natural (unaffected by pumping) flow direction appears to be toward the northeast. Within 3 mi of the site, the aquifer of concern has been reportedly developed by one Suffolk County Water Authority well field, three community of Riverhead well fields, and private wells. Appendix 1.3-6 provides a list of the municipal wells located within 3 mi of the site. The developed area within 3 mi of the site is served by the suffolk County Water Authority, the community of Riverhead, and private wells.

4.3 SITE CONTAMINATION

Waste Types and Quantities

An unknown quantity of electrical components were buried onsite sometime between 1927 and 1975 (Appendix 1.1-1). The liquid from one capacitor was analyzed and found to be 100 percent Aroclor 1254 (PCB) (Appendix 1.1-3). Wire, municipal refuse, cable reels, and poles were also found (Appendix 1.1-2). In 1984, RCA reportedly removed the capacitors, contaminated soil, and all other debris, however, there is not enough evidence to prove that this was accomplished (Appendixes 1.1-10, 1.1-11, and 1.1-12).

Ground Water

Analysis of a ground-water sample taken from Well No. 1 on the site in 1980 yielded the following results: iron at a concentration of 0.57 mg/liter, manganese at 0.05 mg/liter, magnesium at 1.3 mg/liter, chloride at 6.0 mg/liter, calcium at 1.9 mg/liter, sodium at 4.8 mg/liter, and potassium 1.0 mg/liter (Appendix 1.1-5). The NYSDEC reportedly analyzed six downgradient ground-water samples and reported less than 1 ppb of PCB (Appendix 1.1-6).

Surface Water

Water samples were taken from three surface waterbodies downstream of the RCA - Riverhead site in 1980 by NYSDEC and analyzed by NYSDEC. They reported less than 1 ppb of PCB in each of the samples (Appendix 1.1-3).

Soil

BCM sampled the soil of RCA - Riverhead site in 1981. Six samples were collected. Results were as follows:

Parameter	Concentration* in Sample Number 1	2	3	4	5	6	EPA Maximum Concentration for EP Toxicity
Arsenic	<0.001	0.001	0.005	0.002	<0.001	<0.001	5.0
Barium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	100.0
Cadmium	<0.005	0.012	0.073	0.040	0.012	0.045	1.0
Chromium	0.052	0.052	0.052	0.052	0.052	0.052	5.0
Lead	<0.10	<0.10	1.36	<0.10	<0.10	<0.10	5.0
Mercury	0.0002	0.0002	0.0005	<0.0005	0.0002	0.0001	0.2
Silver	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	5.0
Selenium	0.003	<0.001	0.001	0.013	0.012	0.015	1.0

* All values in mg/liter.

Parameter and Units	Sample Number 1	2	3	4	5	6	EPA Maximum Concentration for EP Toxicity
EP Toxic Pesticides in Leachate							
Endrin (ppb)*	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.02
Lindane (ppb)	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.4
Methoxychlor (ppb)	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	10.0
Toxaphene (ppb)	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.5

Parameter	Concentration* in Sample Number 1	2	3	4	5	6	EPA Maximum Concentration for EP Toxicity
2,4-D (ppb)	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	10.0
2,4,5-TP Silvex (ppb)	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	1.0
Other Constituents							
PCB (ppb) (whole sample basis-leached with hexane)	<0.1	<0.1	3,000	1,700	17,000	900	50,000**
Total Organic Carbon (mg/kg)	80,000	162,000	167,000	423,000	195,000	135,000	---

* Parts per billion.
** PCB concentration "cutoff" below which a material is not considered a "PCB item" under the Toxic Substances Control Act (TSCA).

In 1982, sampling was again conducted by BCM. This time a sample of debris from the "west" side contained 98 ppm total PCB (Appendix 1.1-9).

In 1983, a third set of samples was collected from the west side of the site with the following results (Appendix 1.1-9):

Sample Designation*	PCB Concentration ** ppm
W-1	29.0
W-2	17.0
W-3	28.0
W-4	0.90
W-5	2.10
W-6	2.60
Control	<0.01

* Appendix 1.1-9.
** Reported as milligrams per kilogram (ppm - whole sample basis) as Aroclor 1260.

In 1984, RCA reportedly excavated and removed capacitors, contaminated soil, and bulky debris. A composite sample of the underlying soils indicates a residual concentration of <6.75 ug/kg total PCB (Appendix 1.1-11).

Air

No data available.

5. Preliminary HRS

5.1 Narrative Summary

RCA - RIVERHEAD
TOWN OF SOUTHAMPTON, SUFFOLK COUNTY

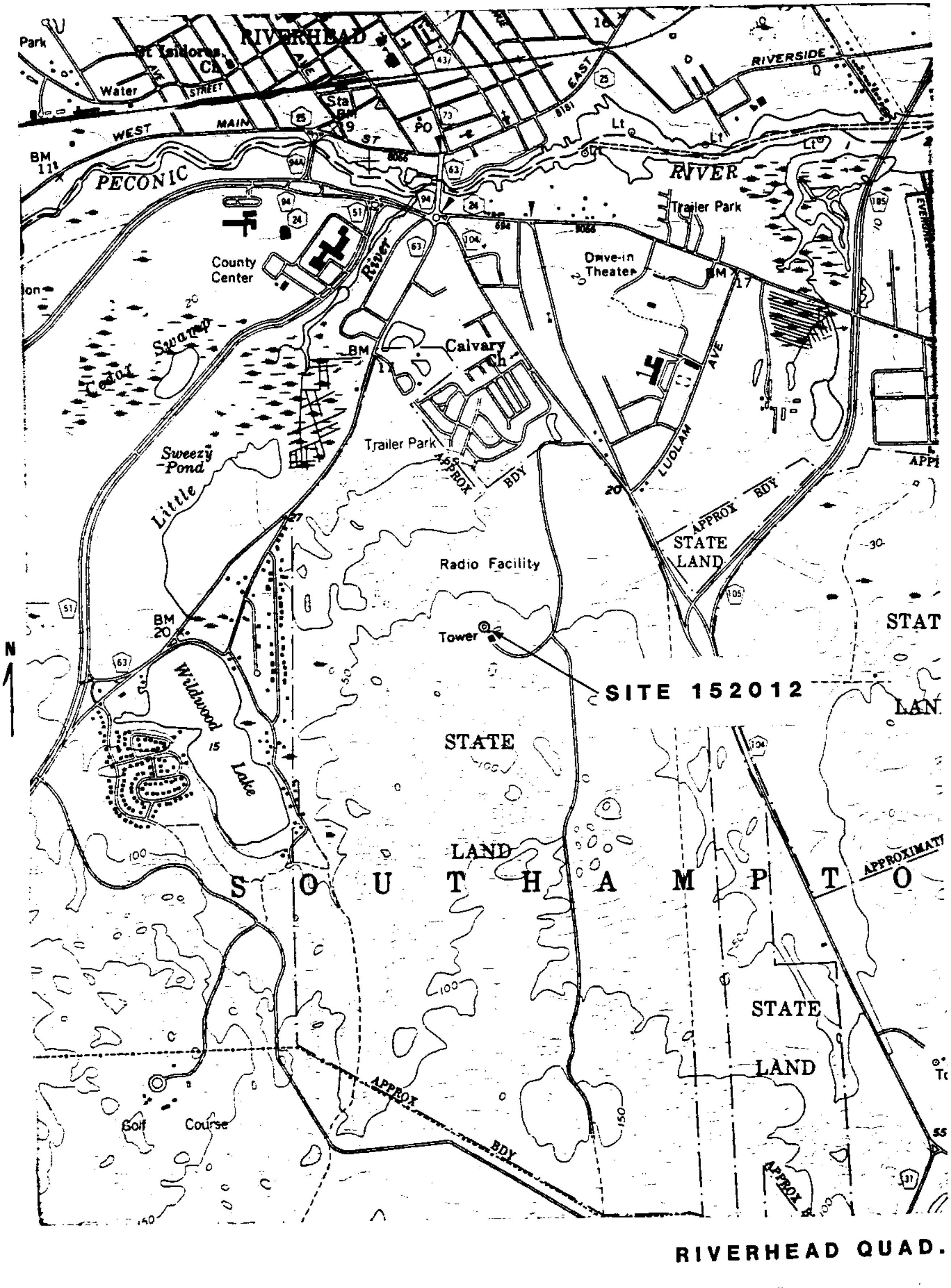
The RCA - Riverhead site is an inactive, open dump located on a 2,056-acre tract of forested land 2 mi south of the community of Riverhead along the Riverhead-Quogue Road in the Town of Southampton, Suffolk County. RCA Corporation owned and operated the site from 1927 until 1975. In 1978, RCA donated the site and the surrounding 2,056 acres to the New York State Department of Environmental Conservation (NYSDEC). In 1980, a NYSDEC inspection team found municipal refuse and electronic parts, including capacitors containing 100 percent PCB Aroclor 1254. Downgradient surface water and ground-water samples collected by NYSDEC were found to contain less than 1 ppb of PCB. Betz, Converse & Murdoch, Inc., an agent of RCA, collected and analyzed soil samples in 1981, 1982, and 1983, and found PCB concentrations ranging from less than 1 ppm to 98 ppm. RCA reportedly removed soil and debris from the site.

5.2 Location

Site Coordinates:

Latitude: 40° 50' 42"
Longitude: 72° 42' 55"

RCA - RIVERHEAD



RIVERHEAD QUAD.

Scale 1:24,000

Suffolk County, New York

Building 40

York 11794

Date: 19 November 1986

zardous substances: location of the for rating, agency action, etc.)

located on a 2,056

by NYSDEC. RCA

Electrical

hemical

ls in the

the

5.3 HRS Worksheets

Ground Water Route Work Sheet							
Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)	Max Score
1 Observed Release	(0) 45	1	0	45	3.1	45
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	3	3		
Permeability of the Unsaturated Zone	0 1 2 (3)	1	3	3		
Physical State	0 1 2 (3)	1	3	3		
Total Route Characteristics Score			13	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	18	18		
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8		
Total Waste Characteristics Score			19	26		19
5 Targets					3.5	
Ground Water Use	0 1 2 (3)	3	9	9		
Distance to Nearest Well/Population Served	0 4 6 8 10 / 12 16 18 20 / 24 (30) 32 35 40	1	30	40		
Total Targets Score			39	49		39
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			28,899	57,330		33,345
7 Divide line 6 by 57,330 and multiply by 100		S_{gw} =	50.41			58.16

FIGURE 2
GROUND WATER ROUTE WORK SHEET

Surface Water Route Work Sheet						
Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max Score	Ref. (Section)	Max Score
[1] Observed Release	(0) 45	1	0	45	4.1	45
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	0	3		
1-yr. 24-hr. Rainfall	0 1 (2) 3	1	2	3		
Distance to Nearest Surface Water	0 1 (2) 3	2	4	6		
Physical State	0 1 2 (3)	1	3	3		
Total Route Characteristics Score			9	15		
[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	18	18		
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8		
Total Waste Characteristics Score			19	26		19
[5] Targets					4.5	
Surface Water Use	0 1 (2) 3	3	6	9		
Distance to a Sensitive Environment	0 1 (2) 3	2	4	6		
Population Served/Distance to Water Intake Downstream	(0) 4 6 8 10 12 16 18 20 24 30 32 35 40	1	0	40		
Total Targets Score			10	55		10
[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]			5,130	64,350		8,550
[7] Divide line [6] by 64,350 and multiply by 100	S_{sw} = 7.97					13.29

FIGURE 7
SURFACE WATER ROUTE WORK SHEET

Air Route Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max Score	Ref. (Section)
[1] Observed Release	0 45	1	0	45	5.1
Date and Location:					
Sampling Protocol:					
If line [1] is 0, the S_a = 0. Enter on line [5]. If line [1] is 45, then proceed to line [2].					
[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	
[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	
[4] Multiply [1] x [2] x [3]				35,100	
[5] Divide line [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})	50.41	2,541.17
Surface Water Route Score (S_{sw})	7.97	63.52
Air Route Score (S_a)	0	0
$S_{gw}^2 + S_{sw}^2 + S_a^2$		2,604.69
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2}$		51.04
$\sqrt{S_{gw}^2 + S_{sw}^2 + S_a^2} / 1.73 = S_M =$		29.50

FIGURE 10
WORKSHEET FOR COMPUTING S_M

Maximum S_M = 34.49

Fire and Explosion Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max Score	Ref. (Section)
1 Containment	1 3	1		3	7.1
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	
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	
4 Multiply 1 x 2 x 3				1,440	
5 Divide line 4 by 1,440 and multiply by 100	S_{FE} = NA				

FIGURE 11
FIRE AND EXPLOSION WORK SHEET

Direct Contact Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max Score	Ref. (Section)
1 Observed Incident	(0) 45	1	0	45	8.1
If line 1 is 45, proceed to line 4 If line 1 is 0, proceed to line 2					
2 Accessibility	0 1 2 (3)	1	3	3	8.2
3 Containment	0 (15)	1	15	15	8.3
4 Waste Characteristics Toxicity	0 1 2 (3)	5	15	15	8.4
5 Targets					8.5
Population Within a 1-Mile Radius	0 1 (2) 3 4 5	4	8	20	
Distance to a Critical Habitat	(0) 1 2 3	4	0	12	
Total Targets Score			8	32	
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			5,400	21,600	
7 Divide line 6 by 21,600 and multiply by 100	S_{DC} = 25,0				

FIGURE 12
DIRECT CONTACT WORK SHEET

5.4 HRS Documentation

DOCUMENTATION RECORDS
FOR
HAZARD RANKING SYSTEM

INSTRUCTIONS: The purpose of these records is to provide a convenient way to prepare an auditable record of the data and documentation used to apply the Hazard Ranking System to a given facility. 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 that will make the document used for a given data point easier to find. Include the location of the document and consider appending a copy of the relevant page(s) for ease in review.

FACILITY NAME: RCA - Riverhead

LOCATION: Town of Southampton, Suffolk County

DATE SCORED: 19 November 1986

PERSON SCORING: EA Science and Technology

PRIMARY SOURC(S) OF INFORMATION (e.g., EPA region, state, FIT, etc.)

New York State Department of Environmental Conservation
Suffolk County Department of Health Services
J. Husted. Personal Communication (Appendix 1.1-10)
J.M. Etter. Personal Communication (Appendix 1.1-10)
RCA Corporation

FACTORS NOT SCORED DUE TO INSUFFICIENT INFORMATION:

Air route
Direct release to ground water or surface water

COMMENTS OR QUALIFICATIONS:

The ground water route is scored on the basis of a confirmed contamination of surficial soil onsite.

The local fire marshal does not consider the site an imminent fire or explosion threat.

Direct contact is scored based on observed release of waste to surficial soil onsite.

GROUND WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected (5 maximum):

None detected.

Assigned value = 0.

References: 1 and 2.

Rationale for attributing the contaminants to the facility:

***

2 ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

Pleistocene Age glacial deposits.

References: 3 and 4.

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

32 ft.

References: 5 and 6.

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

5 ft.

Reference: 7.

Depth to aquifer of concern is 27 ft.

Assigned value = 2.

Reference: 2.

Net Precipitation

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

Mean annual precipitation = 45 in.

Reference: 8.

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

Net precipitation (subtract the above figures):

Mean annual infiltration = 22 in.

Reference: 8.

Assigned value = 3.

Reference: 2.

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

Sand and gravel.

Reference: 9.

Permeability associated with soil type:

$>10^{-3}$ cm/sec.

Assigned value = 3.

Reference: 2

Physical State

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

Liquid.

Reference: 10.

Assigned value = 3.

Reference: 2.

***

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Containers: abandoned capacitors.

Reference: 10.

Method with highest score:

Containers leaking and no liner.

Reference: 10.

Assigned value = 3.

Reference: 2.

***

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

PCB.

Reference: 10.

Compound with highest score:

PCB = 18.

Reference: 2.

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):

Unknown.

Basis of estimating and/or computing waste quantity:

Minimul quantity assumed.

Assigned value = 1.

Reference: 2.

***

5 TARGETS

Ground Water Use

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

Drinking water. No municipal water from alternate unthreatened source presently is available.

References: 11-13.

Assigned value = 3.

Reference: 2.

Distance to Nearest Well

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

Private well northeast of the site.

References: 6 and 13.

Distance to above well or building:

6,200 ft.

Reference: 6.

Assigned value = 2.

Reference: 2.

Population Served by Ground Water 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:

Community Supplies:	Population
Oakland Ridge Mobile Park	120
Peconic River Trailer Park	90
Peconic View Adult Mobile Home Park	70
Pinecrest Garden Apartments	392
Riverhead Water District	12,000
Total	12,672

Appendix 1.3-6 provides a list of community well fields and wells.

An undetermined number of domestic wells exist within the aquifer of concern within a 3-mi radius of the site.

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):

There are approximately 300 acres of land used for agriculture purposes within a 3 mi radius of the site. However, irrigation wells on agricultural land in Suffolk County are not registered by any regulatory agency, so there are no lists or descriptions of the locations of these wells.

References: 16-20.

Total population served by ground water within a 3-mile radius:

12,672.

References: 11-16.

Assigned value = 5.

Combined assigned value = 30.

Reference: 2.

SURFACE WATER ROUTE

1 OBSERVED RELEASE

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

No PCB detected in three surface water samples.

Assigned value = 0.

References: 1 and 21.

Rationale for attributing the contaminants to the facility:

***

2 ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:

2 percent.

Reference: 22.

Name/description of nearest downslope surface water:

Wildwood Lake.

Reference: 6.

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

2 percent.

Reference: 6.

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

No.

References: 6 and 22.

Is the facility completely surrounded by areas of higher elevation?

No.

References: 6 and 22.

Assigned value = 0.

Reference: 2.

1-Year, 24-Hour Rainfall in Inches

2.5-3.0 in.

Reference: 2.

Assigned value = 2.

Reference: 2.

Distance to Nearest Downslope Surface Water

3,800 ft.

Reference: 6.

Assigned value = 2.

Reference: 2.

Physical State of Waste

Liquid.

Reference: 1.

Assigned value = 3.

Reference: 2.

***

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

Containers: abandoned capacitors.

Reference: 10.

Method with highest score:

Containers leaking and no liner.

Reference: 10.

Assigned value = 3.

Reference: 2.

4 WASTE CHARACTERISTICS

<u>Toxicity and Persistence</u>

Compound(s) evaluated

PCB.

Reference: 10.

Compound with highest score:

PCB = 18.

Reference: 2.

<u>Hazardous Waste Quantity</u>

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):

Unknown.

Basis of estimating and/or computing waste quantity:

Assume minimum quantity.

Assigned value = 1.

Reference: 2.

***

5 TARGETS

<u>Surface Water Use</u>

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

Recreation.

Reference: 23.

Assigned value = 2.

Reference: 2.

Is there tidal influence?

No. Site elevation is 50 ft above sea level.

References: 6 and 22.

Distance to a Sensitive Environment

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

3,250 ft.

Reference: 6.

Assigned value = 2.

Reference: 2.

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

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

None.

Reference: 24.

Population Served by Surface Water

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

On Long Island, surface water is not used for drinking or irrigation.

Assigned value = 0.

References: 12, 17, and 18.

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

Total population served:

Name/description of nearest of above waterbodies:

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

AIR ROUTE

During EA's site inspection on 23 January 1986, total volatiles were measured using a photoionization detector (HNU). No readings above background were recorded. No other analytical data was available in any of the agency files examined (Chapter 3).

Assigned value = 0.

Reference: 2.

1 OBSERVED RELEASE

Contaminants detected:

Date and location of detection of contaminants

Methods used to detect the contaminants:

Rationale for attributing the contaminants to the site:

***

2 WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:

Most incompatible pair of compounds:

Toxicity

Most toxic compound:

Hazardous Waste Quantity

Total quantity of hazardous waste:

Basis of estimating and/or computing waste quantity:

***

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

Distance to a Sensitive Environment

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

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

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

Land Use

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

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

Distance to residential area, if 2 miles or less:

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

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

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

FIRE AND EXPLOSION

The local fire marshal has not certified that the site presents a significant fire or explosion threat (Reference: 25). There are no analytical data available in any of hte agency files examined (Chapter 3).

1 CONTAINMENT

Hazardous substances present:

Type of containment, if applicable:

***

2 WASTE CHARACTERISTICS

Direct Evidence

Type of instrument and measurements:

Ignitability

Compound used:

Reactivity

Most reactive compound:

Incompatibility

Most incompatible pair of compounds:

***

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility:

Basis of estimating and/or computing waste quantity:

***

3 TARGETS

Distance to Nearest Population

Distance to Nearest Building

Distance to Sensitive Environment

Distance to wetlands:

Distance to critical habitat:

Land Use

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

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

Distance to residential area, if 2 miles or less:

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

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

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

<u>Population Within 2-Mile Radius</u>

<u>Buildings Within 2-Mile Radius</u>

DIRECT CONTACT

1 OBSERVED INCIDENT

Date, location, and pertinent details of incident:

None reported.

Assigned value = 0.

Reference: 2.

***

2 ACCESSIBILITY

Describe type of barrier(s):

Access to the site is unrestricted.

Reference: 22.

Assigned value = 3.

Reference: 2.

***

3 CONTAINMENT

Type of containment, if applicable:

Abandoned capacitors; leaking; no liner.

Reference: 10.

Assigned value = 15.

Reference: 2.

***

4 WASTE CHARACTERISTICS

<u>Toxicity</u>

Compounds evaluated:

PCB.

Reference: 10.

Compound with highest score:

PCB.

Assigned value = 18.

Reference: 2.

***

5 TARGETS

<u>Population Within 1-Mile Radius</u>

Estimated 659.

Reference: 26.

Assigned value = 2.

Reference: 2.

Distance to Critical Habitat (of Endangered Species)

None.

Reference: 24.

Assigned value = 0.

Reference: 2.

REFERENCES

1. Machlin, A. 1986. NYSDEC Regional Engineer for Environmental Quality. Personal communication. 14 November. (Appendix 1.1-6.)

2. U.S. Environmental Protection Agency. 1984. Uncontrolled Hazardous Waste Site Ranking System. A Users Manual. (HW-10). Originally published in the July 16, 1982, Federal Register.

3. Jensen, H.M. and J. Soren. 1971. Hydrogeologic Data From Selected Wells and Test Holes in Suffolk County, Long Island, New York. Long Island Water Resources Bulletin No. 3. Suffolk County Department of Environmental Control. (Appendix 1.3-1.)

4. DeLaguna, W. 1963. Geology of Brookhaven National Laboratory and Vicinity, Suffolk County, New York. Geological Survey Bulletin 1156-A. (Appendix 1.3-2.)

5. Suffolk County Department of Health Services (SCDHS). Contour Map of the Water Table and Location of Observation Wells in Suffolk County, New York.

6. New York State Department of Transportation (NYSDOT). 1981. 7.5-Minute Topographic Series. Eastport, Quogue, Riverhead, and Mattituck Quads. (Appendix 1.2-1.)

7. NYSDEC. 1980. Well Drilling Investigation at the NYSDEC - RCA Property - Riverhead. (Appendix 1.1-5.)

8. Warren, M.A., W. DeLaguna, and N.J. Lusczynski. 1968. Hydrology of Brookhaven National Laboratory and Vicinity, Suffolk County, New York. Geological Survey Bulletin 1156-C. (Appendix 1.3-5.)

9. Dan Raviv Associates, Inc. 1984. Phase I Evaluation Geohydrologic/Water Quality Conditions Suffolk County Airport and Vicinity, Westhampton, New York. Prepared for Environmental Protection Bureau, New York State Department of Law. Revised. (Appendix 1.3-3.)

10. Faehrenbach, J. and K. Chytalo. 1980. Memorandum to A. DeCostanza. 29 May. (Appendix 1.1-3.)

11. SCDHS. Supply and Monitoring Well Location Maps. Water Resources Division.

12. New York State Department of Health (NYSDOH). 1982. New York State Atlas of Community Water Systems Sources. (Appendix 1.5-1.)

13. Holzmacher, McLendon and Murrell, P.C. 1985. Riverhead Water District, Plan of Distribution System (Appendix 1.3-6.)

14. NYSDOH. 1984. Inventory - Community Water Systems. New York State. (Appendix 1.5-2.)

REFERENCES (Cont.)

15. Pendzick, G. 1986. Superintendent, Riverhead Water District. Personal communication. 26 February. (Appendix 1.5-3.)

16. Long Island Regional Planning Board (LIRPB). 1982. Land Use in 1981. Quantification and Analysis of Land Use for Nassau and Suffolk Counties. Plates 11 and 12. Hauppauge, Long Island, New York. (Appendix 1.5-4.)

17. Connell, A. 1986. District Conservationist, USDA Soil Conservation Service. Personal communication. 13 March. (Appendix 1.5-5.)

18. Fricke, D. 1986. Suffolk County Cooperative Extension Association. Personal communication. 7 April. (Appendix 1.5-6.)

19. Carey, S. 1986. Ground Water Section, SCDHS. Personal communication. 7 April. (Appendix 1.5-7.)

20. Pica, D. 1986. Water Unit, Region I, New York State Department of Environmental Conservation (NYSDEC). Personal communication. 7 April. (Appendix 1.5-8.)

21. Machlin, A. 1980. Memorandum to D. Middleton. 30 May. (Appendix 1.1-4.)

22. EA Site Inspection, 23 January 1986.

23. Guthrie, C. 1986. NYSDEC Regional Fisheries Manager. Personal communication. 20 November. (Appendix 1.5-9.)

24. Ozard, J.W. 1986. Senior Wildlife Biologist, NYSDEC Wildlife Resources Center, Significant Habitat Unit. Personal communication. 6 March. (Appendix 1.5-10.)

25. Jones, K. 1986. Chief Fire Marshal, Town of Southampton. Personal communication. 22 April. (Appendix 1.5-11.)

26. LIRPB. 1985. Population Survey. Current Population Estimates for Nassau and Suffolk Counties. Hauppauge, Long Island, New York.

5.5 EPA 2070-12

United States
Environmental Protection
Agency

Office of Emergency and
Remedial Response
Washington, DC 20460

EPA Form 2070-12
July, 1981

RCA - Riverhead

EPA

Potential Hazardous Waste Site

Preliminary Assessment

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION
01 STATE: NY
02 SITE NUMBER: D980654396

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site): RCA - Riverhead	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER: Riverhead - Quogue Road
03 CITY: Southampton	04 STATE: NY; 05 ZIP CODE: 11968; 06 COUNTY: Suffolk; 07 COUNTY CODE: 103; 08 CONG DIST: 1
09 COORDINATES LATITUDE: 40° 53' 17." LONGITUDE: 72° 32' 25."	

10 DIRECTIONS TO SITE (Starting from nearest public road)
Riverhead-Quogue Road south from Riverhead. Turn right onto site road

III. RESPONSIBLE PARTIES

01 OWNER (if known): NYSDEC	02 STREET (Business, mailing, residential): Building 40 State Campus
03 CITY: Stony Brook	04 STATE: NY; 05 ZIP CODE: 11790; 06 TELEPHONE NUMBER: (516) 751-7900
07 OPERATOR (If known and different from owner): RCA	08 STREET (Business, mailing, residential):
09 CITY: Princeton	10 STATE: NJ; 11 ZIP CODE: 08540; 12 TELEPHONE NUMBER: (609) 734-9893

13 TYPE OF OWNERSHIP (Check one)
☐ A. PRIVATE ☐ B. FEDERAL: ____ (Agency name) ☒ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL
☐ F. OTHER: ____ (Specify) ☐ G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)
☐ A. RCRA 3001 DATE RECEIVED: __/__/__ (MONTH DAY YEAR) ☐ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: __/__/__ (MONTH DAY YEAR) ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION
☒ YES DATE 1 / 23 / 86 (MONTH DAY YEAR)
☐ NO

BY (Check all that apply)
☐ A. EPA ☐ B. EPA CONTRACTOR ☐ C. STATE ☒ D. OTHER CONTRACTOR
☐ E. LOCAL HEALTH OFFICIAL ☐ F. OTHER: ____ (Specify)
CONTRACTOR NAME(S): EA Science and Technology

02 SITE STATUS (Check one)
☐ A. ACTIVE ☒ B. INACTIVE ☐ C. UNKNOWN

03 YEARS OF OPERATION
1941 (BEGINNING YEAR) 1975 (ENDING YEAR) ☐ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED
Dump was the site of PCB contamination. All materials and contaminated soil were removed.

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION
None known. Contaminated soils were removed by RCA. Samples from downgradient wells were analyzed with no PCBs detected. Analysis of surface water samples collected downgradient detected no PCBs.

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous Conditions and Incidents)
☐ A. HIGH (Inspection required promptly) ☐ B. MEDIUM (Inspection required) ☐ C. LOW (Inspect on time available basis) ☐ D. NONE (No further action needed, complete current disposition form)

VI. INFORMATION AVAILABLE FROM

01 CONTACT: Rebecca Ligotino	02 OF (Agency/Organization): EA Science and Technology		03 TELEPHONE NUMBER: (914) 692-6706
04 PERSON RESPONSIBLE FOR ASSESSMENT: Larry Wilson	05 AGENCY:	06 ORGANIZATION: EA	07 TELEPHONE NUMBER: (914) 692-6706; 08 DATE: 3 / 28 / 86 (MONTH DAY YEAR)

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	D980654396

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 *(Measures of waste quantities must be independent)*

- TONS: Unknown
- CUBIC YARDS: ________
- NO. OF DRUMS: ________

03 WASTE CHARACTERISTICS *(Check all that apply)*

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

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE	Unknown	---	Oils containing PCBs were dump-
SOL	SOLVENTS			ed. All contaminated materials
PSD	PESTICIDES			have been removed.
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

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

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
OLW	(PCB) Arcolor 1254	11097-69-1	OD	up to 100%	

V. FEEDSTOCKS *(See Appendix for CAS Numbers)* Not applicable

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)*

New York State Department of Environmental Conservation files.
Suffolk County Department of Health Services files.
RCA
BCM

United States
Environmental Protection
Agency

Office of Emergency and
Remedial Response
Washington, DC 20460

EPA Form 2070-13
July, 1981

RCA Riverhead

EPA

Potential Hazardous Waste Site

Site Inspection Report

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

EPA

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	D980654396

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☒ A. GROUNDWATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ______) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 12,672 — 04 NARRATIVE DESCRIPTION

Four community wells and one SCWA well field within a 3 mi radius of the site. (Ground-water samples taken downgradient of the site showed PCB concentrations less than 1 ppb.)

01 ☒ B. SURFACE WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ______) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 659 — 04 NARRATIVE DESCRIPTION

Three downgradient surface waterbodies were sampled and were found to contain no PCB (less than 1 ppb). However, Wildwood Lake, 3,000 ft southwest was not sampled.

01 ☐ C. CONTAMINATION OF AIR — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______ — 04 NARRATIVE DESCRIPTION

No data available.

01 ☐ D. FIRE/EXPLOSIVE CONDITIONS — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______ — 04 NARRATIVE DESCRIPTION

No imminent threat.

01 ☒ E. DIRECT CONTACT — 02 ☐ OBSERVED (DATE: ______) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 659 — 04 NARRATIVE DESCRIPTION

Site is the center of 2,056 acres of forested land that is a limited access State recreation area; however, there is no gate or fence around the site itself.

01 ☒ F. CONTAMINATION OF SOIL — 02 ☒ OBSERVED (DATE: 10/15/81) ☒ POTENTIAL ☐ ALLEGED
03 AREA POTENTIALLY AFFECTED: 0.5 (Acres) — 04 NARRATIVE DESCRIPTION

Betz, Converse, Murdoch, Inc. collected samples which contained PCB concentrations of up to 98 ppb.

01 ☒ G. DRINKING WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ______) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 12,672 — 04 NARRATIVE DESCRIPTION

Limited to population served by groundwater.

01 ☐ H. WORKER EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: ______ — 04 NARRATIVE DESCRIPTION

None known.

01 ☐ I. POPULATION EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______ — 04 NARRATIVE DESCRIPTION

None known.

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS	I. IDENTIFICATION 01 STATE: NY 02 SITE NUMBER: D980654396

EPA

II. HAZARDOUS CONDITIONS AND INCIDENTS *(Continued)*

01 ☒ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: ______) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

No vegetation was observed at the site, due to recent earth moving activities.

01 ☐ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION *(include name(s) of species)*

None known.

01 ☐ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None known.

01 ☒ M. UNSTABLE CONTAINMENT OF WASTES *(Spills/Runoff/Standing liquids, Leaking drums)* — 02 ☒ OBSERVED (DATE: 3/1/80) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______
04 NARRATIVE DESCRIPTION

NYSDEC team found oil-filled capacitors buried onsite. Soil samples confirmed PCB contamination.

01 ☐ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None known.

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

No potential.

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None known.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

None known.

III. TOTAL POPULATION POTENTIALLY AFFECTED: 12,672

IV. COMMENTS

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

Section 4.3.
Appendixes 1.1-1 through 1.1-6 and 1.1-9.
References: 22 and 25.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	D980654396

II. PERMIT INFORMATION None

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				
☐ G. STATE (Specify)				
☐ H. LOCAL (Specify)				
☐ I. OTHER (Specify)				
☐ J. NONE				

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE
☐ A. SURFACE IMPOUNDMENT		
☐ B. PILES		
☐ C. DRUMS, ABOVE GROUND		
☐ D. TANK, ABOVE GROUND		
☐ E. TANK, BELOW GROUND		
☐ F. LANDFILL		
☐ G. LANDFARM		
☒ H. OPEN DUMP	unknown	
☐ I. OTHER (Specify)		

04 TREATMENT (Check all that apply)

- ☐ A. INCENERATION
- ☐ B. UNDERGROUND INJECTION
- ☐ C. CHEMICAL/PHYSICAL
- ☐ D. BIOLOGICAL
- ☐ E. WASTE OIL PROCESSING
- ☐ F. SOLVENT RECOVERY
- ☐ G. OTHER RECYCLING/RECOVERY
- ☐ H. OTHER (Specify)

05 OTHER

☐ A. BUILDINGS ON SITE

None

06 AREA OF SITE

0.5 (Acres)

07 COMMENTS

Capacitors, electrical components, cable, and poles were found during a 1980 inspection by the NYSDEC. RCA Corporation had operated an open dump at the site from 1927 until 1975.

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

☐ A. ADEQUATE, SECURE ☐ B. MODERATE ☒ C. INADEQUATE, POOR ☐ D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC.

Rusted capacitors were found to contain 100 percent Aroclor 1254; site has no liner.

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: ☒ YES ☐ NO

02 COMMENTS

Site is located amid 2,000 acres of limited access New York State recreation land but there is no fence around the site.

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

Appendixes 1.1-1 through 1.1-6 and 1.1-9.
Reference: 22.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	D980654396

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as applicable)

	SURFACE	WELL
COMMUNITY	A. ☐	B. ☒
NON-COMMUNITY	C. ☐	D. ☒

02 STATUS unknown

ENDANGERED	AFFECTED	MONITORED
A. ☐	B. ☐	C. ☐
D. ☐	E. ☐	F. ☐

03 DISTANCE TO SITE

A. 1.75 (mi)

B. 1.17 (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

☒ A. ONLY SOURCE FOR DRINKING
☐ B. DRINKING (Other sources available) COMMERCIAL, INDUSTRIAL, IRRIGATION (No other water sources available)
☐ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available)
☐ D. NOT USED, UNUSEABLE

02 POPULATION SERVED BY GROUND WATER 12,672

03 DISTANCE TO NEAREST DRINKING WATER WELL 1.17 (mi)

04 DEPTH TO GROUNDWATER 32 (ft)

05 DIRECTION OF GROUNDWATER FLOW N and NE

06 DEPTH TO AQUIFER OF CONCERN 32 (ft)

07 POTENTIAL YIELD OF AQUIFER unknown (gpd)

08 SOLE SOURCE AQUIFER ☒ YES ☐ NO

09 DESCRIPTION OF WELLS (Including useage, depth, and location relative to population and buildings)

Riverhead community drinking water supply consists of three well fields. Wells range from 105 to 721 ft depths, glacial and Magothy aquifers, respectively. The SCWA water supply consists of one well field. Wells from 242 to 279 ft depth, glacial aquifer.

10 RECHARGE AREA

☒ YES ☐ NO COMMENTS

11 DISCHARGE AREA

☐ YES ☒ NO COMMENTS

IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

☒ 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
Wildwood Lake	☐	0.72 (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. 659 NO. OF PERSONS	B. 3,235 NO. OF PERSONS	C. 10,767 NO. OF PERSONS

02 DISTANCE TO NEAREST POPULATION 0.5 (mi)

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE

04 DISTANCE TO NEAREST OFF-SITE BUILDING (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)

The site is in the center of a 2,056 acre limited access New York State recreation area and countryside beyond is very rural.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	D98C 654396

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) unknown

☐ 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 >1,000 (ft)

04 DEPTH OF CONTAMINATED SOIL ZONE unknown (ft)

05 SOIL pH 4.8

06 NET PRECIPITATION 22 (in)

07 ONE YEAR 24 HOUR RAINFALL 2.5-3.0 (in)

08 SLOPE
SITE SLOPE 1-4 %
DIRECTION OF SITE SLOPE N and NE
TERRAIN AVERAGE SLOPE 2 %

09 FLOOD POTENTIAL
SITE IS IN None YEAR FLOODPLAIN

10 ☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS (5 acre minimum)
ESTUARINE A. ______ (mi)
OTHER B. 0.61 (mi)

12 DISTANCE TO CRITICAL HABITAT (of endangered species)
______ (mi)
ENDANGERED SPECIES: None

13 LAND USE IN VICINITY

DISTANCE TO:

COMMERCIAL/INDUSTRIAL A. 0.85 (mi)

RESIDENTIAL AREAS; NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES B. 0 (mi)

AGRICULTURAL LANDS
PRIME AG LAND C. 0.89 (mi)
AG LAND D. 0.89 (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

Site is a 1/2 acre barren plot in the center of a 2,056-acre forest reserve owned by the NYSDEC. The area is quite flat and soils are sandy.

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

References: 1, 3-8, 11-16, and 22-24.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	D980654396

II. SAMPLES TAKEN None

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER			
SURFACE WATER			
WASTE			
AIR			
RUNOFF			
SPILL			
SOIL			
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS
Volatile organics	No readings above background during EA Site Inspection (HNU).
Slope	Suunto clinometer

IV. PHOTOGRAPHS AND MAPS

01 TYPE ☒ GROUND ☒ AERIAL

02 IN CUSTODY OF EA Science and Technology
(Name of organization or individual)

03 MAPS ☒ YES ☐ NO

04 LOCATION OF MAPS EA Science and Technology

V. OTHER FIELD DATA COLLECTED *(Provide narrative description)*

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

EA Site Inspection.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 7 - OWNER INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	D980654396

II. CURRENT OWNER(S) | **PARENT COMPANY** *(If applicable)*

01 NAME	02 D+B NUMBER	08 NAME	09 D+B NUMBER
NYSDEC Region I			

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE
SUNY Campus Building 40			

05 CITY	06 STATE	07 ZIP CODE	12 CITY	13 STATE	14 ZIP CODE
Stony Brook	NY	11794			

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
RCA Corporation			

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
Princeton	NJ	08540			

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)*

Appendixes 1.1-1 through 1.1-4.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	D980 654396

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)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	D98C 654396

II. ON-SITE GENERATOR

01 NAME	02 D+B NUMBER	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	05 CITY	06 STATE	07 ZIP CODE
RCA				Princeton	NJ	08540

III. OFF-SITE GENERATOR(S)

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. TRANSPORTER(S)

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)*

Appendixes 1.1-4 through 1.1-8.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	D980654396

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 1984 03 AGENCY ______
04 DESCRIPTION
Capacitors and all other material reported to have been removed.

01 ☒ E. CONTAMINATED SOIL REMOVED — 02 DATE 1984 03 AGENCY ______
04 DESCRIPTION
Contaminated soil reported to have been removed.

01 ☐ F. WASTE REPACKAGED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☒ G. WASTE DISPOSED ELSEWHERE — 02 DATE 1984 03 AGENCY ______
04 DESCRIPTION
Wastes reported removed.

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

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	D980654396

II PAST RESPONSE ACTIVITIES *(Continued)*

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)*

Appendixes 1.1-1 through 1.1-10.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	D980654396

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY/ENFORCEMENT ACTION ☐ YES ☒ NO

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY/ENFORCEMENT ACTION

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

Appendixes 1.1-4 through 1.1-8.

6. ASSESSMENT OF DATA ADEQUACY AND RECOMMENDATIONS

6.1 ADEQUACY OF EXISTING DATA

The available data are considered insufficient to prepare a final HRS score for the RCA - Riverhead site. Ground-water quality data for upgradient and downgradient of the site are not available in the records. Also, Hazardous Substance List (HSL) ground-water quality data are lacking.

6.2 RECOMMENDATIONS

In order to prepare a final HRS score for this site, analytical data regarding the HSL quality of the ground water will be necessary, thus requiring performance of a Phase II investigation. The proposed Phase II study would include the installation of three test borings/observation wells, and the collection and analysis of ground-water samples.

6.3 PHASE II WORK PLAN

6.3.1 Task 1 - Mobilization and Site Reconnaissance

Project mobilization includes review of the Phase I report and updating the site database with any new information made available since completion of the Phase I report. Based on that review, a draft scope of work for this site will be agreed to and a project schedule developed. At this time, a draft Quality Assurance/Quality Control (QA/QC) document will be prepared in accordance with the most up-to-date NYSDEC guidelines.

Site reconnaissance will be performed to examine general site access for Phase II studies. Site reconnaissance will familiarize key project personnel with the site, enable the project Health and Safety Officer to develop specific health and safety requirements for the field activities. Emergency, fire, and hospital services will be identified. Standard practice during site reconnaissance is an air survey with a photoionization detector (HNU or similar instrument). The air survey would be performed around the site perimeter and throughout the site for safety purposes. Detection of releases to air during site reconnaissance may warrant further confirmation studies. Based on the Phase I study, it is expected that field activities will require only Level D health and safety protective measures.

6.3.2 Task 2 - Geophysics

Multidepth EM and earth resistivity surveying will be performed around the site area perimeter to evaluate the potential presence of ground-water contaminant plumes and stratigraphic conditions. The number of stations and value of depth settings will be determined on the basis of field conditions. Results of the geophysics will be used to refine the specifications for locations, depths, and number of observation wells to be installed.

6.3.3 Task 3 - Preparation of Final Sampling Plan

All data collected during Tasks 1 and 2 will be evaluated to finalize sampling and boring/well locations. The final sampling plan will be developed and submitted to NYSDEC for approval. The plan will include final sampling locations, boring and well specifications, and reference pertinent portions of the QA/QC Plan. A final budget will be developed to complete the drilling and sampling program.

6.3.4 Task 4 - Test Borings and Observation Wells

Because there are several hundreds of feet of unconsolidated sediment overlying bedrock, EA recommends that the subsurface investigation be confined, at this time, to the shallow glacial aquifer to confirm if ground-water contamination is present. If ground-water contamination is detected, then the investigations could be expanded to include the installation and sampling of monitoring wells completed to greater depths. Although three unlocked (unsecured) monitoring wells were observed at the site during EA's site reconnaissance, the integrity of these wells is unknown. Based upon currently available information, EA recommends the installation of three test borings/observation wells. This work would be performed under the fulltime supervision of a geologist. It is anticipated that the hollow-stem auger drilling method will be used. Prior to the drilling of each boring/well, and at the completion of the last boring/well, the drilling equipment which comes in contact with subsurface materials will be steam-cleaned, as well as the split-spoon sampler after obtaining each sample. Soil sampling will be performed using a split-spoon sampler at approximately 5-ft intervals and at detected major stratigraphic changes. An

HNU, or similar instrument, would be used to monitor the potential organic vapors emitted during drilling operations and from each soil sample. Samples of major soil/unconsolidated sediment will be collected for grain-size and/or Atterburg Limits analysis.

It is anticipated that the wells to be installed at this site will be completed in the unconsolidated sediment, approximately 10-20 ft below the ground-water table. Standard construction of such a well would include 10-20 ft of 2-in. diameter threaded-joint PVC screen and an appropriate length of PVC riser with a bottom plug cap, sand pack, bentonite seal, and protective surficial steel casing with a locking cap.

Upon completion and development of the wells by air surging/pumping, the vertical elevation of the upper rim of each well casing and the horizontal location will be surveyed in order to aid in evaluation of the ground-water flow direction. Depending upon the yield of each Phase II well, a short-term, low-yield pumping test will be performed in each well.

For cost estimating purposes, it is assumed that:

a. The depth of each of the three monitoring wells will be 60 ft below ground surface.

b. The three wells will require 10 days to install, develop, and test.

c. All drill sites are accessible by truck-mounted drilling rigs as determined by the driller.

d. There are no excessive amounts of cobbles/boulders which would increase drilling time.

e. Steam-cleaning of drilling/sampling equipment will be performed at each boring/well location. The fluids will be discharged to ground surface.

f. All drill cuttings, fluids, and development water will be left on, or discharged to, the ground surface in the immediate area of the activity.

g. That permission from appropriate land owners to drill borings/wells on their property will be a simple process (expedited by the NYSDEC, if necessary) so that delays during field operations are not incurred.

6.3.5 Task 5 - Sampling

All sampling and analysis will be conducted in accordance with the project QA/QC Plan. The analytical program for every water sample will include the 130 organic and 25 inorganic parameters listed in Statement of Work No. 784, New York State Department of Environmental Conservation Superfund and Contract Laboratory Protocol, January 1985. Also, all additional non-priority pollutant GC/MS major peaks will be identified and quantified. Major peaks will be considered as those whose area is 10 percent or greater than the calibrating standard(s). Based upon the currently available information, collection and analysis of the following numbers and types of samples is recommended:

3 Ground-water samples (one from each Phase II well).

6.3.6 Task 6 - Contamination Assessment

EA will evaluate the data obtained during the records search and field investigation: prepare final HRS scores and documentation forms; complete EPA Form 2070-13; summarize site history, site characteristics, available sampling and analysis data; and determine the adequacy of the existing data to confirm release, and if there is a population at risk.

6.3.7 Task 7 - Remedial Cost Estimate

EA will evaluate remedial alternatives for the site and develop a list of potential options given the information available on the nature and extent of contamination. Approximate cost estimates for the selected potential remedial options will be computed. This work is not intended to be, or a substitute for, a formal cost effectiveness analysis of potential remedial actions.

6.3.8 Task 8 - Final Phase II Report

In accordance with current (January 1985) NYSDEC guidelines, the Phase II report will include:

a. The results of the Phase II investigation, complete with boring logs, photos, and sketches developed as part of the Phase II field work.
b. Final HRS scores with detailed documentation.
c. Selected potential remedial alternatives and associated cost estimates.

In addition to the final Phase II report, the following raw data and resulting reduction would be provided to NYSDEC:

a. geophysical
b. well logs
c. all sampling forms and data
d. all analytical data
e. chain-of-custody forms
f. other pertinent collected information.

6.3.9 Task 9 - Project Management/Quality Assurance

A Project Manager will be responsible for the supervision, direction, and review of the project activities on a day-to-day basis. A Quality Assurance Officer will ensure that the QA/QC Program protocols are maintained and that the resultant analytical data are accurate.

6.4 PHASE II COST ESTIMATE

Based on the scope of work and assumptions described above, the estimated costs to complete the Phase II investigation of the RCA - Riverhead site are as follows:

Consultant Costs (including labor, direct costs, fee)	$35,365
Drilling Contractor	24,040
Laboratory	5,550
Total	$64,955

Appendix 1.1-1

142

Received from
NYSDEC Region 1

HAZARDOUS WASTE DISPOSAL SITES
REPORT FORMAT

Priority Code: B
Site Code: 1 52 012
Name of Site: RCA-Riverhead ~~Landfill~~ Region: 1 Stony Brook
County: Suffolk Town/City Town of Southampton
Street Address:

Status of Site Narrative:

Open dump site consists of less than 1/2 acre of a 2100 acre transcontinental communications station that operated from 1927 to 1975. In 1979, the land was deeded to N.Y.S. Dept of Environmental Conservation.

Inspection on March 7, 1980 revealed that dump contains general municipal-type refuse with noticeable addition of electronic parts and sub-assemblies, including canned capacitors. Area has not been covered over, it is overgrown with brush, weeds and young trees.

There is no record of any wells on the property. There are no public water supplies in the vicinity.

The water table at the dump site is 17' above sea level. The dump site is 50' above sea level. Possibility of fuel storage on the site

Type of Site: Open Dump XXXX Treatment Pond(s) ☐ Number of Ponds ____
Landfill ☐ Lagoon(s) ☐ Number of Lagoons ____
Structure ☐

Estimated Size less than 1/2 Acres

Hazardous Wastes Disposed? Confirmed ☐ Suspected XXXX

*Type and Quantity of Hazardous Wastes:

TYPE	QUANTITY (Pounds, drums, tons, gallons)
Possible PCB's	Pounds

Name of Current Owner of Site: XX New York State Dept of Environmental Conservatio
Address of Current Owner of Site: Region 1 Bldg 40 SUNY Stony Brook NY 117

Time Period Site Was Used for Hazardous Waste Disposal:
, 1961 To 1975 xx19xx

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

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

Remedial Action: Proposed xxxx Under Design ☐
In Progress ☐ Completed ☐
Nature of Action: ~~Install test wells. Test groundwater for possible PCB's. If found, plan capping operation, monitor downstream wells.~~ Capping

Status of Legal Action: ______ State ☐ Federal ☐ None

Permits Issued: Federal ☐ Local Government ☐ SPDES ☐
None Solid Waste ☐ Mined Land ☐ Wetlands ☐ Other ☐

Assessment of Environmental Problems:

~~Possible PCB's leaching from discarded capacitors.~~ ???
Additional sampling need to be completed at this site for the various media, particularly air, groundwater, surface water, flora and fauna.

Assessment of Health Problems:
Access to disposal site should be limited so that humans can not come in contact with the exposed PCB capacitors.

Persons Completing this Form:

J. Austin ~~3/21/80 3/31/80~~
G. David Knowles

Ronald Tramontano

New York State Department of Environmental Conservation
Date 4/10/80

New York State Department of Health
Date 4/10/80

Appendix 1.1-2

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

1-12

CLASSIFICATION CODE: 2a REGION: 1 SITE CODE: 152012

NAME OF SITE : RCA - Riverhead
STREET ADDRESS: Riverhead Westhampton Road
TOWN/CITY: COUNTY: ZIP:
Riverhead Suffolk

SITE TYPE: Open Dump- Structure- Lagoon- Landfill-X Treatment Pond-
ESTIMATED SIZE: 0.5 Acres

SITE OWNER/OPERATOR INFORMATION:
CURRENT OWNER NAME....: NYSDEC
CURRENT OWNER ADDRESS.: Building 40, State Campus, Stony Brook, NY
OWNER(S) DURING USE...: RCA
OPERATOR DURING USE...: RCA
OPERATOR ADDRESS......: Cherry Hill, NJ
PERIOD ASSOCIATED WITH HAZARDOUS WASTE: From 1941 To 1975

SITE DESCRIPTION:
Site was a telecommunication station owned by RCA. Site was sold to NYS as open space.

On site is a landfill containing bulk items such as wire, cable reels, poles and electronic parts and assemblies.

Soil tests indicate PCB concentrations.

RCA has agreed to remove soil and material from landfill; removal commenced late 1984.

HAZARDOUS WASTE DISPOSED: Confirmed-X Suspected -

TYPE	QUANTITY (units)
PCB	

NYDEC Bureau of Hazardous
Site Control

SITE CODE: 152012

ANALYTICAL DATA AVAILABLE:

Air- Surface Water- Groundwater-X Soil-X Sediment- None-

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-X Completed-
NATURE OF ACTION: PCB removal, landfill closure

GEOTECHNICAL INFORMATION:
SOIL TYPE: Sand
GROUNDWATER DEPTH: 50 feet

ASSESSMENT OF ENVIRONMENTAL PROBLEMS:

Soil contamination, groundwater threat

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.: James Heil, P.E. TITLE: Assoc. San.Eng.	NAME.: Ronald Tramontano TITLE: Bur. Tox. Sub. Assess.
NAME.: R.A. Olazagasti TITLE: Solid Waste Mgmt. Spec.	NAME.: TITLE:
DATE.: 01/22/85	DATE.: 01/22/85

Appendix 1.1-3

1 of 2

NYDEC Bureau of Hazardous
Site Control

[illegible handwriting]

15 (12/75)

New York State Department of Environmental Conservation

MEMORANDUM

TO: Mr. A. DeCostanza, Solid Waste
FROM: Jack Foehrenbach and Karen Chytalo
SUBJECT: Analysis of Capacitor Contents

DATE: May 29, 1980

The viscous liquid in the capacitor, which you submitted to the Lab on 5/27/80, is about 100% Aroclor 1254 (PCB's). This was also found in the capacitor you submitted a few weeks ago. In this case, however, the canister was made out of iron and was severely rusted. Because of this, special care and quick action should be taken with these capacitors to prevent the leakage of PCB's into the environment.

bd
cc: D. Middleton
A. Machlin
M. Bruckman
A. Taormina

2-f2

AM

15 (12/75)

New York State Department of Environmental Conservation

MEMORANDUM

TO: A.R. DeCostanzo
FROM: Jack Foehrenbach, Karen Chytalo JF. + K.C.
SUBJECT: PCB's IN SURFACE WATERS
DATE: May 29, 1980

We analyzed the three water samples that you submitted to the Lab and they were found to contain less than 1 ug/L (ppb) of PCB's. They were collected by you on May 22, 1980, at the following locations:

1- Riverhead, large pond east of Riverhead/Moriches Road.

2- Riverhead, pond east of Ludlam Ave.

3- Riverhead, stream adjacent to County Center, (east of County Center).

KC/ef

cc: A. Machlin
M. Bruckman
A.S. Taormina

NYDEC Bureau of Hazardous
Site Control

Appendix 1.1-4
1 of 11

15 (12/75)

GDK

FILE COPY

Copy to ...
File ...

New York State Department of Environmental Conservation

MEMORANDUM

RECEIVED
JUN 12 1980
BUREAU OF HAZARDOUS
WASTE MANAGEMENT PROGRAMS

RECEIVED
JUN 11 1980
DIRECTOR, DIVISION OF
SOLID WASTE MANAGEMENT

TO: D. Middleton
FROM: A. Machlin
SUBJECT: RCA Properties PCB Investigation

DATE: May 30, 1980

This is in reference to your memorandum of 5/15/80 requesting a report regarding the RCA properties PCB investigation. You indicated that the following matters should be included:

1. Maps of both properties and surrounding communities indicating groundwater depth and flow direction and the location of all public and/or private wells downstream from the landfills.

   Items #1 and #2, which are attached, show the Rocky Point and Riverhead sites respectively, with approximate ground-water depths and flow direction. Location of wells downstream of the sites were obtained from the Water Supply Unit records.

2. Results of samples drawn from those wells that might intercept any leachate plume from the landfills.

   Rocky Point Site

   - 1 sample from kitchen tap water, 50 Patchogue Rd., Rocky Point. Taken by R. O'Reilly on 5/13/80. (Water supplied by Great Beach Public Water Supply System.)

   - 1 sample taken from McDonald's Restaurant, Rte. 25A, Rocky Point. Taken by R. Galli on 5/14/80. (Water supplied by Great Beach Public Water Supply System.)

   - 1 sample taken from outdoor tap at the horse stables at the north end of the property by A. DeCostanzo on 5/12/80. (Operator of stable indicated that water was supplied by A. Sini (North Shore) Water Supply Company, whose well is directly north of the landfill.)

   These water samples were analyzed for the presence of PCB's by the Division of Marine Resources' chemistry laboratory and found to contain less than 1 ppb (detection limit). (See attached documents on this matter.)

   Riverhead Site

   An on-site survey was made by A. DeCostanzo on 5/22/80 to itemize downstream wells that could be sampled for analysis. It was determined by A. DeCostanzo that all of the water supply downstream of the site was supplied by a public water supply company, with its well field north of the Peconic River, and it would not be useful to have these analyzed for PCB's. He was unable to identify any private wells downstream of the site that could be sampled. Three surface water samples taken downstream of the disposal site on 5/22/80 were found to contain less than 1 ppb (detection limit).

Ground Water Investigation Program

On 5/20/80, Environmental Quality received the approval from Albany for funds to install four 4-inch diameter wells, 50 feet in depth, at both of the sites, for an estimated cost of $2,940 (see attached). Two wells are planned to be installed downstream of the Rocky Point disposal site, and two wells are planned to be installed downstream of the Riverhead disposal site. Samples will be taken from these wells for PCB analysis. In accordance with Departmental procedures, we must receive at least five potential bidders for this work. A. DeCostanzo is working on this now, and the process is estimated to take about four weeks. It is possible that SCDHS could drill the necessary four wells (or more) in a shorter period of time.

3. A detailed inventory of all equipment likely to contain PCB's.

Inspection was made by J. Austin on 5/30/80 of the Rocky Point site. Two more days are required to complete inspection of the Rocky Point properties and make inspection of Riverhead site. This is planned for wk.of 6/2. Inventory completed of all equipment outside of buildings. This equipment consists of subassemblies with transformer oil containing PCB's (see attached inspection report, J. Austin to A. DeCostanzo dated 5/30/80).

4. A description of the way in which the information regarding the possible dumping of equipment containing PCBs was first brought to our attention, by whom, when, etc.

The following is a chronology of events concerning the way in which the information was brought to our attention:

11/27/79 - R. Ryan memorandum to M. Bruckman, Subject: "Possible Hazardous Waste Disposal Site/Former RCA Lands at Rocky Point," requesting investigation of former RCA lands at Rocky Point.

12/10/79 - Cursory inspection made by A. DeCostanzo and R. Hartmann. Photographs taken and sketch made of site.

12/11/79 - Memo to File by A. DeCostanzo recording conversation with M. Etter, former RCA Rocky Point site manager. M. Etter indicated that the only materials he felt were hazardous were GE PYRANOL capacitors containing PCB's.

12/11/79 - Conversation between A. DeCostanzo and M. Etter. A. DeCostanzo indicated not finding capacitors at the "dump site," but seeing some capacitors in bins at the main building. M. Etter stated that many capacitors were given away, but some of the capacitors were still in bins in the main building, and probably contained PCB's. He indicated capacitors varied in size.

12/18/79 - Telephone conversation between A. DeCostanzo and M. Etter. Request made to M. Etter on possible number of capacitors that may have been discarded. M. Etter informed A. DeCostanzo that capacitors may also have been discarded at the Riverhead site.

12/19-20/79 - Investigation by A. DeCostanzo by telephone to Division of Solid Waste in Albany to obtain background information on PCB problem.

12/21/79 - Telephone conversation between A. DeCostanzo and M. Etter. M. Etter indicated that RCA operated landfill at Rocky Point site from about 1929 to 1979, and indicated that he believed that capacitors containing PCB probably came into use during World War II. He also indicated that, from conversations with three former RCA employees, failure of PCB capacitors was rare and few were discarded.

5. A chronological description of all steps that have been taken to investigate the situation.

11/27/79 - Memorandum, R. Ryan to M. Bruckman requesting investigation of RCA property at Rocky Point.

12/10/79 - A. DeCostanzo assigned to investigate PCB's at RCA properties.

12/21/79 - At a meeting with D. Middleton, J. Scherb, M. Bruckman, A. Machlin and P. Lappano, A. DeCostanzo reported that he was told by M. Etter that failure of PCB capacitors was rare, and, therefore, few were discarded by RCA. He indicated that, based on this information, it was not a problem. To insure that there was no problem, plans were initiated for the drilling of wells downstream of the RCA Rocky Point site to test for the presence of PCB's in ground water. Plans were also made for testing water from the Great Beach Water Supply System north of the area. Discussions were held on the possible need for capping site for ground-water protection, and the possible use of DEC rehabilitation funds for drilling and capping.

1/10/80 - Approval of funds obtained from Albany to pay USGS for drilling of two wells at Rocky Point site.

1/11/80 - Letter, A. Machlin to I. Kantrowitz (USGS), to make arrangements for USGS to drill two wells, to be paid for by New York State Voucher.

1/11/80 - Memorandum, R.B. MacMillan to A. Machlin. Indicated that chemistry laboratory would be able to analyze six samples for PCB's, and that special arrangements would be necessary if more than six were needed (see attached memorandum).

1/14/80 - Memorandum, A. Machlin to D. Middleton. USGS drill rig available to drill two wells, and pipe already ordered to USGS. USGS will drill wells whether or not DEC can pay them for it. Approval received for $2,000 to pay for cost of wells. Two wells drilled on 1/11/80 by USGS, but, unfortunately, one well collapsed. As soon as sample-pump is available to USGS, water sample will be taken for analysis by J. Foehrenbach sometime during week of 1/14 (see attached memo).

1/29/80 - Memorandum, A. DeCostanzo to File. USGS laboratory unable to obtain water samples with available equipment.

2/21/80 - Memorandum, A. DeCostanzo to File. Report on second unsuccessful attempt on 2/15/80 by USGS to obtain water sample.

2/27/80 - Third unsuccessful attempt by USGS to obtain water samples from well.

3/7/80 - Memorandum, J. Austin to File. Based on inspection at Riverhead site, reported that an inactive site existed there, and indicated that site included electronic parts and subassemblies, which could contain PCB's.

Week of 3/24/80 - Inquiry, D. Middleton to A. Machlin, on status of work on RCA property.

3/27/80 - Telephone conversation A. Machlin to I. Kantrowitz on situation at Rocky Point. Recommendation by I. Kantrowitz to attempt to obtain water samples by drilling new well. (At this time, A. Machlin realized that he was under an incorrect assumption that water samples could not be taken in that area because of a possible perched aquifer.)

3/27/80 - A. Machlin discussion with B. DeMaggio on availability of funds for drilling wells. Was informed that unspent funds would be unavailable after 3/31/80, which is end of fiscal year. A. Machlin directed A. DeCostanzo to immediately arrange with a drilling company for drilling of wells at both Rocky Point and Riverhead (two at each site). A. DeCostanzo made arrangements by telephone with Marine Pollution Control, and firmed up arrangements the next morning by telephone and letter, which was mailed on 3/31/80. Unfortunately, because of an error in the coding used on the Purchase Requisition, these funds were lost for use in drilling the wells because end of fiscal year had passed (see attached copy).

4/1/80 - Memorandum, A. DeCostanzo to File. A followup on J. Austin's inspection of Riverhead site. Photographs of subassemblies included.

Week of 4/7/80 - Received notification that previous fiscal-year emergency funds were lost due to error in coding. Immediately made another request for funds to pay the cost of the wells.

4/8/80 - Memorandum, A. DeCostanzo to File. One capacitor and one transformer given to J. Foehrenbach to test for PCB's.

4/24/80 - Memorandum, J. Foehrenbach to A. DeCostanzo. Report that both pieces of equipment submitted for analysis on 4/8/80 contained PCB's (Aroclor 1254).

5/6/80 - Inspection by A. DeCostanzo and P. Lappano of Rocky Point site to obtain information to make an estimate of costs to cap dumping site.

5/9/80 - Memorandum, P. Lappano to A. Machlin, estimating the cost of capping the Rocky Point site at $23,600 with DOT equipment, and $29,500 without DOT equipment over a land area of 1.5 acres.

5/12-13-14/80 - Three samples of water taken from north of Rocky Point site: two from Great Beach Public Water Supply System, and one from horse stable being supplied by A. Sini (North Shore) public water system. Given to J. Foehrenbach for PCB analysis.

5/15/80 - Memorandum, J. Foehrenbach to A. DeCostanzo. Report that three water samples did not indicate presence of PCB (detectable limit, 1 ppb).

5/15/80 - Memorandum, D. Middleton to A. Machlin. Request report on RCA properties by end of month.

5/15/80 - A. Machlin request to M. Bruckman to have A. DeCostanzo start working on report.

5/15/80 - A. Machlin request to M. Bruckman that two additional alternative methods for capping the landfill at Rocky Point be investigated (P.V.C. and clay).

5/20/80 - Received memorandum, W. Agresta to A. DeCostanzo dated 5/9/80, with approvals for $2,940 to pay for the wells. Five Bidders are required before work is let. This process was immediately initiated (see enclosed memo).

5/22/80 - Three samples collected by A. DeCostanzo from three surface waters (two ponds and a stream) generally downstream of disposal site at Riverhead, and submitted to laboratory for PCB analysis.

5/27/80 - A. DeCostanzo submitted a capacitor to J. Foehrenbach for PCB analysis (taken from Riverhead site).

5/28/80 - Memorandum, P. Lappano to A. Machlin: Subject, "Capping of PCB Landfill at Rocky Point." Estimate for use of P.V.C. liner is $17,105 (with DOT) and $29.205 (without DOT). This assumes 6 inches of clean sand, a 20-mill liner, 2 feet of clean fill, and seeding and cliff stabilization.

Estimate for use of clay liner is $48,000, if two feet of clay is used: $24,000, if one foot is used.

5/28/80 - Notified by R. Ryan that, ". . . since the Department has been the owner of the properties, no PCB contaminants knowingly and willfully have been disposed of at any dump or land-fill."

5/29/80 - Memorandum, J. Foehrenbach to A. DeCostanzo. Reported that the liquid in the capacitor submitted on 5/27/80 (taken from Riverhead site) contained about 100% Aroclor 1254 (PCB's).

5/29/80 - Memorandum, J. Foehrenbach to A. DeCostanzo. Reported that the three surface water samples, taken downstream of the disposal site at Riverhead and submitted on 5/22/80, did not indicate presence of PCB's (detectable limit, 1 ppb).

5/30/80 - Inspection by J. Austin of Rocky Point property. Completed inventory of all equipment outside of buildings. Insufficient time to investigate inside one large and two small buildings. Also insufficient time to go to Riverhead to investigate one large and three small buildings. Plan to complete the inventory during week of 6/2/80 (see attached inspection report, J. Austin to A. DeCostanzo, 5/30/80).

5/30/80 - Memorandum A. DeCostanzo to M. Bruckman indicating that the capacitor from Riverhead submitted to J. Foehrenbach on 5/27/80 was found to contain Aroclor 1254. Also pointed out need for monitoring and maintaining soil-cover integrity.

6. A follow-up plan to notify water districts and private well owners of the results of our investigation.

   This report should be given to the Suffolk County Department of Health Services as discussed in our meeting of 5/16/80, at which Dr. Harris and Dr. Zaki were present. If there is a problem, notification to water districts and private well owners should be made by SCDHS as soon as possible since public water supply is their responsibility.

7. A plan to conduct ongoing monitoring.

   Samples should be taken from all four wells at both sites every three months to analyze for the presence of PCB's. This is similar to requirements which this Department imposes on municipal landfills.

8. A plan to investigate landfill sites.

   D. Knowles of the Division of Solid Waste, Hazardous Waste Unit, informed M. Bruckman on 5/30/80 that, according to USEPA requirements, if a site contains more than 50 ppm of PCB's, it should not be capped except as a temporary measure. Therefore, RCA should be contacted for a history and background of this site as it concerns its use as a landfill. It would be valuable to obtain an original topography map to ascertain the depth of the landfill. When available information is obtained, soil investigations should be made to evaluate the situation.

   Since SCDHS has extensive experience in soil investigations, particularly in landfill situations, this Department should try to utilize their expertise and equipment, if possible.

9. A plan to properly dispose of equipment found on RCA properties containing PCB's.

   Preliminary contact has been made with R. Miller of the Toxic Substances Coordination Unit in Albany concerning the measures needed to dispose of equipment containing PCB's found on both the Rocky Point and Riverhead properties. NYSDEC trucks could possibly be made available to cart any material for disposal to a secure burial landfill at Niagara Falls. A rough estimate of the cost for acceptance of the material by the landfill in Niagara Falls will be made as soon as the inventory of both sites is completed. This information will be sent to R. Miller for action by his Unit. This material will also include the samples of equipment taken from that property presently stored in the Region 1 basement. A preliminary unit cost estimate received to date is $17/cu.ft. for landfill fee.

7811

SUMMARY

Investigation was made on two disposal sites on the land given to the Department by RCA: one at Rocky Point, the other at Riverhead.

An inventory is being made of all equipment at both of the sites which could possibly contain PCB's. So far, the outside area at Rocky Point has been inventoried, but the inside of three buildings at that site as well as the inside of four buildings at Riverhead have yet to be checked. This will be done during the week of 6/2/80.

Water samples were taken from public well water supply systems downstream of the Rocky Point site, and from three surface water bodies downstream of the Riverhead site. Analysis of these samples showed no detectable limits of PCB's (1 ppb). Two wells are being drilled immediately downstream of each site so that ground-water samples can be taken for PCB analysis. These wells will remain in place for periodic water monitoring.

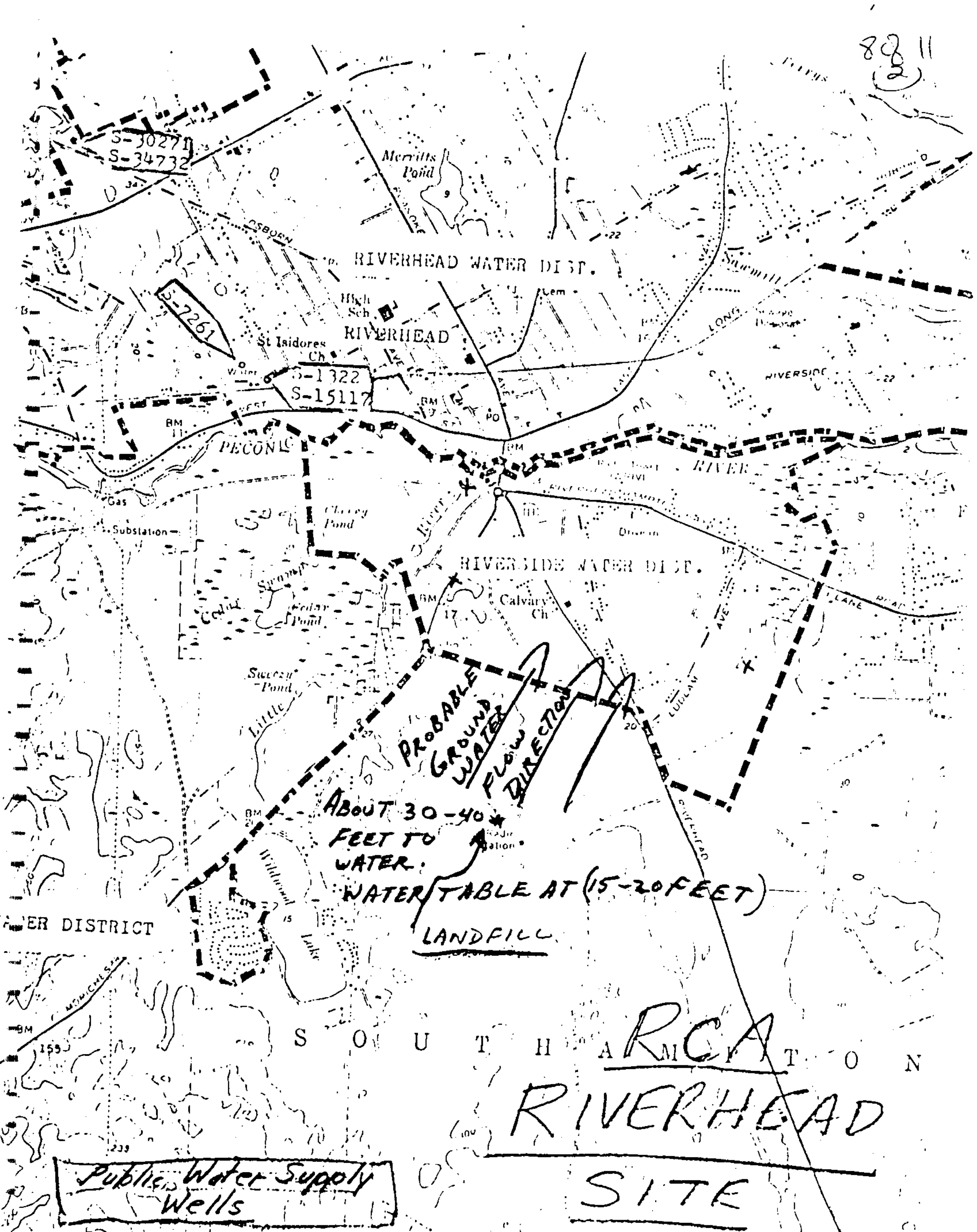
Samples of oil from one capacitor and one transformer at Rocky Point, and one capacitor at Riverhead, were found to contain Aroclor 1254 (PCB).

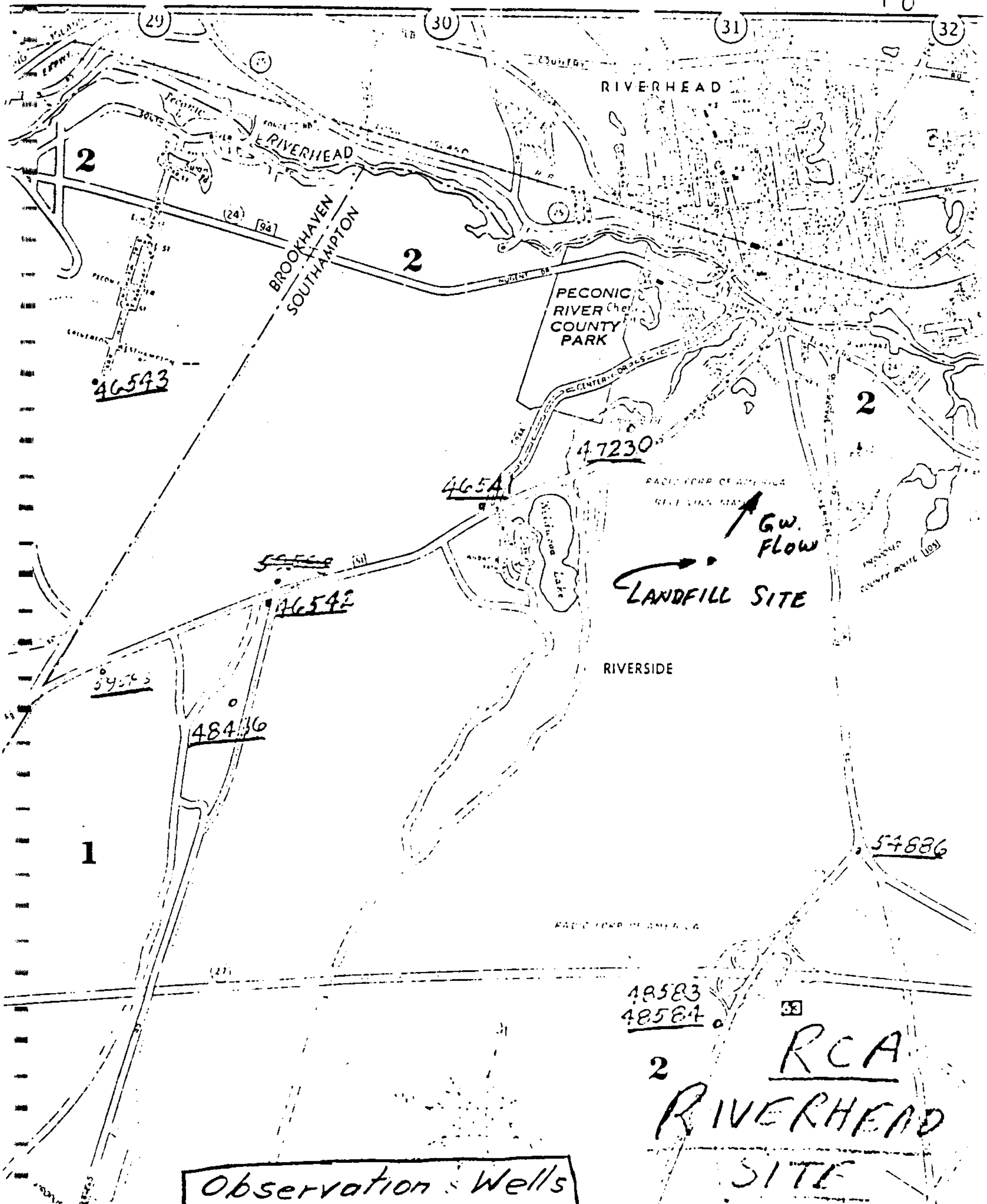
After the inventory of equipment containing PCB's is completed, a determination should be made as to which equipment is reusable. Arrangements should then be made to dispose of the unusable equipment at an acceptable secure-burial land-fill. Preliminary contact has been made with the Toxic Substances Unit in Albany for disposal of this material.

RCA should be contacted to determine the history of the landfill sites at both Rocky Point and Riverhead, and the extent of possible landfilling of such equip-ment. We should make an effort to have RCA not only take responsibility for determining which items are reusable, but also for satisfactorily disposing of the unusable material. Another possibility for disposing of any equipment determined to be reusable is through the New York State surplus procedure.

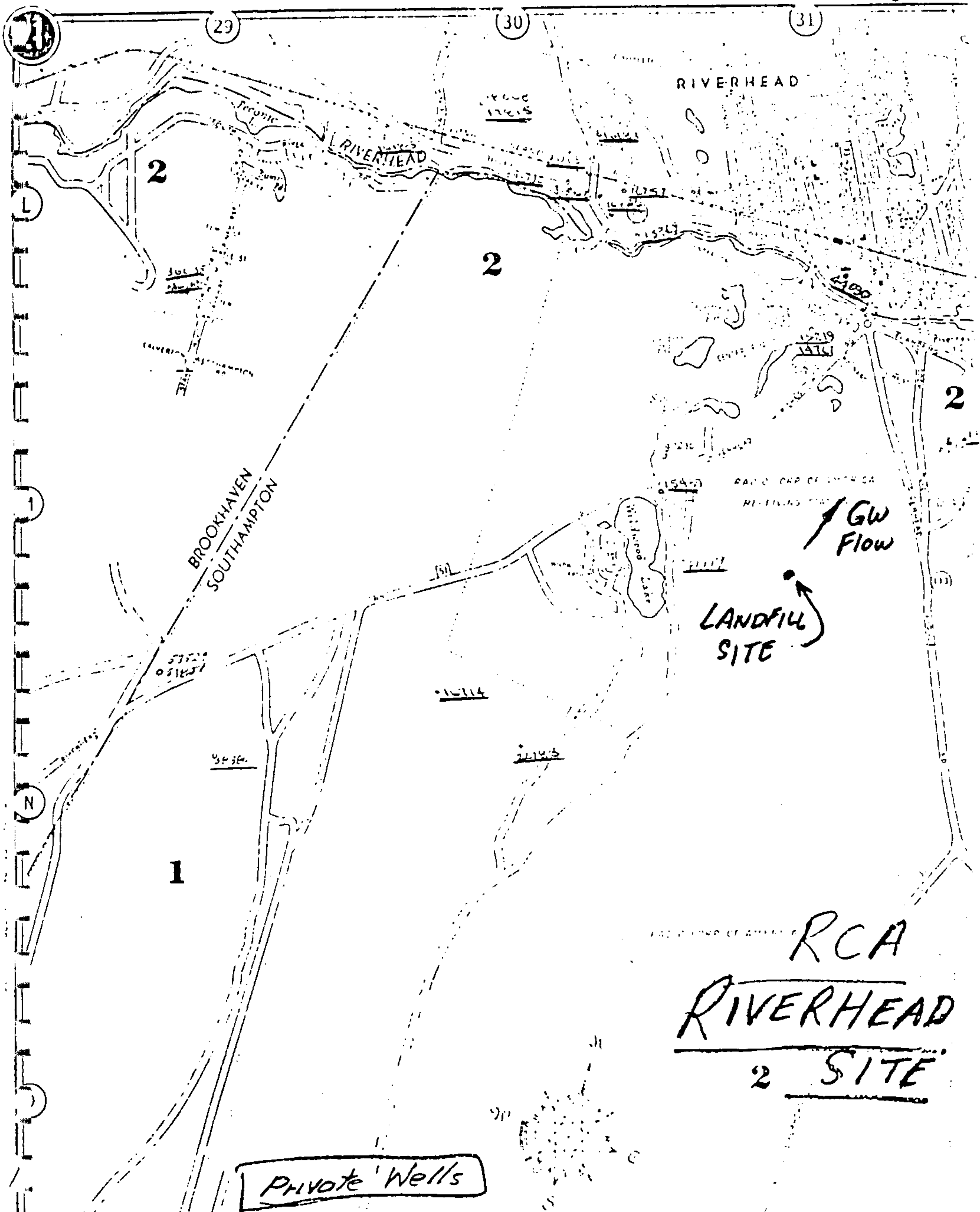
The investigation of both of the landfill sites will be completed as soon as possible to determine whether any problems exist. Since much of the equipment is securely locked in the buildings at both sites and does not present an immediate environmental problem, we have more time to deal with the disposal of that meterial.

va
Enclosures
cc: Dr. Harris, SCDHS
N. Nosenchuck
R. Miller
R. Ryan
M. Bruckman
A. Yerman


8811 (2)
S-30271
S-34732
S-7261
S-1322
S-15117
Merritts Pond
OSBORN
RIVERHEAD WATER DIST.
High Sch
RIVERHEAD
St Isidores Ch
PECONIC
RIVER
Gas
Substation
Cherry Pond
Swamp
Cedar Pond
RIVERSIDE WATER DIST.
Calvary Ch
RIVERSIDE
Sweezy Pond
Little
PROBABLE GROUND WATER FLOW DIRECTION
ABOUT 30-40 FEET TO WATER.
Radio Station
WATER TABLE AT (15-20 FEET)
LANDFILL
Wildwood Lake
ER DISTRICT
MORICHES
S O U T H A M P T O N
RCA RIVERHEAD SITE
Public Water Supply Wells


29
30
31
32
RIVERHEAD
RIVERHEAD
2
2
2
2
2
1
(24)
94
BROOKHAVEN
SOUTHAMPTON
PECONIC RIVER COUNTY PARK
46543
47230
46541
46542
48436
54886
48583
48584
GW. FLOW
LANDFILL SITE
RIVERSIDE
(27)
63
RCA RIVERHEAD SITE
Observation Wells

10811


29
30
31
RIVERHEAD
RIVERHEAD
2
2
2
1
2
L
N
BROOKHAVEN
SOUTHAMPTON
GW
Flow
LANDFILL
SITE
RCA
RIVERHEAD
2 SITE
Private Wells

11811

15 (12/75)

New York State Department of Environmental Conservation

MEMORANDUM

TO: M. Bruckman
FROM: A. DeCostanzo
SUBJECT: RCA Properties - PCB Investigation

DATE: May 30, 1980

The rusted capacitor I submitted to J. Foehrenbach for PCB analysis on 5/27/80 was found to contain about 100% Aroclor 1254 (PCB's). This capacitor was taken from the landfilled area (from a subassembly laying on the ground) at the RCA Riverhead site.

We are planning to put in pumpable permanent wells for sampling purposes at both RCA Riverhead and Rocky Point. We must now consider having Suffolk County drill the wells or have a private contractor drill them. I now have proof that PCB's were buried in the landfill at RCA Riverhead; there is no reason to delay well drilling at that site.

Both Part 360 existing and Part 360 proposed draft require ground-water monitoring for at least five years after final cover is completed; we would, therefore, be required under our own Departmental Rules and Regulations to provide for ground-water monitoring as well as maintain soil-cover integrity, etc.

I recommend that we make use of Suffolk County's well-drilling capabilities; however, I will process the paperwork for the six proposed private well drillers.

va

cc: D. Middleton
A. Machlin
R. Ryan
J. Austin

Received from
NYSDEC Region 1

WELL DRILLING INVESTIGATION AT THE NYSDEC-RCA PROPERTY - RIVERHEAD

There has been some concern that deposition of old transformer parts at the above site contain PCBs and that groundwater contamination could occur. An investigation was undertaken to address this problem.

A total of four groundwater profile wells and two soil borings were drilled at a small landfill located on the former RCA property in Riverhead to determine if any PCB contamination was present. Groundwater samples were collected from the profile wells at depths of 72, 62 and 52 feet from grade. Soil samples were collected from two areas of the landfill. The general location of the landfill is shown on Figure 1.

Groundwater Direction

The groundwater direction was determined from the SCDHS 1979 regional water table map and was found to be due north (see Figure 2).

Landfill: Size, Shape and Description

The landfill is very small (approximately 100 by 200 feet) and consists mainly of scrap wood, cable, hinges, porcelain insulators, remains of old radios, transmitters and other assorted debris. The thickness of the fill was estimated at 5 feet. A cross section through the landfill (see Figure 3) indicates there is some clay, but it is below the water table.

Groundwater Wells

As already indicated, four groundwater wells were installed--one upgradient and three downgradient of the landfill. The wells are all 2-inch steel with 2-foot stainless steel points. They were installed and pumped successively at depths of 72, 62 and 52 feet. The wells were left in place at the 52-foot level for further monitoring.

The samples collected were given to the State DEC office in Stony Brook for analysis of PCBs. A groundwater sample was collected from well #1 and analyzed by the SCDHS Laboratory. The results (see Appendix 1) show that excellent quality water exists at the site for the parameters tested.

Soil Samples

Seven soil samples were collected from two areas of the landfill, labeled A and B, as shown on Figure 4. Also attached is a soil sample log (Appendix 2).

RM/jb
9-29-80

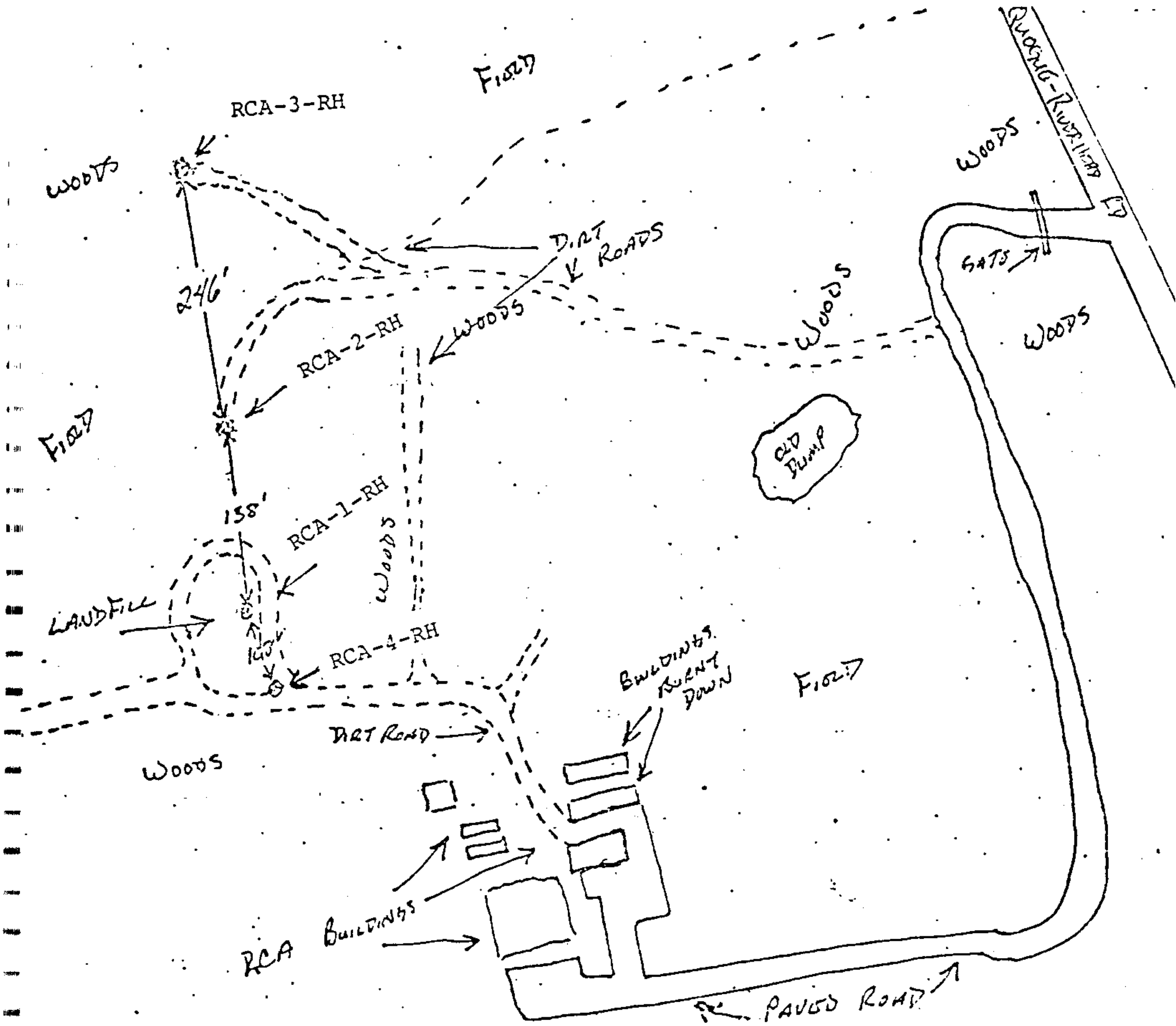


FIGURE 1
LOCATION OF LANDFILL
AT NYSDEC-RCA PROPERTY - RIVERHEAD

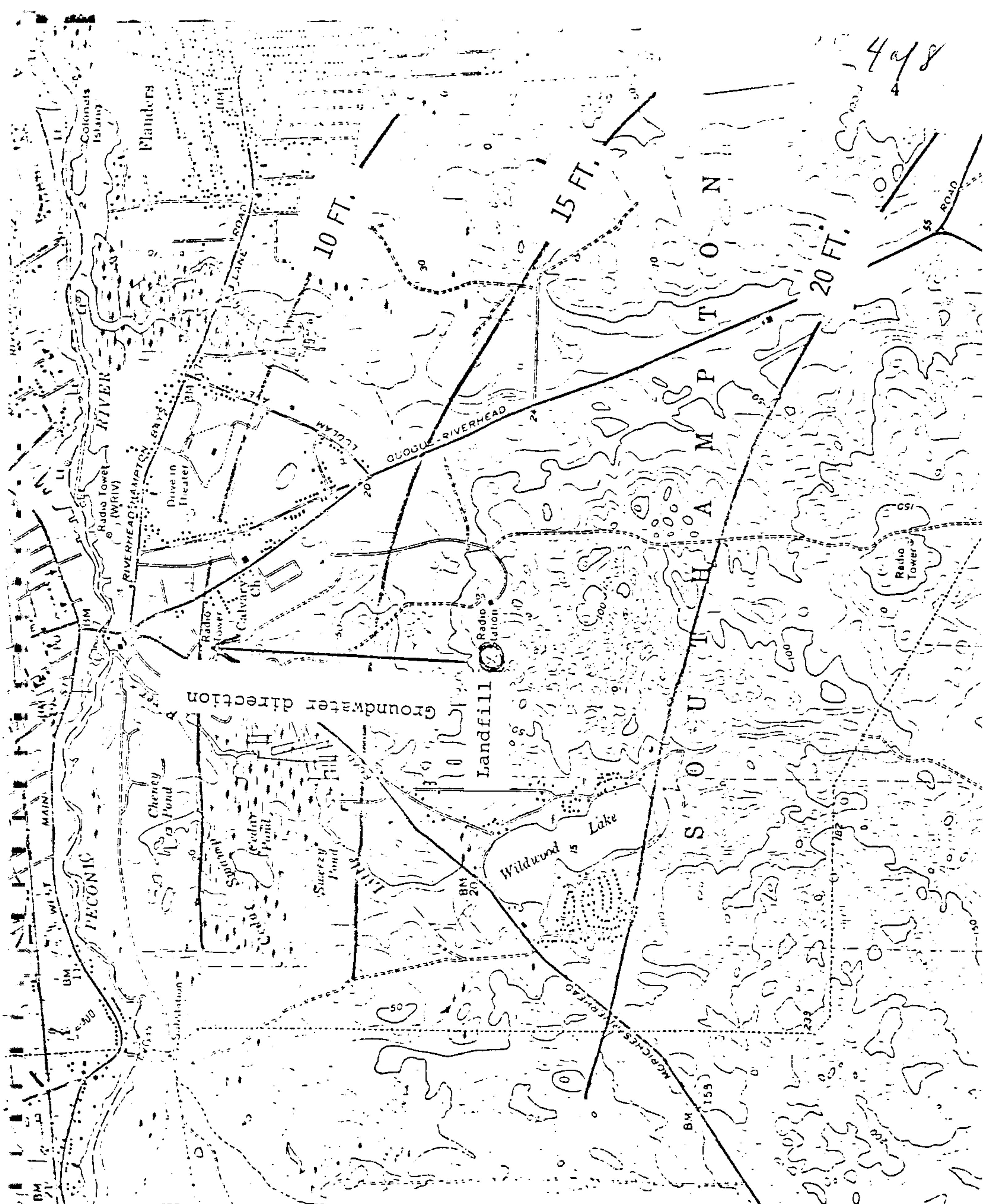


FIGURE 2

GROUNDWATER DIRECTION

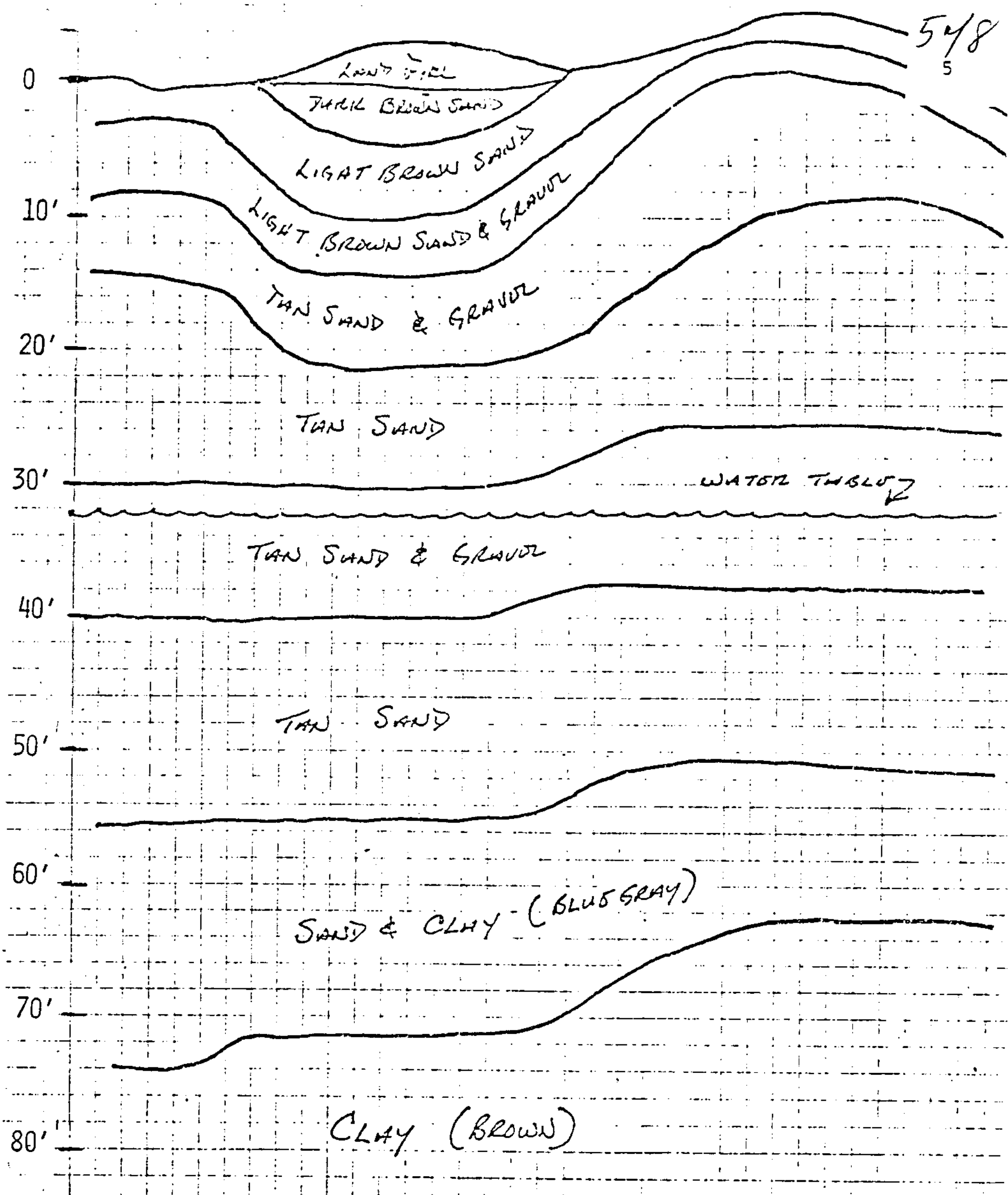


FIGURE 3

CROSS SECTION THROUGH LANDFILL

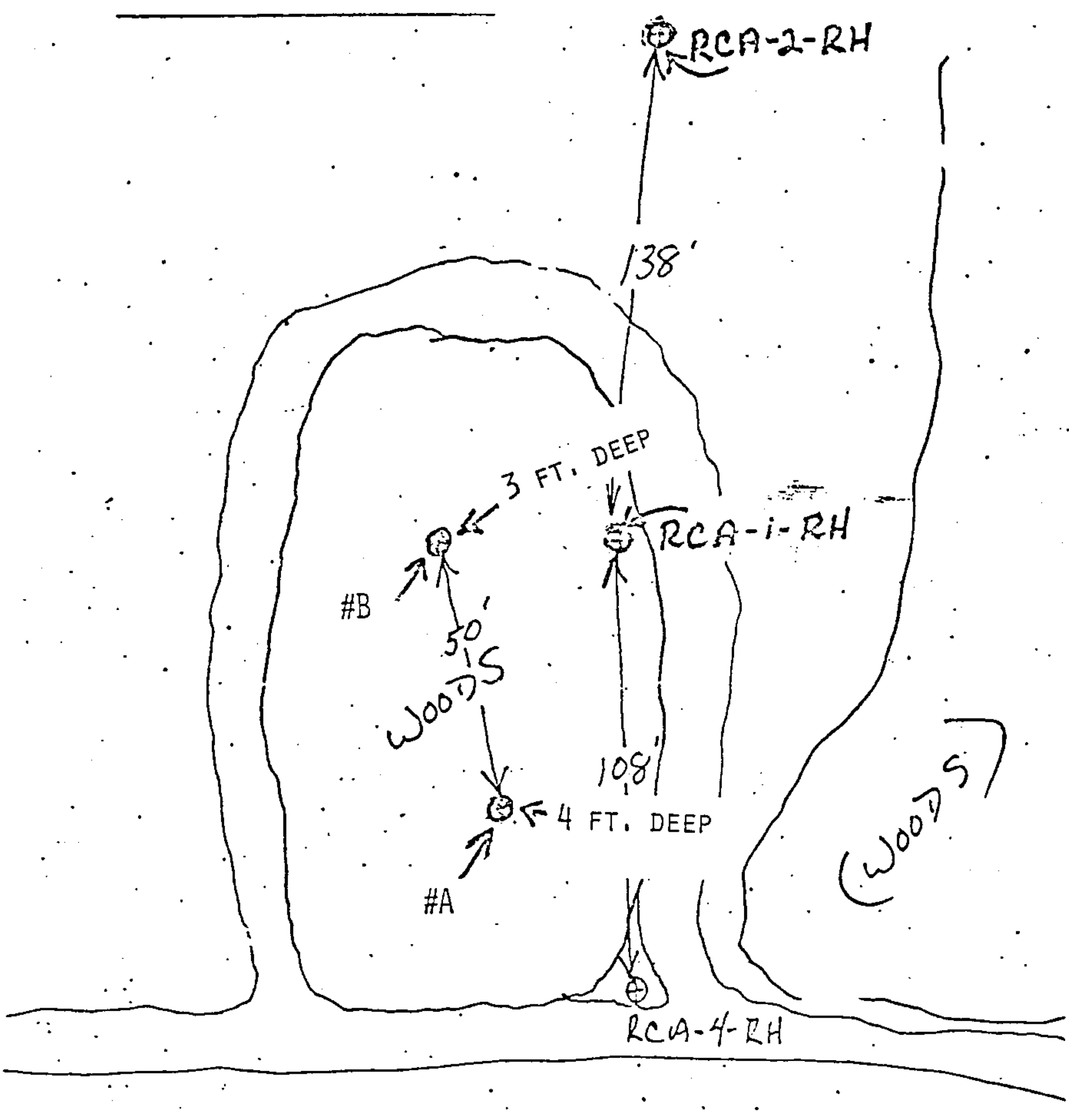


FIGURE 4

LOCATION OF SOIL BORINGS

FIELD

APPENDIX 1

LABORATORY

7

FIELD NO. ____________________

BY S. Hansen (NAME, NOT INITIALS)

DATE COL. 7/21/80

TIME COL. 11:00 Am

LAB NO. 7-80-104 1 of 8

TYPE SAMPLE WELL

DATE REC'VD. 7/21

TIME REC'VD. 4 PM

DATE COMPLETED 8/11/80

SUFFOLK COUNTY HEALTH SERVICES LABORATORY
CHEMICAL EXAMINATION OF WATER, SEWAGE, INDUSTRIAL WASTE

NAME OR FIRM RCA - Southampton property (Kirkhead)

ADDRESS OR LOCATION at dump site

POINT OF COLLECTION Well # 1

REMARKS/INSTRUCTIONS Coll. at depth of 52 ft from grade
Results to R. [illegible]

TEST	RESULT	TEST	RESULT mg./liter	TEST	RESULT mg./liter
✓ CONDUCT	53 umho	✓ NITRATE-N	< .02	COPPER	
✓ pH	FIELD	✓ NITRITE-N	.005	✓ IRON	.57
TEST	RESULT mg./liter	✓ AMMONIA-N	.06	✓ MANGANESE	.05
ph. ALKALINITY		TKN		CHROMIUM	
✓ T. ALKALINITY	FIELD	✓ O-PO$_4$-P	.009	NICKEL	
✓ CHLORIDE	6.0 7.1			ZINC	
FLUORIDE				✓ MAGNESIUM	1.3
CYANIDE		TOT. SOLIDS		✓ CALCIUM	1.9
		SUS. SOLIDS		LEAD	
✓ SULFATE	6.9	✓ DISS. SOLIDS	—	CADMIUM	
MBAS				SILVER	
C.O.D.				✓ SODIUM	4.8
✓ T.C.	4.0			✓ POTASSIUM	1.0
				BARIUM	
		FIELD D.O.			
		FIELD TEMP			
		FIELD pH			

SOIL SAMPLE LOG

Well No. Holes A & B
Driller Hansen
Method Hand auger
Date Started 7 / 31 / 80
Date Completed 7 / 31 / 80

Street Quogue-Riverhead Road
Community RCA Landfill
Township Southampton
Quadrangle
Hagstrom Map # Sq /

8a/8

No	C/F	#El	Lnt	Taken	Formation	Dpt	Tkn	Remarks
HOLE #A				Grade	Dark brown sand			
				1 ft.	Dark to light brown			
				2 ft.	" " " "			
				3 ft.	Light brown			
				4 ft.	" "			
HOLE #B				Grade	Rusted cable - burnt coal			
					Dark brown sand			
				1 ft.	Dark to light brown sand			
					Coal - glass			
				2 ft.	Light brown sand			
					Burnt coal			
				3 ft.	Light brown sand			
					Mica - Green glass			

Appendix 1.1-6

1 of 4

EA SCIENCE AND TECHNOLOGY
A Division of EA Engineering, Science, and Technology, Inc.

COMMUNICATIONS RECORD FORM

RCA [illegible]

Distribution: ( ) ________, ( ) ________
( ) ________, ( ) ________
( ) Author

Person Contacted: [illegible] Date: 3-24-86

Phone Number: [illegible] Title: ________

Affiliation: [illegible] Type of Contact: ________

Address: [illegible]
[illegible] NY 11788

Person Making Contact: [illegible]

Communications Summary: Water samples were collected in July 86 at 4 wells on the RCA [illegible] site and given to the DEC Region I office. [illegible] DEC [illegible]. The samples were found to be [illegible]

[illegible]

[illegible] (516) 751-7900 ext 301

(see over for additional space)

Signature: [illegible]

EA SCIENCE AND TECHNOLOGY
A Division of EA Engineering, Science, and Technology, Inc.

COMMUNICATIONS RECORD FORM

Distribution: ( ) RCA - [illegible], ( ) ______
( ) ______, ( ) ______
( ) Author

Person Contacted: [illegible]

Date: 3-24-8[illegible]

Phone Number: [illegible]

Title: Chemist

Affiliation: [illegible]

Type of Contact: Phone

Address: [illegible]

Person Making Contact: [illegible]

Communications Summary: Water samples from the [illegible] wells at the RCA [illegible] site were [illegible] in [illegible] of 1983 and brought in at the [illegible] OSC Lab. [illegible] analysis was performed on [illegible] samples from well 1+2 for RCRA [illegible]. The data from these analysis was lost after the [illegible] was closed.

(see over for additional space)

Signature: [illegible]

3-14

RECEIVED NOV 19 1986

New York State Department of Environmental Conservation

Building 40
SUNY
Stony Brook, NY 11794

516-751-7900

Henry G. Williams
Commissioner

November 14, 1986

Mr. Larry Wilson
EA Science and Technology
R.D. 2
Goshen Turnpike
Middletown, NY 10904

Dear Mr. Wilson:

This is in reference to your request for any water quality analyses for the former RCA Property in Riverhead, presently owned by this Department.

The only information I have uncovered to date is the enclosed memo dated August 11, 1980 from J. Foehrenbach and K. Chytalo to A. De Costanza concerning analayses which were made for PCB's.

If I come across any other information, I will forward it to you.

Very truly yours,

Albert Machlin, P.E.
Assistant Regional Director
and Regional Engineer for
Environmental Quality

AM:11

Enc.

New York State Department of Environmental Conservation

4 of 4

MEMORANDUM

A. DeCostanza

OM: Jack Foehrenbach and Karen Chytalo JF & KC

UBJECT: PCBs in Groundwater

DATE: August 11, 1980

The following water samples were analyzed for PCBs. No PCBs were found, atleast down to 1 ug/L (PPB) level. This is our limit of detection for our operating conditions.

Area	Well#	Depth
Rocky Point	RCA#4	60'
Riverhead	RCA#1	72'
Riverhead	RCA#1	62'
Riverhead	RCA#1	52'
Riverhead	RCA#2	52'
Riverhead	RCA#2	62'
Riverhead	RCA#2	72'

The chromatograms did show some early eluting peaks which were not identified; these peaks also showed up in previous samples from this project.

cc: D. Middleton
A. Macklin
M. Bruckman
J. Austin
R. Ryan

Received from:
Suffolk Co. Dept. of
Health

Appendix 1.1-7
Rocky Point
1 of 4

MINUTES OF MEETING

on

PCB Investigation - Former RCA Properties at Rocky Point and Riverhead

NYSDEC Region 1 Office, Stony Brook, N. Y.

July 17, 1981 - 11 a.m.

Attendees: S. M. Porfido, Staff Vice President, Environment and Facilities - RCA
L. Tuft, Vice President, Corporate Affairs - RCA
D. Bauer, Counsel, RCA
J. Maloney, SCDHS
F. Johnson, NYSDEC
A. Machlin, "
M. Bruckman, "
A. DeCostanzo, "

A meeting was held to discuss the handling of landfill and PCB problems at the Riverhead and Rocky Point sites.

RIVERHEAD SITE

RCA indicated that they were willing to handle the Riverhead landfill problem. They will arrange for their consultants, Betz, Converse and Murdock (BC&M), to perform the toxic extraction procedure test on samples taken from the Riverhead landfill. If the waste is not considered hazardous according to that test, DEC will request the Town of Brookhaven to accept those wastes in its landfill. RCA will arrange to remove all of the material at the landfill and transport it to the Brookhaven landfill for disposal.

In the event that the material is considered to be hazardous, RCA will arrange for their consultant (BC&M) to submit a proposal to DEC for removal and disposal of the material.

It was agreed that RCA would arrange to have a representative from BC&M contact DEC to discuss details of the toxic extraction test. NYSDEC and SCDHS both agreed on this approach to handling the landfill.

ROCKY POINT SITE

a. Disposal of PCB's - Equipment

RCA indicated that the disposal of PCB's in equipment was divided in two categories: PCB's in liquid form, and PCB-impregnated equipment. RCA estimated the total amount of liquid PCB's at the Rocky Point site to be approximately four to eight barrels. In addition, they estimated about one to two truck-loads of contaminated liquid resulting from triple flushing of the PCB-containing equipment. According to RCA, USEPA feels that the transformer can be disposed of as non-contaminated equipment, after the triple-flushing procedure has been completed.

At the present time, there are two approved locations for burning of liquid PCB's: one in Texas, the other in Arkansas. There is a burning charge of $400 to $500 a barrel, a minimum nine months storage charge, as well as the cost of transportation.

Although the new Sunohio "Chemical Detoxification Process" has been approved by USEPA and is significantly less expensive than disposal to Texas or Arkansas, that company has been deluged with requests for use of its equipment. RCA has been told by Sunohio that first priority will be given to utilities, and second priority to regulatory agencies, before consideration can be given to servicing RCA. This could involve a waiting time of over two years for RCA. The cost of disposing of all of the PCB's at Rocky Point was estimated as follows by RCA:

Disposal of PCB-impregnated equipment to Chemical Waste Management in Albama . . . . $10,000 to $20,000

Disposal of liquid PCB's to Texas or Arkansas	. . . .	$20,000 (approximately)
Processing of liquid PCb's by Sunohio	. . . .	less than $20,000
Total cost of disposal (Liquid PCB's to Texas or Arkansas plus impregnated PCB's to Alabama)	. . . .	$60,000 maximum
Total cost of disposal (Liquid PCB's processed by Sunohio plus impregnated PCB's to Alabama)	. . . .	$40,000 maximum

b. Landfill

J. Maloney distributed copies of SCDHS's "Plan of Action to Prevent Groundwater Contamination at RCA Property at Rocky Point," dated July, 1981, which covers capping of the Rocky Point landfill plus groundwater monitoring and soil borings. A discussion was held on the cost of capping the landfill with bentonite or clay. Previous estimates indicated a total cost of 20¢ to 40¢ a square foot (clay plus soil). Since the area involved is about an acre (or about 40,000 square feet), the cost could vary from $8,000 to $16,000. If a larger area of 100,000 square feet were to be capped, the cost could be as high as $40,000.

c. RCA Proposal

RCA indicated that, since they were experienced in the handling of PCB's. they would dispose of all PCB's and associated equipment providing that DEC would handle the capping of the landfill. To avoid the excessive waiting time for Sunohio, RCA would pay the higher cost of PCB disposal to Texas and Arkansas.

DEC representatives indicated that it was hoped that RCA would also include the capping costs in their offer since it would be difficult for DEC to obtain those funds. RCA stated that they were not authorized to make any further commitments.

There was a discussion on the possibility of disposing of liquid PCB's to Sunohio through DEC to take avantage of the higher priority given to regulatory agencies. If this could be done, the money saved could possibly be utilized for capping of the landfill. It was agreed that DEC would contact Sunohio to pursue this matter.

Whether this was possible or not, DEC requested RCA to consider providing the funds to purchase bentonite. DEC will investigate the possibility of arranging for the installation of the clay by other State agencies. SCDHS will provide DEC with an up-to-date cost estimate for capping the landfill with clay, a copy of which will then be transmitted to RCA.

GROUNDWATER MONITORING

a. Riverhead Landfill

It was agreed that, after the material is removed from the Riverhead landfill, there will be no need for groundwater monitoring.

b. Rocky Point Landfill

It was agreed that only one 4-inch monitoring well will be required downstream of the Rocky Point site (as proposed by SCDHS). RCA agreed to install the well. SCDHS agreed to periodically perform the water sampling, and DEC agreed to analyze the samples for PCB's.

SUMMARY

Two letters will be send to RCA: one covering the agreements reached for the Riverhead site; the other for Rocky Point. A tentative meeting was set for Friday, August 21, 1981 at the NYSDEC Region 1 office.

Received from:
Suffolk Co. Dept. of
Health

File
RCA Appendix 1.1-8

1 of 3

MINUTES OF MEETING

on

PCB Investigation - Former RCA Properties at Rocky Point and Riverhead

NYSDEC Region 1 Office, Stony Brook, N. Y.

September 18, 1981 - 11 a.m.

Attendees: S. M. Porfido, Staff Vice President, Environment and Facilities - RCA
G. A. Shawy, Director, Real Estate and Administrative Services - RCA
D. B. Bauer, Counsel - RCA
J. Maloney, SCDHS
D. Middleton, NYSDEC
F. Johnson, "
R. Ryan, "
A. Machlin, "
A. DeCostanzo, "

A meeting was held to discuss the status of the handling of the PCB-related problems at the Riverhead and Rocky Point sites.

Riverhead Site

It was indicated that the consultants for RCA--Betz, Converse and Murdock (BC&M), had contacted the DEC to make arrangements for testing of the soil under the Riverhead landfill. The Toxic Extraction Procedures test will be performed on these samples. The Town of Brookhaven ~~has been~~ was contacted ~~again~~ by DEC to confirm ~~that it will~~ their agreement to accept ~~the~~ material from that landfill, if it is not considered hazardous by EPA, according to that ~~test~~. RCA will arrange to remove all of the material ~~at~~ from the landfill to either the Brookhaven landfill or another satisfactory disposal site.

Rocky Point Site

a. Disposal of PCB-Contaminated Equipment

DEC indicated that the Sunohio Company was contacted ~~to inquire~~ and asked about the processing of PCB-contaminated liquid in equipment on this site. Sunohio informed DEC that the PCB concentration would have to be less than 1% for their process to be used. RCA was contacted, and arrangements were made for BC&M to determine the PCB content of the liquid. If the tests show that the concentration is less than 1%, DEC will contact Sunohio to determine how soon that company could arrange to process this material.

Although 17 transformers were listed in DEC's records, RCA indicated that their records only show that there is one transformer on that site. M. Etter of RCA has separated all of the earthen-filled PCB-contaminated equipment into a secured area.

S. Porfido informed us that equipment containing ~~the~~ 400 to 500 gallons of PCB-contaminated oil would have to be triple-flushed with solvents. ~~and~~ This would result in about 5,000 gallons of liquid which must be burned. He indicated that, under the law, RCA could buy this equipment as an "end-user."

A discussion was held on the measures to be taken to secure the site until the ~~time that~~ Sunohio is able to service the area. RCA offered to "sandbag" the site and provide a low concrete splash on the concrete pad. BC&M will arrange to properly secure the transformer. BC&M will be inspecting the Rocky Point site on 9/21/81, and will sample the soil at Riverhead later that week.

b. Landfill

J. Maloney has obtained estimates for the cost of purchasing bentonite to cap the landfill. He was informed that 2 lbs. per square foot of material were needed ~~and~~ at ~~the~~ a cost of 28¢ per square foot. The estimated cost for 40,000 square feet would be $11,200.

DEC indicated that, if RCA would purchase the bentonite, DEC would make arrangements to place it on the landfill. S. Porfido felt that RCA would probably arrange to provide that material for capping.

Summary

A letter will be drafted from DEC to RCA showing agreement ~~on working~~ jointly with the Sunohio Company, and indicating that DEC will arrange to cap the Rocky Point landfill site if the bentonite is provided by RCA.

After the sampling and analysis work is done, another meeting will be arranged.

cc: Attendees
F. Miller
M. Bruckman

Appendix 1.1-9

logged in 7/25/84
1 of 18

Betz • Converse • Murdoch • Inc.

REPORT ON FOLLOW-UP INVESTIGATION OF RIVERHEAD SITE

FOR

THE RCA CORPORATION

Received
NYDEC
Dept of Remediation

JANUARY 1984

BCM PROJECT NO. 00-8517-07

PREPARED BY

JAMES V. HUSTED, P.E
SENIOR ENGINEER

APPROVED BY

RICHARD J. GRZYWINSKI, P.E.
VICE PRESIDENT

BCM EASTERN INC.
ONE PLYMOUTH MEETING MALL
PLYMOUTH MEETING, PENNSYLVANIA 19462

REPORT ON FOLLOW-UP INVESTIGATION OF RIVERHEAD SITE FOR THE RCA CORPORATION

1.0 Background

Results of the initial investigation of the site, located near Riverhead Long Island, New York, were presented in a June 1982 report prepared for RCA by Betz·Converse·Murdoch, Inc. (now BCM Eastern Inc.). These initial investigations, presented in Attachment 1, revealed that the concentration of total PCB in the six (6) debris/soil samples collected were less than 50 parts per million (ppm) on a whole sample basis. Under the Toxic Substances Control Act (TSCA) PCB regulations, 50 ppm is the threshold concentration above which the material would have to be considered as "non-liquid PCBs" and be handled as a hazardous waste. The maximum PCB concentration observed in any of the six samples was 17 ppm in a composite debris sample collected from the "west" portion of the site.

In April 1982, the New York State Department of Environmental Conservation (NYDEC) requested that the toxic extraction procedure (TEP) leachate derived from these same debris/soil samples be analyzed for PCB, even though the samples contained less than 50 ppm PCBs. The TEP leachate had been analyzed for the EP-Toxic metals, as reported in Attachment 1.

RCA, therefore, authorized BCM to resample the debris piles and analyze these samples for total PCB and PCB in the TEP leachates. This resampling was conducted on July 13, 1982 and the results reported in a letter dated October 6, 1982 (Attachment 2). No PCBs were detected in the leachates; however analytical results showed the "west" pile composite debris sample contained 98 ppm total PCB as compared with the maximum of 17 ppm in the October 1981 samples .

Because this sample contained total PCB in excess of the 50 ppm threshold value, RCA subsequently authorized BCM to conduct a third, more intensive, sampling effort directed at the "west" portion of the debris pile area. This report documents this additional sampling and analytical effort.

2.0 FIELD INVESTIGATION

On October 12, 1983, a BCM engineer and RCA representative collected a total of seven (7) soil and debris samples from the Riverhead site. As detailed on the attached figure, a grid network for the collection of six (6) composite debris samples was established. Between 10 and 12 individual grab samples of the debris were collected and composited into one sample for each of the six indicated areas (W-1 through W-6). In addition, one control (background) sample was collected from an area shown on the attached figure.

The grab samples were collected using a manually operated 3-inch diameter, stainless steel bucket auger. Sampling depth ranged from 3 inches to about 3 feet, depending upon the amount and type of debris encountered by the auger. Most of the material sampled was sandy soil containing various amounts of debris. The 10 to 12 grab samples were composited in a 5-gallon white plastic bucket. After thorough mixing with a stainless steel trowel, an aliquot of this composite sample was then placed in amber pint glass jars with teflon-lined lids.

Prior to collecting the first sample and between samplings, the auger, 5-gallon plastic bucket, and stainless steel trowel were cleaned thoroughly with a high-pressure washer/steam cleaner.

The seven (7) soil and debris samples collected were submitted to the BCM laboratory in Norristown, Pennsylvania for total PCB analysis. These analyses were performed in accordance with EPA Method 8.08, as specified in "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods", SW846, 1982.

3.0 RESULTS AND DISCUSSION

Analytical results, presented in Table 1, indicate that PCB is present at concentrations ranging from 0.9 to 29.0 ppm in the 6 composite debris samples collected from the "west" area. PCB concentration in the control (background) sample was less than the detection limit for the test (10 parts per billion).

The PCB concentration in all samples is less than the the 50 ppm threshold value currently specified by TSCA and confirmed by NYDEC (Attachment 3). Because the level of sampling was more concentrated during this effort than during the previous two samplings, BCM feels that the analytical data presented in Table 1 accurately represent site conditions.

5418

Betz • Converse • Murdoch • Inc.

TABLE 1

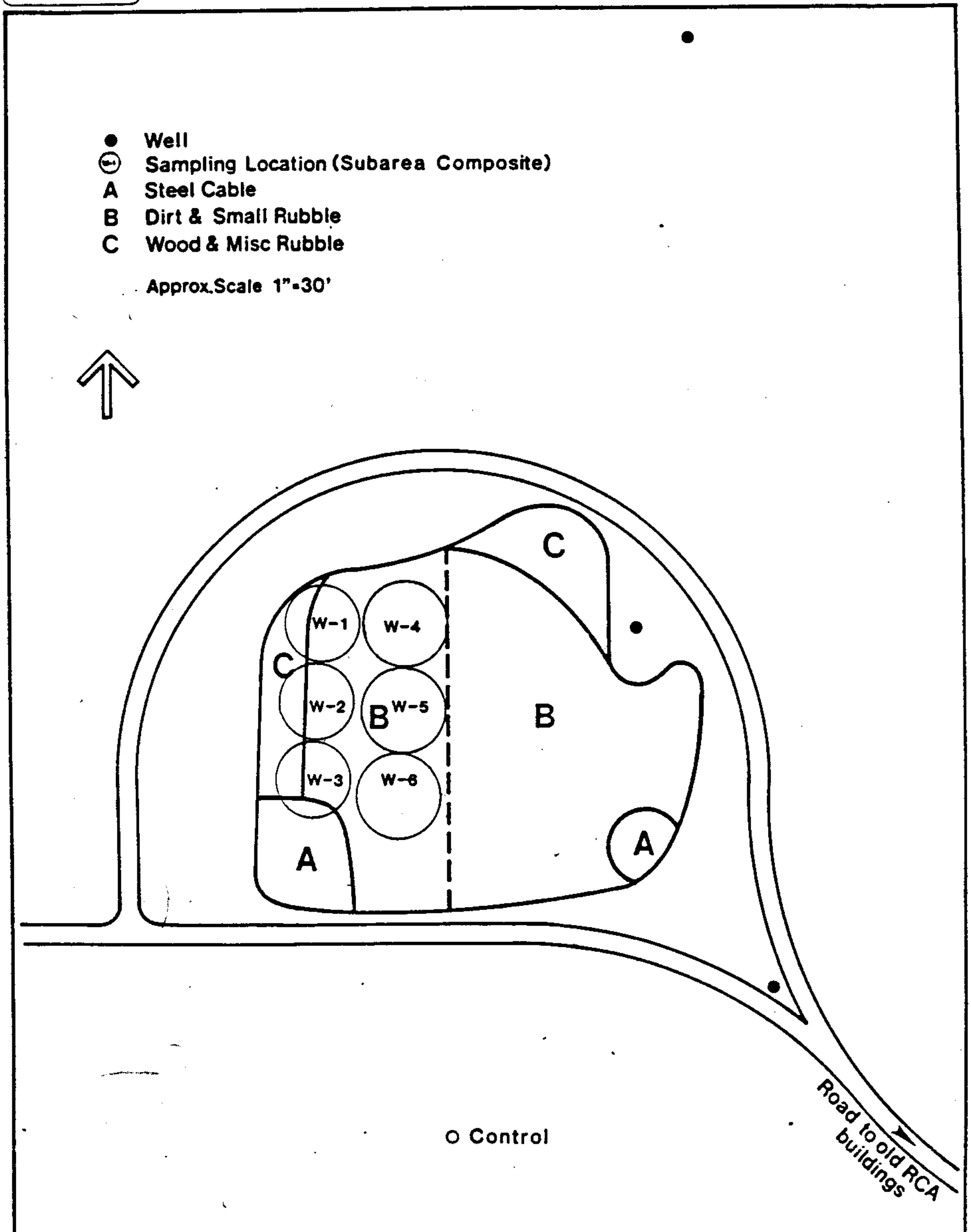
PCB ANALYSIS SUMMARY
RCA RIVERHEAD SITE
OCTOBER 12, 1983

Sample Designation*	PCB Concentration ** ppm
W-1	29.0
W-2	17.0
W-3	28.0
W-4	0.90
W-5	2.10
W-6	2.60
Control	<0.01

*See attached Figure
**Reported as milligrams per kilogram (ppm - whole sample basis) as Aroclor 1260

BCM Engineers, Planners and Scientists

6-18



Sample Location Plan
Riverhead Site - RCA Corporation
October 12, 1983

BCM

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon the results of this more intensive sampling effort, conclusions drawn pertaining to PCB concentrations at the Riverhead site follow:

1. Both the debris and soil within the debris piles are not classified as PCB under Section 761.2(s) of TSCA. Because the debris and soil contains less than 50 ppm of PCB, and because it appears that the PCB detected in the samples has resulted from small capacitors, the material in the debris piles can be landfilled.

2. Based upon previous sampling and analysis of specific electrical components from the Riverhead site by NYDEC, PCBs are contained in some of these components (primarily small capacitors) mixed with the rubble at the site.

These conclusions, coupled with the requirements of NYDEC's August 31, 1983 letter (Attachment 3), lead to the following recommendations for removal and proper disposal of debris at the Riverhead site:

1. All bulky debris (steel cable, metal scraps, stumps and pallets) should be removed to the Riverhead (T) Landfill for disposal.

2. The remaining debris (primarily soil), after removal of any large capacitors, should be hauled to the lined landfill at Horseblock Road, Brookhaven (T) for disposal.

3. During excavation of the debris piles, any readily-observable large capacitors (those suspected of containing greater than 3 pounds of dielectric fluid) should be removed. This work should be done by hand, and the removed capacitors should be placed in a suitable PCB container for storage and subsequent disposal.

4. After all material is removed from the excavation, samples of the underlying soils should be collected in a 4 x 5 grid (20 grab samples), using a 20-foot square spacing. These 20 grab samples should be combined into one (1) composite sample for total PCB analysis to confirm the absence of PCB (50 ppm threshold per Attachment 3).

5. Following confirmation of item 4 above, the excavated area should be backfilled, regraded to natural contour, and revegetated. Fill required for the regrading is available to the immediate north and west of the site depicted in the attached figure.

8-18

Betz · Converse · Murdoch · Inc.

ATTACHMENT 1

JUNE 1982 REPORT

9-18

ANALYSIS OF RIVERHEAD DISPOSAL SITE

FOR THE

RCA CORPORATION

JUNE 1982

BCM PROJECT NO. 00-8517-01

PREPARED BY

JAMES V. HUSTED, P.E.
SENIOR ENGINEER

APPROVED BY

TERRENCE J. MCMANUS, P.E.
ASSISTANT VICE PRESIDENT

BETZ•CONVERSE•MURDOCH•INC.
ONE PLYMOUTH MEETING MALL
PLYMOUTH MEETING, PENNSYLVANIA 19462

Betz • Converse • Murdoch • Inc.

ANALYSIS OF RIVERHEAD DISPOSAL SITE FOR THE RCA CORPORATION

1.0 INTRODUCTION AND BACKGROUND

This report documents an evaluation of solid waste material contained in a disposal site located near Riverhead, Long Island, New York, on land previously owned by the RCA Corporation (RCA). The primary purpose of this investigation was to determine whether the solid waste material would be classified as either hazardous or nonhazardous waste in accordance with the regulations promulgated by both the U.S. Environmental Protection Agency (EPA), under the Resource Conservation and Recovery Act (RCRA), and the New York State Department of Environmental Conservation (NYDEC). A nonhazardous classification of the material would allow for its proper disposal at the Brookhaven landfill.

Based upon telephone communications with NYDEC representatives, Betz•Converse•Murdoch•Inc. (BCM) of Plymouth Meeting, Pennsylvania developed a sampling and analysis program to classify the material at the disposal site. NYDEC personnel were directly involved in the program development, not only because of that agency's direct control over solid and/or hazardous waste disposal in New York State, but also due to the fact that RCA has donated the property to the State of New York.

Due to the heterogeneous nature of material contained in the disposal site, BCM and NYDEC personnel recognized the difficulty that would be encountered in obtaining a representative sample of the larger debris. Consequently, a sampling program was devised that involved collecting samples of soil from beneath the disposal area. It was agreed that five to six samples of soil (with one sample serving as background) should be sufficient to categorize the waste as either hazardous or nonhazardous.

Based upon previous NYDEC sampling and evaluation of specific electronic components contained in the rubble piles, the presence of polychlorinated biphenyl (PCB)-containing components had been confirmed. Accordingly, analysis for PCB was to be performed on the samples collected. In addition, the toxic extraction procedure (TEP), as described under the RCRA regulations, was to be performed on all samples, with a subsequent evaluation of the EP toxic metals and pesticides on the leachate from the samples.

2.0 FIELD INVESTIGATION

Two representatives of NYDEC and a BCM engineer arrived at the site on Thursday morning, October 15, 1981. The BCM engineer was to collect samples and categorize the disposal area while the NYDEC representatives observed the operation.

The disposal area consists of miscellaneous rubble situated approximately 1/4 mile from the old RCA buildings at Riverhead, in an area of mixed pitch pine, scrub oak, and other oak species. The site appears to have been a small excavated area into which rubble was dumped and then pushed up in piles approximately 5 feet high.

The actual area measures approximately 84 feet by 72 feet, as shown schematically on Figure 1. The southwest corner of the site is covered by a large pile of old steel cable, about 20 feet square and 4 feet deep. The cable appears to be in coils and is all tangled together. A similar pile, although smaller (roughly 15 feet in diameter and 3 feet high), is located at the southeast corner of the site. The visible debris at the site may be categorized as follows:

1. Approximately 25 percent of the volume consists of metal in the form of cable, old tin cans, a few drums and empty 5-gallon buckets, plus some small metal capacitors and miscellaneous metal debris. Some old electric chassis, containing small capacitors and/or transformers, are present. All drums are empty and severely rusted.

2. Approximately 70 percent of the debris volume consists of mixed soil and debris. Most of this debris appears to be cinders, soil, ceramic insulator parts, glass, and old electric components, with some plastic, paper, fiberglass, and other miscellaneous debris.

3. The remaining 5 percent by volume is mostly wood in the form of trees, stumps, and broken pallets. In addition, some building rubble (old broken concrete block, etc.) is present in small quantities.

Soil and debris samples were collected from the areas indicated on the following schematic diagram. Sample collection and description details are contained in Appendix 1 and are summarized as follows:

1. Sample No. 1 was collected approximately 100 feet from the disposal area, and served as a background sample.

2. Sample No. 2 was collected from the south-central portion of the debris area in a depression, and consisted of a mixture of sandy soil and debris.

3. Sample No. 3 was collected from the west side of the debris area, at the base of a mixed debris pile that contained various small electrical components.

4. Sample No. 4 was collected from the northeast corner of the debris pile, and consisted of a mixture of soil and debris.

5. Sample No. 5 was a composite of approximately 20 individual borings taken from the western half of the area, and consisted of mixed soil and debris.

6. This sample was a composite similar to No. 5, but taken from the eastern half of the area.

The six soil and debris samples collected were submitted to the BCM laboratory and subjected to the following analyses:

- EPA toxic extraction procedure (TEP)
- EP toxic metals on leachate
- EP toxic pesticides on leachate
- PCB scan on whole sample (sample leached with hexane)
- Total organic carbon analysis on whole sample

The analytical methodologies for these analyses are described in Appendix 1.

Betz • Converse • Murdoch • Inc.

TABLE 1

EP TOXIC METALS ANALYSIS ON LEACHATE
RCA RIVERHEAD SITE
OCTOBER 15, 1981

Parameter	Concentration* in Sample Number 1	2	3	4	5	6	EPA Maximum Concentration for EP Toxicity
Arsenic	<0.001	0.001	0.005	0.002	<0.001	<0.001	5.0
Barium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	100.0
Cadmium	<0.005	0.012	0.073	0.040	0.012	0.045	1.0
Chromium	0.052	0.052	0.052	0.052	0.052	0.052	5.0
Lead	<0.10	<0.10	1.36	<0.10	<0.10	<0.10	5.0
Mercury	0.0002	0.0002	0.0005	<0.00005	0.0002	0.0001	0.2
Silver	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	5.0
Selenium	0.003	<0.001	<0.001	0.013	0.012	0.015	1.0

*All values in milligrams/liter (mg/l)

Source: Betz•Converse•Murdoch•Inc.

TABLE 2

ORGANIC ANALYSIS SUMMARY
RCA RIVERHEAD SITE
OCTOBER 15, 1981

Parameter and Units	Sample Number 1	2	3	4	5	6	EPA Maximum Concentration for EP Toxicity
EP Toxic Pesticides in Leachate							
Endrin - ppb*	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.02
Lindane - ppb	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.4
Methoxychlor - ppb	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	10.0
Toxaphene - ppb	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.5
2,4-D - ppb	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	10.0
2,4,5-TP Silvex - ppb	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	1.0
Other Constituents							
PCB - ppb (whole sample basis-leached with hexane)	<0.1	<0.1	3,000	1,700	17,000	900	50,000**
Total Organic Carbon-mg/kg	80,000	162,000	167,000	423,000	195,000	135,000	--

* Parts per billion

**PCB concentration "cutoff" below which a material is not considered a "PCB item" under the Toxic Substances Control Act (TSCA)

Source: Betz•Converse•Murdoch•Inc.

15 of 18

APPENDIX 1

SAMPLING AND ANALYTICAL METHODOLOGY

APPENDIX 1

SAMPLING AND ANALYTICAL METHODOLOGY

SAMPLING PROCEDURE

Soil and debris samples were collected using a manually operated, 2-inch diameter, 3-foot-long steel auger. The screw portion of the auger was 6 inches long and 2 inches in diameter, with the remainder being 1/2-inch-diameter steel rod. Samples of material (whether soil or debris) that were retained on the 6-inch-long auger portion were transferred to a 1/2-gallon plastic wide-mouthed bottle. Once the composite sample was formed, the contents of the plastic bottle were thoroughly mixed with a stainless steel spatula, and sufficient material was removed from this composite sample to fill a 250-ml glass sample container with a teflon-lined lid.

Prior to collecting the first sample and between samplings, the auger, 1/2-gallon plastic container, and stainless steel spatula were rinsed with deionized water and then with petroleum ether. The details of each sample collection procedures are as follows:

Sample No. 1 (background soil sample) - This sample was collected approximately 100 feet from the southeast corner of the dump site area in a wooded area which appears not to have been disturbed due to the size of the trees. The 2-inch diameter hand auger was used to collect a soil core sample to a depth of approximately 36 inches. The soil profile is as follows: 0 to 12 inches - sand, varying from grey in color to a depth of about 4 inches, a narrow band of yellowish sand 1-inch thick between 4 and 5 inches, and varying grey and yellowish brown shades of sand to 12 inches; 12 to 36 inches - yellow-brown sand.

Sample No. 2 - This soil sample was taken in the south-central portion of the debris area about 30 feet back from the dirt road adjacent to the debris pile and is as follows: 0 to 6 inches - mixture of sand and humus and possibly some debris; 6 to 30 inches - yellow-brown sand.

Sample No. 3 - This sample was collected from the west side of the debris pile, approximately 2 feet in from the toe of the pile, which was about 4 to 5 feet high. Numerous electrical components were observed mixed with the debris in this area. Resistance was met in this hole at a depth of about 14 inches beneath the surface. The sample removed was sandy in nature and contained obvious contaminants; different colors, from grey to black, and some wood and glass particles were observed. An electrical component that appeared to be a resistor was picked up in the sample. There was some shiny silver metal shavings on the surface of the debris, although it is uncertain whether any of these were collected with the sample. The sample had a slight, unusually pungent odor.

Sample No. 4 - This sample was collected from the east side of the dump area at the toe of a pile of miscellaneous rubble containing some electrical components and assemblies, metal parts, and other refuse. The surface was essentially leaves and other dead vegetation. The first 12 inches consisted of sandy soil with obvious contamination from shredded rufuse and numerous electrical components such as tubes, tubed bases, cables, pipes, and other debris. Resistance that felt like a metal object was met at a depth of 14 inches. Similar resistance was met in a second hole made approximately 8 inches away. A third hole located about 2 feet from the first one encountered resistance at a depth of approximately 18 inches. Consequently, sample No. 4 represents a composite of samples collected from three separate borings in the same immediate area to a maximum depth of 18 inches. There appears to be a significant quantity of material buried beneath the surface in this area.

Sample No. 5 - This sample was collected from the western half of the site in mixed soil and debris piles. Approximately 20 locations around the area were augered down to a maximum depth of 1 foot, and all material removed by the auger was combined into one composite sample.

Sample No. 6 - This consisted of a composite debris sample collected from 15 to 20 separate borings taken from the eastern half of the debris piles. Borings were taken to a maximum depth of 12 inches.

The six soil and debris samples were transported to the BCM laboratory for subsequent analysis.

ANALYTICAL METHODOLOGY

The analytical procedures used for the analyses conducted for this project are summarized as follows:

- PCB in Debris/Soil - EPA Method 8.08, as specified in "Test Methods for Evaluation Solid Waste - Physical/Chemical Methods", SW 846, 1980 (copy attached)

- EP Toxicity Extraction Procedure - EPA Method 7.0 from the above-referenced document (copy attached)

- EP Toxic Metals - Methods specified in "Methods for Analysis of Water and Wastes", Environmental Monitoring and Support Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268 (EPA - 600/4-79-020, March 1979)

- EP Toxic Pesticides - Methods specified in "Methods for Benzidine, Chlorinated Organic Compounds, Pentachloraphenol, and Pesticides in Water and Wastewater", September 1978, U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 42568, as standardized in "Test Methods for the Evaluation of Solid Waste, Physical/ Chemical Methods"

- Total Organic Carbon - Run by Oceanographics International Corporation (OIC) Ampule Method on Model 524C instrument

EA SCIENCE AND TECHNOLOGY
A Division of EA Engineering, Science, and Technology, Inc.

Appendix 1.1-10
1 of 4

COMMUNICATIONS RECORD FORM

Distribution: ( ) RCA-Riverhead, ( ) ____
( ) ____, ( ) ____
( ) Author

Person Contacted: John Marshal Etter Date: 1-28-86

Phone Number: (516) 653-5350 Title: Retired RCA Employee

Affiliation: RCA Type of Contact: phone

Address: ____ Person Making Contact: L. Wilson

Communications Summary: Mr Etter witnessed the excavation of the RCA dump at Riverhead to a depth of 50' below grade and the removal of all material and dirt to a Toxic dump (not sure where)

Referral: Glen Nastil RCA (609) 734-9893
James Hunt-d BCM (215) 825-3800
for additional information

(see over for additional space)

Signature: L. Wilson

EA SCIENCE AND TECHNOLOGY
A Division of EA Engineering, Science, and Technology, Inc.

2 1/4

NJSP C

COMMUNICATIONS RECORD FORM

Distribution: ( ) RCA-Princeton, ( ) ____
( ) ____, ( ) ____
( ) Author

Person Contacted: Calvin Vestal Date: 2-6-86

Phone Number: (609) 734-4893 Title: Environmental Chemist and Health Physics

Affiliation: RCA Type of Contact: phone

Address: Princeton NJ Person Making Contact: L. Wm

Communications Summary: RCA has no ground water data, no wellpoint site was installed during the ~~St~~ SC.00H. The reactor site is completely clean. All material removed several years ago and the AEC completely satisfied.

(see over for additional space)

Signature: Larry W. Oum

EA SCIENCE AND TECHNOLOGY
A Division of EA Engineering, Science, and Technology, Inc.

3-14

COMMUNICATIONS RECORD FORM

Distribution: ( ) RCA Rimenhead, ( ) ______
( ) ______, ( ) ______
( ) Author

Person Contacted: Mark Mornikian* Date: 11-10-86

Phone Number: (518) 457-5637 Title: Bureau of Remedial Action

Affiliation: NYDEC Type of Contact: Phone

Address: 50 Wolf Rd. Albany Person Making Contact: L. Wilson

Communications Summary: had little information about RCA Rimenhead. Did not return several messages. Reminded that RCA Rocky Point data was lost to

Jim Hunted now at Woodward & Clyde (215) 825-3000

* called 3 times and left messages for Smith? He did not return call.

(see over for additional space)

Signature: Larry Wilson

EA SCIENCE AND TECHNOLOGY
A Division of EA Engineering, Science, and Technology, Inc.

4.14

COMMUNICATIONS RECORD FORM

Distribution: ( ) R.A. Rinehart, ( ) ______
( ) ______, ( ) ______
( ) Author

Person Contacted: James [illegible] Date: 11-13-86

Phone Number: 215-825-3000 Title: Engineer

Affiliation: Woodward + Clyde Type of Contact: phone

Address: ______ Person Making Contact: R. Wilson

Communications Summary: Was in charge of the RCA Remedial project for RCM. Does not recall who removed the waste from the site or where it went. Definitely remembered they were removed, but not excavated to the depth Ettan had indicated (50').

Thought that samples of soil were taken after material was removed which showed no detectable concentration of PCB but cannot be sure.

(see over for additional space)

Signature: Larry Wilson

RCA | Staff Center | One Independence Way | US Route 1 | Princeton, NJ | Tel (609) 734-9400
Mail Address: PO Box 2023 | Princeton, New Jersey 08540

Appendix 1.1-11

RECEIVED APR 10 1987

1 of 6

RCA

Mr. Bud Going
EA Science & Technology
RD 2 Goshen Turnpike
Middletown, N.Y. 10940

Subject: RCA Riverhead Site

Dear Bud,

April 8, 1987

Per our conversation of April 7, 1987, I offer the following information in response to your inquiries regarding the RCA Riverhead site. Information regarding the final place of disposal of the soil and bulky materials from the excavation of the site, is presently being pursued. According to the Danny Tew company, the wires and cables were separated from the soil, t[redacted] was deposited at the Smithtown dumps (per agreement arranged by NYDEC), and the wires and cables deposited at the Riverhead Landfill. RCA is awaiting a statement in writing to that effect from the Danny Tew company and will forward it to you as soon as it is received.

As discussed in our phone conversation, the sampling described in the last paragraph of "Summary of Clean up Effort at the RCA Riverhead Site on Monday, November 19, 1984 and Tuesday, November 20, 1984" was conducted according to the grid proposed in "Report on Follow-up Investigation of Riverhead Site" (January 1984) section 4.0, recommendation item 4. In accordance with that recommendation item, one composite sample for total PCB analysis was performed to confirm the absence of PCB (50 ppm threshhold). ← App. 1.1-9

I will forward any relevant information to you when received. Please do not hesitate to call me with any further questions or concerns you may have regarding this matter.

Sincerely,

Lorraine Myers

Lorraine Myers
Corporate Environmental Programs

RCA | Staff Center | One Independence Way | US Route 1 | Princeton, NJ | Tel (609) 734-9400
Mail Address: PO Box 2023 | Princeton, New Jersey 08540

2 of 6

Federal Express

RCA

Mr. Bud Going
EA Science & Technology
RD 2 Goshen Turnpike
Middletown, N.Y. 10940

Subject: RCA Riverhead Site

Dear Bud,

April 3, 1987

Per our conversation of April 3, 1987, enclosed is the "Summary of Clean Up Effort at the RCA Riverhead Site on Monday November 19, 1984 and Tuesday, November 20, 1984" and the BCM laboratory results of the sample taken, as described in the summary.

Please feel free to contact me at (609) 734-9820, or Mark Stevens at (609) 734-9622 for any further assistance in this matter.

Sincerely,

Lorraine Myers

Lorraine Myers
Corporate Environmental Programs

attachment

BETZ • CONVERSE • MURDOCH • INC.

PLYMOUTH MEETING MALL
PLYMOUTH MEETING, PENNSYLVANIA 19462
PHONE: (215) 825-3800 • TWX: 510-660-8034

3 of 6

MESSAGE

TO: Mr. Glenn K. Hertel, Manager
Environmental Services
RCA Corporation
Route 38
Cherry Hill, N.J. 08358

SUBJECT: Riverhead Cleanup Status Update

DATE: 12/3/84

Dear Glenn:

Enclosed for your files/use are the following items:

1. Trip report summary for 11/19-20/84 at Riverhead
2. Numerous photos
3. Copy of BCM lab test results on composite soil sample from excavation bottom surface

Regards,

BY Jim

REPLY

DATE

SIGNED

Form ... The Drawing Board Inc. Box 505 Dallas Texas

INSTRUCTIONS TO SENDER:
1. KEEP YELLOW COPY. 2. SEND WHITE AND PINK COPIES INTACT

INSTRUCTIONS TO RECEIVER:
1. WRITE REPLY. 2. DETACH STUB. KEEP PINK COPY, RETURN WHITE COPY TO SENDER

4a/6

SUMMARY OF CLEAN UP EFFORT AT THE
RCA RIVERHEAD SITE ON
MONDAY, NOVEMBER 19, 1984 AND
TUESDAY, NOVEMBER 20, 1984

J.V. Halsted
11/27/84

BCM PROJECT NO. 00-8517-07

We started excavating the dump site at about 10:00 a.m. on Monday, November 19, after some discussion and orientation with the contractor (Danny Tew). The contractor had a Cat 955 crawler loader and Cat articulated bucket loader on the job. The 955 was used to tear the debris piles apart and spread the debris out so Marshall Etter and I could inspect it for possible PCB-containing items. The loader then scraped the material up into piles for subsequent outloading. Marshall and I found a number of suspect electronic components, only two or three of which were known to contain some PCB due to previous testing and Marshall's knowledge of the components.

When Danny Tew tried to get authorization to take the material to the Smithtown Landfill, things began falling apart. According to Tew, the person in charge of the Smithtown Landfill (Duane Rhodes) did not want the material to contain any debris. This problem came about just shortly after noon on Monday. After numerous telephone conversations with Rhodes, Tew and Glen Nestel at RCA, all appeared to be ironed out by 3:00 in the afternoon. We worked until about 4:15 or 4:30 when darkness forced us to shut down.

On Tuesday, November 20, we started about 8:00 and a tractor-trailer coal bucket and 10-wheeler arrived on the scene about 8:15. The 10-wheeler was loaded with cable destined for the Riverhead Landfill and the 18-wheeler was loaded with dirt and debris bound for Brookhaven Landfill. The 10-wheeler hauled a total of three loads of cable and other bulky debris to the Riverhead Landfill on Tuesday. However, when the other truck got to the Brookhaven Landfill, he was refused permission to dump. According to Danny Tew, the landfill manager had given authorization to take the material yesterday but was overruled by another person (I believe a woman) in the organization who would not allow the material from another town to be dumped at the Brookhaven Landfill.

This is apparently the same problem that we ran into before trying to get authorization to take this material to the Brookhaven Landfill. At any rate, the tractor trailer came back loaded to the Riverhead site at about 1:00 p.m. and dumped his load next to the pile of soil and debris and then Tew dismissed the truckers (in the meantime, another 18-wheeler had arrived). I asked Danny Tew if he wanted me to get RCA involved at this point (i.e., 1:30 p.m.) and he is still trying to work it out with the landfill and has a man in a radio-equipped truck here to coordinate the communications. I said that I could contact RCA and have them correspond with the landfill and/or DEC to get this thing straightened out. However, at this time, it is really too late to run any loads out of here today and, since site access will be a problem tomorrow due to Marshall Etter having to go away for the holidays, Tew and I agreed that we would hold the job off until next Tuesday. By then, we hope to get this landfill situation straightened out.

Numerous photographs were taken and final grooming of the exposed dump site bottom was done in preparation for collecting the sample. I spoke with Bob Ford at the lab twice regarding the analysis schedule and Bob indicated that they can turn the results around in about 24 hours.

Between 2:00 and 2:30 p.m. I collected a composite sample of soil from the former dump bottom. The soil appeared to be yellow-brown loamy sand. Grab samples of about 50 grams each were taken from 24 locations in a random grid pattern over the excavation bottom. A small steel pointing trowel was used to collect the samples from about the 0 to 1" depth. Each grab sample was placed in a glass amber pint jar with a teflon-lined lid. The sample was transported to our lab under custody procedures for total PCB analysis.

BCM Laboratory Division
521 W. GERMANTOWN PIKE
NORRISTOWN, PA 19401
215-825-0447

PLEASE REMIT CHECKS TO:
BCM Eastern Inc.
1 PLYMOUTH MEETING
PLYMOUTH MEETING, PA 19462
215-825-3800

6-46

CLIENT

RCA-CORPORATE STAFF
ATTN JIM HUSTED
BCM MALL
PA

00-701444 11/28/84

FINAL REPORT REF: 00-8517-07 PAGE 1

This is the final report for the samples shown below. If you have questions concerning this report please call 215-825-0447.

BCM NUMBER		N4200A1
CLIENT SAMPLE ID		BOTTOM CO MP
DATE SAMPLED		11/20/84
DATE RECEIVED		11/21/84
TEST AND UNITS	(ANAL. METH.)	
(608) PCB (1) UG/KG	(84)	<6.75

composite

REMARKS

BCM SAMPLE NO: N420061

1 : PCB'S AS A-1260.

LAB CERT. : EPA/PA-#38007, NJ-#77175, AL- #40300, EPA BULK ASBESTOS Q-#3339,
AIHA/NIOSH-# 241/19401

METHODS (84) EPA-60012-80-029

END OF REPORT

EA SCIENCE AND TECHNOLOGY
A Division of EA Engineering, Science, and Technology, Inc.

Appendix 1.1-12

COMMUNICATIONS RECORD FORM

Distribution: ( ) RCA-Riverhead, ( ) ______
( ) Smithtown MSF, ( ) ______
( ) Author

Person Contacted: Lorraine Meyers Date: 9/1/87

Phone Number: (609) 734-9820 Title: Corporate Environmental Programs

Affiliation: RCA / Staff Center Type of Contact: phone

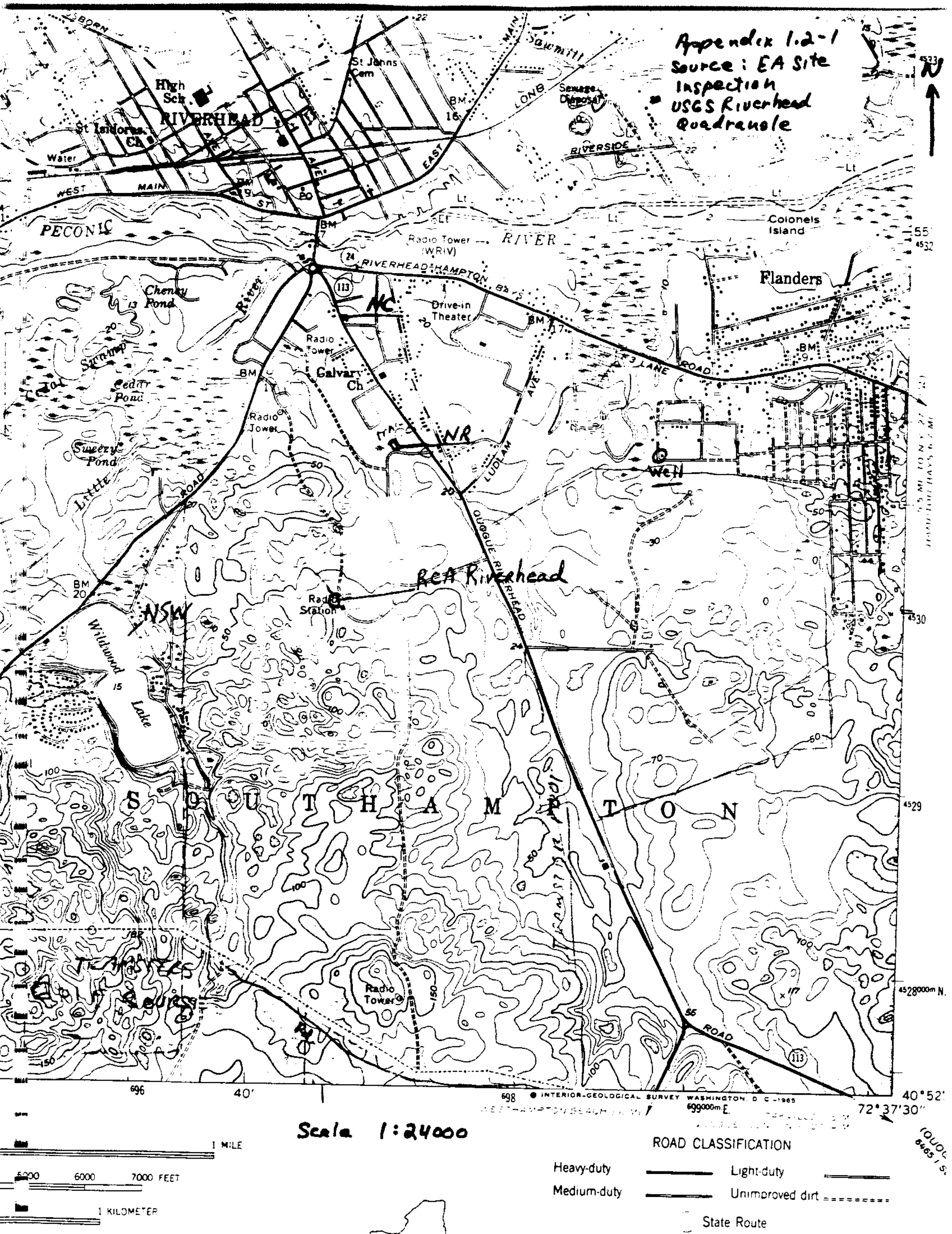
Address: One Independance Way / US Rt 1 Princeton NJ 08540 Person Making Contact: L. Rogers

Communications Summary: I informed Ms. Myers that we ~~had~~ needed documentation to support the info she gave saying the contaminated soil from RCA went to the Smithtown Dump. I asked which landfill received the waste. She was unsure, had never received documentation & suggested calling the Danny Tew Co. for further information at (516) 289-1111 (E. Patchogue, NY)

Note: Called Danny Tew twice & left messages → phone call never returned

(see over for additional space)

Signature: Lori Rogers



Scale 1:24000

Appendix 1.3-1
P. 1 of 4

HYDROGEOLOGIC DATA FROM SELECTED WELLS AND TEST HOLES IN SUFFOLK COUNTY, LONG ISLAND, NEW YORK

By

H. M. Jensen and Julian Soren

LONG ISLAND WATER RESOURCES

LONG ISLAND WATER RESOURCES
BULLETIN NUMBER 3

Prepared by the U. S. Department of Interior, Geological Survey, in cooperation with the New York State Department of Environmental Conservation, the Nassau County Department of Public Works, the Suffolk County Department of Environmental Control, and the Suffolk County Water Authority.

Published by

SUFFOLK COUNTY DEPARTMENT OF ENVIRONMENTAL CONTROL

1971

2 of 4

HYDROGEOLOGIC DATA FROM SELECTED WELLS AND TEST HOLES IN SUFFOLK COUNTY, LONG ISLAND, NEW YORK

By

H. M. Jensen and Julian Soren

INTRODUCTION

Suffolk County, N. Y., comprising roughly the eastern two-thirds of Long Island along with several smaller islands has an area of about 920 square miles (fig. 1). The western half of the county is mainly suburban; the eastern half is more rural. The population of Suffolk County has increased sharply from less than 200,000 in 1940 to about 1.1 million in 1970. However, most of the increase has occurred since 1950, when the population was about 275,000.

The fresh-water supply for the county is obtained solely from the underlying ground-water reservoir. The major hydrogeologic units in the ground-water reservoir are summarized in table 1, and a generalized section showing the vertical relation of these units is shown in figure 2. Ground-water pumpage increased from an average of about 42 mgd (million gallons per day) in 1950 to about 131 mgd in 1969 (New York State Conservation Department, written commun., May 1970). The projected water use in Suffolk County in 1990 for an estimated population of 2 million is about 300 mgd (New York State Conservation Department, Division of Water Resources, 1970, p. 26-27).

Water-related problems associated with increased population and attendant increased ground-water development are of considerable concern to the water-resources managers of Suffolk County. To help supply the hydrologic information needed to anticipate and cope with these problems, the U.S. Geological Survey is participating in a cooperative program of water-resources studies with the Suffolk County Water Authority, the Suffolk County Department of Environmental Control, and the New York State Department of Environmental Conservation. Several reports have been published as a result of the cooperative program. (See "Selected References.") One of the best known and most widely used of those reports is New York State Water Power and Control Commission Bulletin GW-18, "Mapping of geologic formations and aquifers of Long Island, New York" (Suter, de Laguna, and Perlmutter, 1949). That report includes three major sections: (a) a fairly detailed description of the surface and the subsurface geology of Long Island; (b) a detailed table of geologic correlations of well logs; and (c) a series of maps showing pertinent surficial features and structure contours on the tops of key hydrogeologic units.

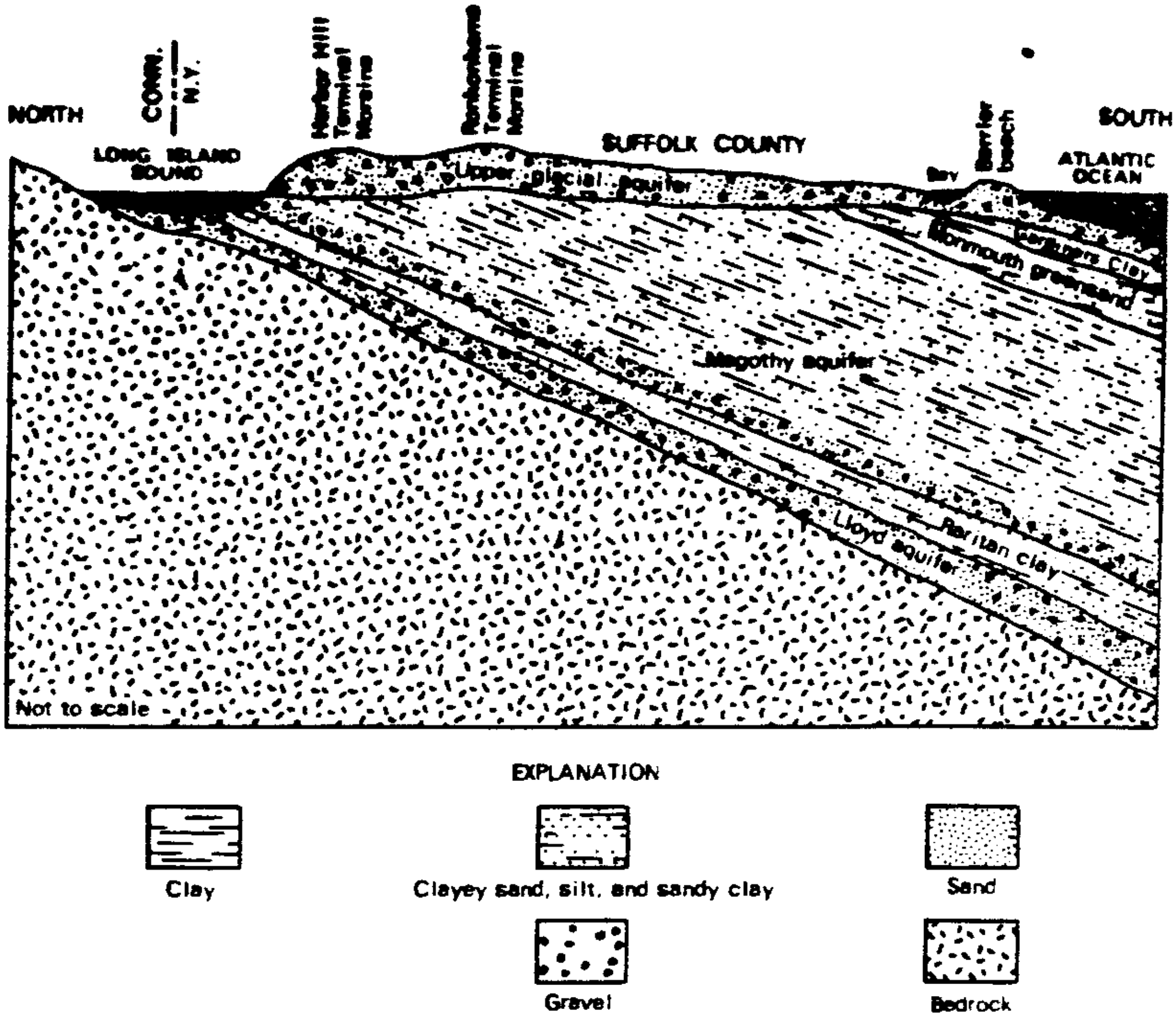


Figure 2.--Generalized section showing major hydrogeologic units in Suffolk County, N.Y.

Table 1.--Major hydrogeologic units in Suffolk County, N. Y.

Hydrogeologic unit 1/	Geologic name	Approximate thickness (feet)	Description and water-bearing character
Upper glacial aquifer	Holocene and upper Pleistocene deposits, and Mannetto Gravel	0-750	Mainly brown and gray sand and gravel of moderate to high hydraulic conductivity; also includes deposits of clayey glacial till and lacustrine clay of low hydraulic conductivity. A major aquifer.
Gardiners Clay	Gardiners Clay	0-75	Green and gray clay, silt, clayey and silty sand, and some interbedded clayey and silty gravel; of low hydraulic conductivity. Unit tends to confine water in underlying aquifer.
Jameco aquifer	Jameco Gravel	Not known	Not identified in Suffolk County.
Monmouth greensand 2/	Monmouth Group	0-200	Interbedded marine deposits of dark-gray, olive-green, dark-greenish-gray, and greenish-black glauconitic and lignitic clay, silt, and clayey and silty sand. Unit has low hydraulic conductivity and tends to confine water in underlying aquifer.
Magothy aquifer	Matawan Group-Magothy Formation, undifferentiated	0-1,100	Gray and white fine to coarse sand of moderate hydraulic conductivity. Generally contains sand and gravel beds of low to high hydraulic conductivity in basal 100 to 200 feet. Contains much interstitial clay and silt, and beds and lenses of clay, of low hydraulic conductivity. A major aquifer.
Raritan clay	Clay member of the Raritan Formation	0-200	Gray, black, and multicolored clay and some silt and fine sand. Unit has low hydraulic conductivity and tends to confine water in underlying aquifer.
Lloyd aquifer	Lloyd Sand Member of the Raritan Formation	0-500	White and gray fine-to-coarse sand and gravel of moderate hydraulic conductivity and some clayey beds of low hydraulic conductivity. Not highly developed as an aquifer.
Bedrock	Undifferentiated crystalline rocks	Not known	Mainly metamorphic rocks of low hydraulic conductivity; surface generally weathered; considered to be the bottom of the ground-water reservoir. Not a source of water in Suffolk County.

1/ Adapted largely from Cohen and other (1968, p. 18).

2/ Name adopted in this report.

Appendix 1.3-2
P. 1 of 19

Geology of Brookhaven National Laboratory and Vicinity, Suffolk County New York

By WALLACE DE LAGUNA

STUDIES OF SITES FOR NUCLEAR ENERGY FACILITIES—
BROOKHAVEN NATIONAL LABORATORY

GEOLOGICAL SURVEY BULLETIN 1156-A

This report concerns work done on behalf of the U.S. Atomic Energy Commission

This series of reports provides a basis for evaluating results of a possible nuclear incident upon the hydrologic environment

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON:

2 of 19

STUDIES OF SITES FOR NUCLEAR ENERGY FACILITIES—BROOKHAVEN NATIONAL LABORATORY

GEOLOGY OF BROOKHAVEN NATIONAL LABORATORY AND VICINITY, SUFFOLK COUNTY, NEW YORK

By Wallace de Laguna

ABSTRACT

In connection with the construction and operation of atomic research facilities at the Brookhaven National Laboratory, the U.S. Geological Survey made a study of the geologic and ground-water conditions at and near the Laboratory. The area is in central Suffolk County, about 60 miles east of New York City, and extends in a 26-mile-wide strip across the island from Long Island Sound on the north to the Atlantic Ocean on the south. The geologic fieldwork consisted of examination of surface outcrops and the supervision of the drilling of and examination of samples from shallow test wells 100 to 200 feet deep and two deep test wells about 1,600 feet deep.

The gently rolling land surface at the Laboratory is bordered by two lines of hills; the Harbor Hill moraine on the north, and the Ronkonkoma moraine on the south. A broad flat, relatively featureless outwash plain extends south from the Ronkonkoma moraine to the tidal swamps, bays, and barrier beaches, which form the southern boundary of the area. The Carmans, Forge, and Peconic Rivers, and their tributaries, carry most of the surface water.

Six principal stratigraphic units, some containing subdivisions of local importance, were recognized in the test holes and surface exposures. At the bottom is the southeasterly sloping bedrock of Precambrian age, which is at a depth of about 1,500 feet beneath the Laboratory. Above the bedrock is the Raritan formation of Cretaceous age about 500 feet thick, which is divided into the lower Lloyd sand member and an upper clay member. Resting on the clay member of the Raritan formation is about 900 feet of sand, sandy clay, and some gravelly beds, which have been tentatively assigned to the Magothy(?) formation. The Gardiners clay, an interglacial deposit of Pleistocene age, overlies the Magothy(?) formation in much of the area. The Gardiners is 10 to 20 feet thick at Brookhaven National Laboratory, but it thickens appreciably to the south. Above the Gardiners clay are upper Pleistocene deposits, which have a maximum thickness of about 200 feet. Locally these deposits are divided into an unidentified unit of sand and gravel characterized by a greenish color, a unit of silt and clay recognized near Manorville, and the Harbor Hill and Ronkonkoma moraine deposits and associated outwash deposits. Recent deposits of gravel, sand, silt, and clay are restricted to stream channels, bays, and beaches, and are generally less than 40 feet thick.

Fresh water under artesian pressure occurs in several permeable zones in the Raritan and Magothy(?) formations. Most of the water in the upper Pleistocene deposits is unconfined and fresh, and it is the principal source of supply. Recent deposits are not a source of water except for small supplies at scattered localities on the barrier beaches.

INTRODUCTION

PURPOSE AND SCOPE OF INVESTIGATION

In the fall of 1946, the War Department, then in charge of the atomic energy program, requested the U.S. Geological Survey to prepare a preliminary report on the possible water-supply problems of the proposed nuclear research laboratory at Camp Upton. In the fall of 1947, the Geological Survey began a detailed investigation of the ground-water conditions in the vicinity of the Laboratory with particular reference to the effect of a hypothetical accidental release to the environment of radioactive wastes. The routine operation of Brookhaven National Laboratory does not constitute a hazard because of the very stringent precautions that the Laboratory exercise in handling and disposing of radioactive materials. The work on which the present report is based began in March 1948. During the first 2 years, 2 deep test wells and about 12 shallow observation wells were drilled. As a guide to the installation of test wells, an attempt was made to obtain information on the subsurface geology by earth-resistivity observations, but the method was found to be poorly adapted to the conditions in the area.

During this same period, 95 samples of surface and ground waters were collected and shipped to Washington for analysis. On the basis of the data provided by this work, a second water-sampling program was set up in November 1950 to monitor the surface-water and ground-water supplies of the area, but this sampling was stopped in the summer of 1953 because the program was felt to be unsound.

Some instrumental leveling was done in the first year or two, and in 1949 the Topographic Division of the Geological Survey established a network of bench marks covering the area of immediate interest. This made it possible to convert water-level measurements to a sea-level datum so that accurate water-table contour maps could be drawn.

A more detailed study of the hydrology began in 1950; a detailed pumping test was run at the end of that year. In 1951 the observation-well net was expanded, and in 1952 a study was made of the hydrology of the Carmans River. At the same time, an attempt was made to estimate the amount of water lost annually by evaporation and by transpiration so that an estimate could be made of the recharge to the ground-water reservoir.

Attempts were made during the first year to measure the rate of movement of the ground water directly by tracers. The work provided answers which seemed to be valid, but it was dropped because of the complexity of the theoretical and practical problems involved. Some laboratory work with dye solutions was attempted later to illustrate the pattern of movement of contaminated liquids, but again problems involved in faithfully representing natural conditions were not satisfactorily solved.

The investigation was made under the immediate supervision of M. L. Brashears, Jr., and J. E. Upson, former district geologists. The organization and preparation of the report were coordinated by C. V. Theis and J. E. Upson.

PREVIOUS INVESTIGATIONS

Previous work on the hydrology and geology of Long Island has dealt either with Long Island as a whole or with the western part. In 1903 the water-supply problems of Greater New York were studied in detail by the Commission on Additional Water Supplies and described in a report by Burr, Hering, and Freeman (1904). This report related primarily to the occurrence and availability of ground water in Nassau County and western Suffolk County. In 1906, this study was enlarged to investigate the possibility of developing 250 mgd. (million gallons per day) of water from Suffolk County by extending the Brooklyn aqueduct eastward along the south shore through Patchogue, Moriches, and Quogue. Branches and collecting works were to tap, among other sources, the Carmans River and the lower Peconic. A report on this study was made by Spears (1908). Because of the general interest in the problem of water supply at this time, and as the result of a cooperative agreement with the Commission on Additional Water Supply, the U.S. Geological Survey made a study of both the geology and the hydrology of all Long Island in the years 1902–05. The results of this investigation were published under the authorship of Veatch and others (1906). Later, geologic investigations were made by Fuller (1914).

In 1932, the U.S. Geological Survey returned to the study of Long Island under cooperative agreements with the New York State Water Resources Commission (formerly Water Power and Control Commission) and with Nassau County. Later, these agreements were extended to include Suffolk County.

The principal publications dealing with central Suffolk County that have resulted from these cooperative investigations are listed under "References cited." These reports are concerned mainly with the problem areas of western Long Island, and little has been published

3 of 19

for Suffolk County except for the reports on the mapping of the aquifers by Suter, de Laguna, and Perlmutter (1949), and the mapping of the water table by Lusczynski and Johnson (1952). Among the independent workers who have contributed to the glacial geology of Long Island are MacClintock and Richards (1936) and Fleming (1935).

LOCATION OF AREA

Brookhaven National Laboratory is on the site of Camp Upton, formerly an Army post during World Wars I and II. It is nearly in the geographical center of Long Island, about 60 miles east of New York City. (See fig. 1) The Laboratory tract is an irregular polygon that is roughly rectangular and about 2.5 miles on a side.

Brookhaven National Laboratory lies in a strip across the island about 13 miles wide extending approximately north-south between long 72°45′ and 73° W. This area (fig. 1) is referred to in this report as the Upton area from the post office address of the Laboratory, and it is the area of principal concern in the hydrologic part of this report.

The geologic studies cover a somewhat wider area (fig. 1), as it was felt desirable to include some information from adjoining areas where wells had been drilled deep enough to reach beds of Cretaceous age. This larger area, extending from about long 73°07′30″ W. on the west to long 72°37′30″ W. on the east, a distance of about 26 miles, is here called central Suffolk County.

WELL-NUMBERING SYSTEM

Numbers of wells mentioned in the text and shown on illustrations of this report are those assigned by the New York State Water Resources Commission. Wells are numbered serially and are designated by letter prefix according to the county in which they are: S for Suffolk County and N for Nassau County. Records and logs of wells referred to in this report are either published in Bulletins GW 4, 9, and 31 of the New York Water Resources Commission or may be examined at the Geological Survey office at 1505 Kellum Place, Mineola, N.Y. The location of wells referred to in this report are shown on plate 1.

TOPOGRAPHY

Brookhaven National Laboratory is on gently rolling ground in the upper part of the Peconic River valley, which is bordered by two lines of low hills. These extend beyond the limits of the valley east and west nearly the full length of Long Island and form its most prominent topographic features. The northern line of hills, known as the Harbor Hill moraine, lies along the north shore of Long Island; the

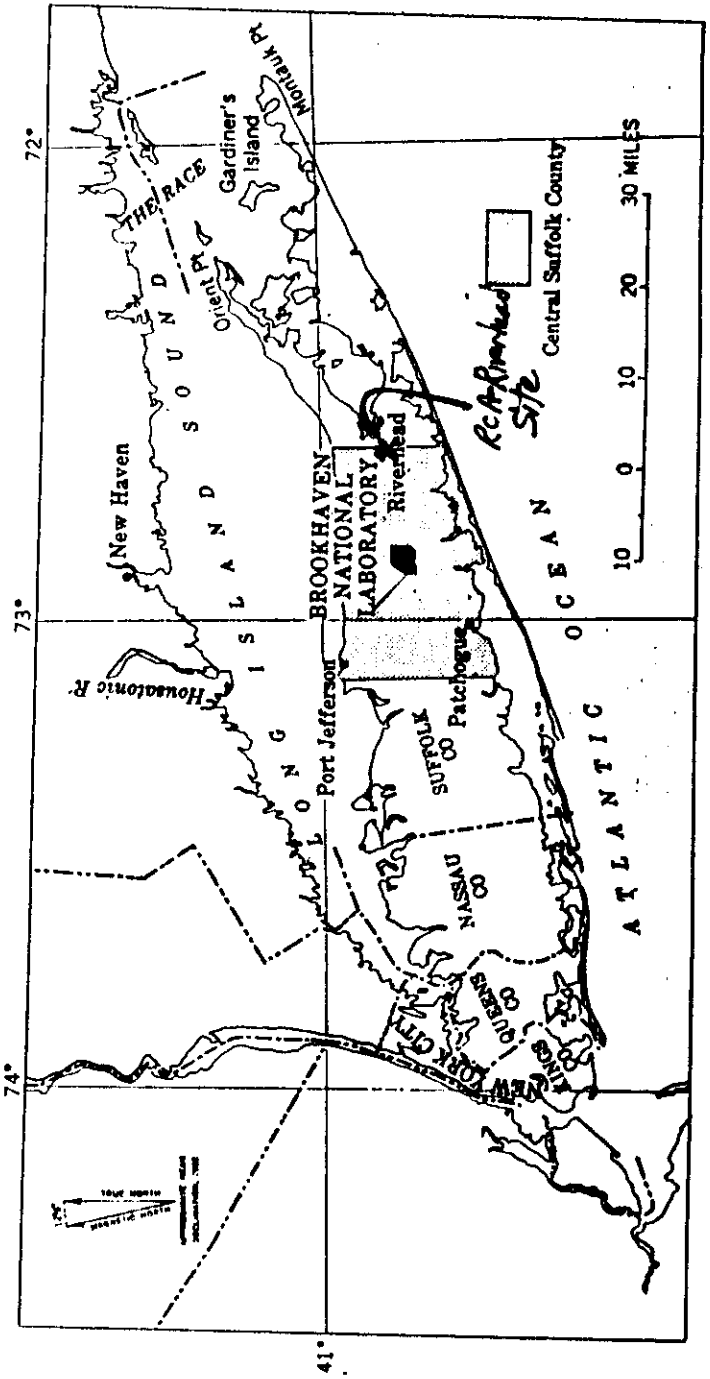


FIGURE 1.—Outline of map of Long Island, showing location of Brookhaven National Laboratory and adjoining areas.

southern line of hills, the Ronkonkoma moraine, trends along the center of Long Island and passes just south of Brookhaven National Laboratory. (See pl. 1.)

Just west of Brookhaven National Laboratory, the two moraines are connected by a narrow north-south ridge, which gives the neighboring hamlet of Ridge its name. East of this ridge, and enclosed by it and two moraines, is the Manorville basin (pl. 1), on the relatively high west margin of which are the main Laboratory grounds. The basin forms the upper drainage area of the Peconic River. It is partly enclosed on the east south of Calverton by Bald Hill, a salient of the Ronkokoma moraine, so that the surface drainage of the Manorville basin is poor, and much of the land near the river is swampy. East of Calverton, the valley widens and forms the Riverhead basin (pl. 1).

West of the north-south ridge is the narrow, straight valley of the Carmans River, branches of which formerly drained Artist Lake and a pond at Middle Island. To the east, along the south margin of the Harbor Hill moraine are two large kettle holes, Long Pond and Deep Pond.

Just west of the Carmans River, another ridge extends north from Coram Hill and nearly joins one of the wide low spurs extending south from the Harbor Hill moraine. West of this ridge, between the two moraines, is the Selden basin (pl. 1), a wide shallow basin that has no surface-drainage outlet.

South of the Ronkonkoma moraine is a comparatively flat featureless plain of irregular width. This surface slopes gently to the south, where it merges into a swamp and then passes under Great South Bay and Moriches Bay. The shoreline is indented by many small estuaries that are the drowned mouths of the small streams that drain the plain. The principal irregularities of the plain south of Brookhaven National Laboratory are the valleys of the Carmans River, which head north of the moraine, and the much shorter Forge River which heads in the Ronkonkoma moraine just south and southeast of the Laboratory.

Between the mouths of the Carmans and the Forge Rivers, the south shore bays are divided by a wide tongue of land which extends nearly across to Fire Island Beach. This tongue is occupied by the summer community of Mastic and by the southern part of another community called Mastic Beach. To the east is Moriches Bay; to the west is Great South Bay. The bays are bordered on the south by a long narrow line of barrier beaches.

The north shore of central Suffolk County is bordered by a long line of steep bluffs overlooking Long Island Sound. These bluffs form a series of shallow arcs, concave northward, each of which is 8 to 10 miles long. The line of bluffs is broken by several small embayments such as at Mount Sinai Harbor and Wading River. These embayments have flat swampy bottoms and are bordered on the south by an abrupt line of hills. West of Port Jefferson the shoreline is much less regular, because it comprises a succession of bays and necks.

5-619

SUMMARY OF STRATIGRAPHY

Six principal stratigraphic units, some of which include subdivisions of minor importance, were recognized in the test drilling at Brookhaven National Laboratory and have been identified in well logs and at exposures in central Suffolk County (table 1). Their general relationships are indicated diagrammatically in figure 2, and their lithology, as determined in the two deep test wells at Brookhaven National Laboratory, is indicated in figure 3. Plate 2 shows the lithologic characteristics of the uppermost units, particularly those of Pleistocene age. Plate 1 shows the location of wells used in preparing the report; the cross sections are shown in plate 2.

At the base is the oldest of the stratigraphic units, the bedrock of pre-Cretaceous age, to which no formational name has been attached. Above the bedrock is the Raritan formation of Cretaceous age, which is as much as 500 feet thick. This formation has two members. The lower, as much as 300 feet thick, called the Lloyd sand member, is composed of coarse-grained sand, gravel, and some clay. The upper member, as much as 200 feet thick, is mostly clay and is called the clay member of the Raritan formation. Overlaying the Raritan formation is the Magothy(?) formation, also of Cretaceous age. Beneath Brookhaven National Laboratory this formation consists of about 900 feet of mostly clayey sand, and it includes beds of clay and of sand and gravel.

Beneath most of the laboratory tract, and in general beneath the southern half of central Suffolk County, the Magothy(?) formation is overlain unconformably by the Gardiners clay of Pleistocene age. Within Brookhaven National Laboratory and for a few miles to the south, test wells showed the Gardiners clay to be 10 to 20 feet thick and to be composed of clay containing sand and gravel. Still farther south, along the ocean shore, the Magothy(?) formation is overlain by 150 feet or more of clay, silt, and clayey sand, which in texture, color, and composition is somewhat like the Gardiners clay, but which resembles neither the Magothy(?) below nor the upper Pleistocene deposits above. This material is tentatively referred to as the Gardiners clay, although it is possible that detailed paleontologic studies may show that other units are present in some places (Perlmutter and Crandell, 1959).

TABLE 1.—*Physical character and water-bearing properties of the geologic units underlying central Suffolk County*

System	Series	Geologic unit		Approximate thickness (feet)	Physical character of deposits	Water-bearing properties
Quaternary	Recent	Recent deposits		0–40	Gravel, sand, silt, some clay, organic matter, and shell fragments.	Permeable beds contain fresh and salt water near shoreline. Clay and silt are local confining units.
	Pleistocene	Upper Pleistocene deposits	Moraine deposits and outwash	0–150	Moraine deposits composed of unsorted boulders, gravel, silt and clay; compact in places. Outwash composed chiefly of gravel and sand. Locally, thin loesslike deposits of silt and clay at and near surface.	Moraine deposits generally of low permeability but permeable sandy zones are common. Outwash generally highly permeable and productive. Water-table conditions prevail almost everywhere.
			Clay at Manorville	0–60	Silt and clay, laminated, gray and brown.	Relatively impermeable local confining unit.
			Unidentified unit	0–50	Fine to coarse sand, greenish; some silt and clay.	Contains water under water-table conditions. Tapped by few wells.
		---- Unconformity? ----				
		Gardiners clay		0–150	Clay and silt, grayish-green; some lenses of sand and gravel.	Relatively impermeable. Confining unit in southern part of area.
		---- Unconformity ----				
Cretaceous	Upper Cretaceous	Magothy(?) formation		0–1,000	Sand, fine to coarse, clayey, lenses of clay; coarse basal zone containing gravel. Lignite is abundant. Light and dark gray are predominant colors.	Low to high permeability. Tapped by few wells but has several productive zones. Water is under artesian pressure.
		---- Unconformity ----				
		Raritan formation	Clay member	150–200	Clay and silt, dark- and light-gray; some red and white; some lenses of sand.	Relatively impermeable, extensive confining unit.
			Lloyd sand member	130–300	Sand and gravel, gray; some beds of sandy clay and clay and silt.	Permeable zones are potential sources of water. Not tapped by pumping wells at present. Water is under artesian pressure.
		---- Unconformity ----				
Precambrian(?)		Bedrock		----------	Granitic-gneiss, upper 30–50 feet moderately to highly weathered.	Relatively impermeable. Not an aquifer.

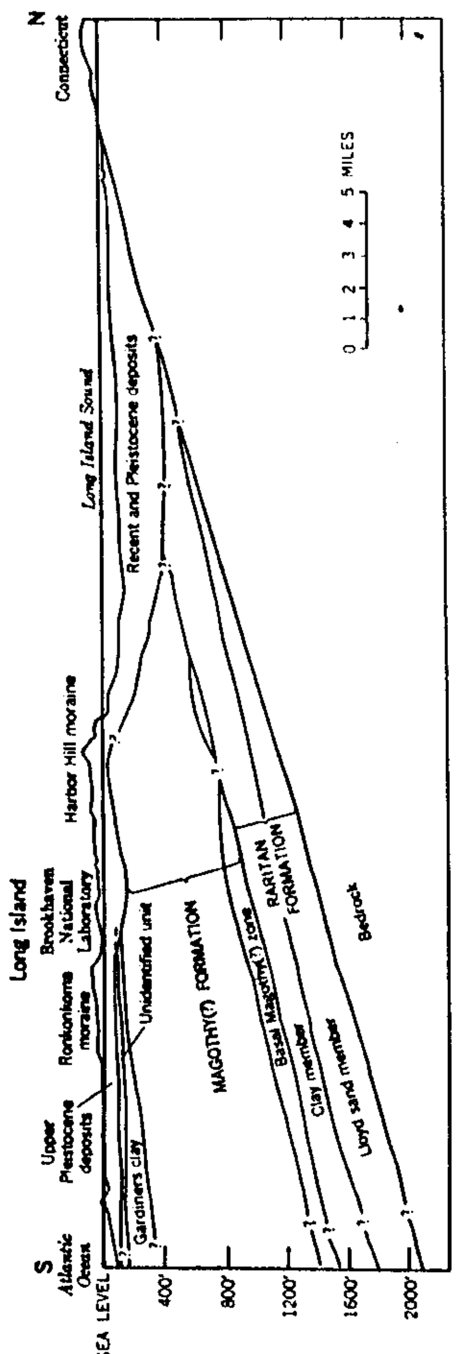


FIGURE 2.—Generalized cross section along long 72°52'30'' W. in central Suffolk County.

The sixth major stratigraphic unit is called the upper Pleistocene deposits, an informal term used to describe the glacial deposits which, in nearly all Long Island, overlie the Gardiners clay or the Magothy(?) formation. Most of these deposits consist of sand and gravel which, with local silt and clay, form the stratified outwash and morainal deposits of presumed Wisconsin age. Their maximum known thickness is about 200 feet. The formational units into which Fuller (1914, p. 80–170) divided these deposits have not been recognized within the area of this report. However, some distinctive subdivisions were recognized. For example, overlying the Gardiners clay in the southern half of the report area is a greenish sand 25- to 50-feet thick of uncertain origin, but apparently the oldest outwash material in this area. It has not been named and, therefore, is called here the unidentified unit. At Manorville, and probably beneath a surrounding area of several square miles, there is a varved clay in the middle of the upper Pleistocene deposits. In the lower part of the Peconic River valley, beneath the south-shore beaches and in a buried valley south of Mount Sinai Harbor, the upper Pleistocene deposits include a complex series of alternating layers of sand, silt, and clay, some fossiliferous, which may in part represent the Gardiners clay. Despite these variations, however, most of the upper Pleistocene deposits form a comparatively uniform blanket of sand and gravel.

The current differentiation of stratigraphic units on Long Island is the result of gradual refinement of knowledge based largely on data from wells. Substantial contributions were made by Thompson, Wells, and Blank (1937), and more recently by Suter, de Laguna, and Perlmutter (1949). Most of the formations recognized here occur nearly everywhere beneath Long Island.

BEDROCK

The bedrock which underlies the unconsolidated deposits is known principally from well records. It includes hard, dense schist, gneiss, and granite similar in character to that which underlies much of the mainland in nearby parts of New York and Connecticut. These rocks were previously thought to be of Precambrian age, but now many geologists believe that some of them are metamorphosed early Paleozoic age sediments. Data from well records and samples on Long Island do not warrant any identification except of rock type.

Two deep test wells (S6409 and S6434, pl. 1) penetrated bedrock at a depth of nearly 1,600 feet beneath Brookhaven National Laboratory. The bedrock was found to be a hard, banded, granitic gneiss. Microscopic examination showed it to be composed of about 50 percent plagioclase (oligoclase and andesine) feldspar, about 50 percent quartz, about 1 percent biotite, and a trace of garnet. The plagioclase feldspar in the sample from well S6434 contained a little more sodium than that from S6409; otherwise, the two samples were identical.

This bedrock contains no openings capable of holding or transmitting appreciable quantities of water, thus it forms the base of the water-bearing material beneath Brookhaven National Laboratory.

In Connecticut, the bedrock includes, in addition to the gneiss and schist, a body of sandstone, shale, and diabase of Triassic age which could conceivably extend south from New Haven as far as Long Island. Seismic studies (Oliver and Drake, 1951, p. 1295) suggest that it does not. No rocks of Triassic age have been found in any wells drilled on Long Island.

CONFIGURATION OF THE BEDROCK SURFACE

The shape of the upper surface of the bedrock of Long Island is best known beneath the west end of the island (de Laguna and Brashears, 1948). Here the bedrock surface, as indicated by well records, has a maximum relief of about 100 feet, except where it is near the surface and may have been modified by erosion in Pleistocene or Recent time. The apparent low relief and local deep weathering of the bedrock in western Long Island as shown by well logs (de Laguna and Brashears, 1948, p. 8) suggest that the surface had reached an advanced stage of peneplanation. Indeed, the surface is considered to be part of the Fall Zone peneplain (Von Engeln, 1942, p. 353). The most recent map of the bedrock surface underlying Long Island (Suter, and others, 1949, pls. 8, 9, and 10) shows that this surface slopes southeast about 80 feet per mile beneath most of Long Island. It seems to slope more southerly at the east end of Long Island. If the surface represents a peneplain, the relief on the bedrock surface in the Brookhaven area is not likely to be greater than 50 to 100 feet.

FORMATIONS OF LATE CRETACEOUS AGE

RARITAN FORMATION

The Raritan formation rests directly on highly to slightly weathered bedrock. The formation is probably entirely continental and was laid down as a costal-plain deposit by streams flowing off the uplifted Fall Zone peneplain. The name Raritan was applied to the Long Island deposits by Veatch and others (1906, p. 23) who correlated the formation with deposits of the same name in New Jersey. On Long Island the formation has two fairly distinct members; the Lloyd sand member below, and a clay member above.

The formation probably occurs beneath all central Suffolk County. Northward the Lloyd sand thins and probably pinches out beneath Long Island Sound, and the clay member may do likewise. Southward the formation extends a considerable distance offshore, possibly as far as the continental shelf (about 100 miles), where the beds probably have lithologic characteristics different from those beneath Long Island.

At many wells the position of the contact with overlying deposits, and in fact between the members themselves, cannot be defined precisely. Nevertheless, the units are distinctive in their general characteristics.

LLOYD SAND MEMBER OF THE RARITAN FORMATION

The Lloyd sand member is a fairly uniform and extensive unit consisting predominantly of sand and gravel with some clay. It is known only from well logs. At the two deep test wells (S6409 and S6434) at Brookhaven National Laboratory, it is separated from the hard crystalline bedrock by 15 to 30 feet of tough, white, structureless clay containing scattered angular grains of quartz, which is considered to be weathered bedrock. At the same wells, the upper contact of the Lloyd sand member with the overlying clay member is fairly definitely marked by a change in the lithology of the sediments.

As shown by the columnar section (fig. 3) of well S6409, the Lloyd sand member is about 300 feet thick. It is largely composed of fine to coarse sand containing silt and clay in the interstices. It also includes beds of clay or sandy clay and coarser textured beds that contain gravel. Near the middle, the unit consists chiefly of sand and coarse gravel, which contains some pebbles at least 2 inches in diameter. The voids between the pebbles are for the most part filled with sand and some clay. The porosity of the unit is, therefore, appreciably less than that of a well-sorted sand or gravel. A somewhat similar sequence of material was found at well S6434. The dominantly sandy material which makes up the bulk of the unit here rests directly on highly weathered bedrock.

The pebbles and the sand found in the Lloyd member at Brookhaven National Laboratory and elsewhere on Long Island are composed almost entirely of quartz. This composition suggests that the material was derived from a region in which the climate was warm and the rate of erosion slow, so that all but the most resistant material was entirely decomposed. The clay is entirely or dominantly kaolinite, a mineral indicative of complete weathering.

675117—63——3

8/13

The cores, the drill cuttings, the rate of drilling, and other evidence suggests that the Lloyd found at Brookhaven National Laboratory is in many respects similar to that found in western Suffolk, Nassau, Queens, and Kings Counties where more than a hundred wells have been drilled into it. In both the Laboratory wells and in a well drilled at Port Jefferson, however, the interstitial clay seems to be tougher and more tightly packed than it is farther west.

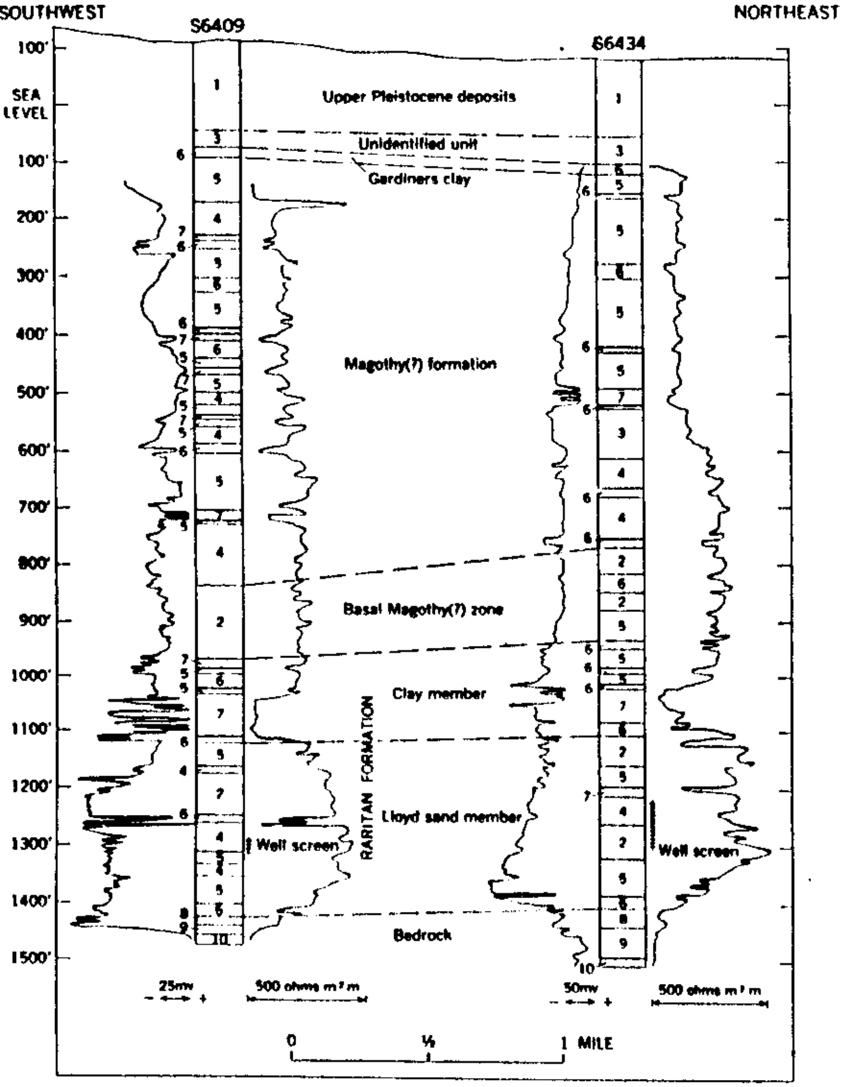


FIGURE 3.—Columnar sections and electric log of deep test wells at Brookhaven National Laboratory.

EXPLANATION

Numbers arranged in order of estimated decreasing permeability

Unit No.	Description of unit	Unit No.	Description of unit
1	Sand, or sand and gravel, clean; little or no silt or clay.	6	Clay, mixed with some sand, and containing beds of clayey sand.
2	Sand, coarse, or sand and gravel; includes some clay.	7	Clay, tough; containing little sand.
3	Sand, fine or medium; includes some clay.	8	Bedrock weathered. Original rock texture no longer visible, but material has not been transported or sorted by water.
4	Sand, coarse, or sand and gravel; mixed with considerable clay and containing beds of clay.	9	Bedrock, weathered. Original igneous texture visible, but most minerals except quartz much altered chemically.
5	Sand, fine to medium; mixed with considerable clay and containing beds of clay.	10	Bedrock, fresh. May show some staining or discoloration.

In the western part of Long Island, the Lloyd ranges in thickness from about 350 feet on the south shore to a few tens of feet along the north shore, where in a few places it is absent. These variations in thickness apparently represent the form in which the Lloyd was originally deposited. At Port Jefferson the Lloyd has a thickness of 135 feet, which shows that it thins to the north in central Suffolk County also. Indeed, it is possible that beneath Long Island Sound, the Lloyd sand pinches out and that the overlying clay member of the Raritan overlaps it and extends beyond it. (See fig. 2.) Thus, although penetrated by only a few wells in the report area, the Lloyd probably is a continuous unit of substantial thickness.

CLAY MEMBER OF THE RARITAN FORMATION

The clay member, which overlies the Lloyd sand, makes up the balance of the Raritan formation. At Brookhaven National Laboratory, the top of the clay member is 975 feet below sea level at well S6409 and 940 feet below at S6434. In both wells, its thickness was less than 200 feet. It is largely composed of tough dark-gray or black lignitic clay and some red and white clay and includes some sandy layers and thin lenses of gravel. It also contains some light-gray silty and sandy clay. It is not clearly bedded, as the textures and colors grade into one another. Zones which contain well marked, narrow bands of light silty clay alternate with darker clay which may represent annual variations in rate of deposition, as between a rainy and dry season.

The clay member shows little if any systematic variation in thickness on Long Island. In most of the carefully logged wells that penetrate it, the clay is about 200 feet thick, and at least some of the greater or lesser thicknesses reported may be due to difficulty in placing the contacts, for these depend only on differences in lithology. In parts of King County, and in northern Queens and Nassau Counties, where the top of the clay member is at or near sea level, the member is much less than 200 feet thick and in places it may be absent. This is probably due to local erosion, most of which probably took place in late Tertiary or Pleistocene time. Where the clay member is found at greater depths, as in central Suffolk County, there is no evidence of erosion, but the data are scanty. Thompson, Wells, and Blank (1937, p. 455) suggest that in Kings and Queens Counties, channels were cut into the clay member at the close of Raritan time and then filled with sand or other permeable material at the beginning of Magothy(?) deposition. There is no evidence that such deep erosion and deposition took place within the area investigated; the Lloyd member in central Suffolk County is everywhere covered by the clay member.

Like the Lloyd member below and the Magothy(?) formation above, the clay member has not yielded any fossils except plant remains and is probably nonmarine. The scattered pieces and grains of lignite, the widely distributed spores and pollen, the casts of twigs and leaves, and the possible varving suggest deposition on a coastal plain by generally sluggish but sometimes flooded rivers, that drained a deeply weathered area of moderate relief. It is possible, but unlikely, that some of the rivers crossing this plain maintained their channels in the same place over long periods of time, because aggrading streams commonly build up both their banks and their beds and then shift some distance laterally to lower ground. Accordingly, the coarser grained materials found locally probably are lenses of limited extent both horizontally and vertically. However, at places these may act as relatively permeable but devious paths for the movement of water.

WATER-BEARING PROPERTIES

The Lloyd sand is one of the most important aquifers on Long Island largely because it yields adequate supplies of good quality water in areas, generally beneath the margins of Long Island, where supplies from overlying formations are inadequate or are contaminated by or readily subject to contamination by sea water. The Lloyd can supply water under these circumstances because it is overlain by the relatively impermeable and virtually continuous blanket of the clay member.

The problem of how fresh water moves into and out of the Lloyd has been considered by many investigators. Such movement may occur by means of valleys cut through the clay member or by slow seepage of water through the clay (Suter, and others, 1949, p. 16). As there is little evidence of deep buried valleys in the clay member in central Suffolk County, it is likely that most of the movement of water into and out of the Lloyd is by means of slow seepage through the overlying clay. Lusczynski (oral communication) speculates that if the clay member has an average permeability of 0.2 to 0.3 gpd per square ft, then quite possibly all the water in the Lloyd reaches the unit by percolation through the clay member. Wenzel (1942, p. 13) gives the permeability of a clay (sample No. 2278) that is similar to the clay member of the Raritan as 0.2 gpd per ft, which suggests that there is no compelling need to assume permeable channelways. In any event, movement of water through the clay member of the Raritan either up or down doubtless is very slow in most places.

Although the water from the Lloyd is relatively high in iron content, the usefulness of the aquifer in central Suffolk County is more seriously compromised by the probability of poor yield, as exemplified by the two Brookhaven National Laboratory wells. In the western part of the island, many wells tapping the Lloyd sand member have a specific capacity between 10 and 20, which means that they yield 10 to 20 gpm per ft of drawdown. Test well S6409 at Brookhaven National Laboratory was finished with 25 feet of screen and had a specific capacity of about 2. The other deep test well, S6434, was underreamed and gravel-packed and finished with 80 feet of screen, but it had a specific capacity of only 2.5. The principal reason for these low yields seems to be the toughness of the interstitial clay in the deposits, which made it difficult to wash the clay out thoroughly during the development. Much of the same type of tough interstitial clay was found in the cores from test well S5901 at Port Jefferson.

MAGOTHY(?) FORMATION

The Magothy(?) formation in central Suffolk County is a thick body of continental deposits composed of lenses of sand, sandy clay, clay, and some gravel. It rests on the Raritan formation and is in turn unconformably overlain by upper Pleistocene deposits. The greatest thickness, revealed by drilling, is about 1,000 feet. The present upper surface of the Magothy(?) on Long Island is an erosional surface, and the original total thickness is not known.

The type area of the Magothy formation is in Maryland along the Magothy River, where it was first described by Darton (1893, p. 407–410). W. O. Crosby (1910) and later Horace R. Blank (written communication, 1935) suggested that the Cretaceous deposits overlying the Raritan formation on Long Island were a greatly thickened extension of the Magothy formation of New Jersey. Later work (Perlutter and Crandell, 1959, p. 1060–1076) shows that the uppermost art of the Magothy(?) formation beneath the south shore of Suffolk County includes marine beds possibly equivalent in age to the Monnouth group of New Jersey. In this report, as in recent publications y Survey authors, the name Magothy when applied to the upper part f the Long Island Cretaceous, is followed by a question mark to indiate the doubt. Examination of pollen and spores may lead to both reliable correlation of the Cretaceous deposits on Long Island with hose of New Jersey and to the establishment of a useful type sequence for Long Island itself.

The Magothy(?) formation underlies most of Long Island except for parts of Kings and Queens Counties and northwestern Nassau County where it was removed by erosion. It may extend beneath Long Island Sound, but is probably truncated by erosion and overlain by Pleistocene deposits. (See fig. 2.) To the south, the Magothy(?) formation, like the Raritan, extends out under the sea, where it also probably changes from a terrestrial to a marine deposit.

The formation crops out at only a few places on Long Island, most of them in northern Nassau County, so that the formation is known chiefly from well records. At test wells S6409 and S6434, the Magothy(?) is about 885 and 819 feet thick, respectively. (See fig. 3.) Well S5901 at Port Jefferson, 12 miles northwest of Brookhaven National Laboratory, passed through nearly 500 feet of the Magothy(?) formation, and well S128 about 5 miles southwest of the Laboratory penetrated about 760 feet of the Magothy(?) and did not reach the bottom of the formation.

The Magothy(?) at Brookhaven National Laboratory has about the same characteristics as elsewhere on Long Island. It is composed of beds of poorly sorted quartzose sand mixed with and interbedded with silt and clay, and locally it contains pebbles or small lenses of gravel. Sandy clay and clayey sand make up most of the fine beds, but there are also several thick beds of clay. In both of the deep test wells (S6409 and S6434), the basal 100–150 feet of the Magothy(?) contains a greater proportion of coarse-grained material. This consists partly of coarse sand and gravel that contains pebbles as much as 2 or 3 inches in diameter. The voids are largely filled with silt and soft clay, however, and the coarse-grained beds are separated by beds of sandy clay. A similar coarse-grained zone can be distinguished in most reliable well logs in other parts of Long Island (J. J. Geraghty, written communication, 1953). It is best described as a zone, immediately overlying the clay member of the Raritan, in which relatively coarse-grained permeable material is commonly found.

The Magothy(?) formation typically contains several clay layers, some of them as much as 50 feet thick. Where the Magothy(?) itself

is thick, the aggregate thickness of the clay beds is nearly as great as that of the clay member of the Raritan. Even in the western part of the Island, where wells are close together, it is difficult or impossible to trace any of these clay beds from one well to the next; hence, they are probably lenticular and individually of small extent. Thus, they probably do not constitute as effective a barrier to the movement of ground water as the clay member of the Raritan formation.

WATER-BEARING PROPERTIES

Although it consists in part of beds of dense clay and layers of coarse sand and gravel, by far the greater part of the Magothy(?) formation is made up of sandy clay and clayey sand. Thus, although the formation as a whole is probably less permeable than the Lloyd because of its thickness it can transmit and store large amounts of ground water. Also, there are no effective barriers to the movement of water through the formation except locally. Wells that are constructed and developed carefully generally yield large quantities of water from all but the most clayey parts of the formation. In other parts of Long Island, the beds of gravel at the base of the Magothy(?) and the lenses of sand and gravel of smaller extent that occur at various zones within the formation also yield substantial quantities of water. The Magothy(?) is important as an alternate aquifer in the event that the water in the overlying upper Pleistocene deposits becomes contaminated.

A well near Brookhaven National Laboratory that produces water from the Magothy(?) is S5902 at Port Jefferson. The aquifer tapped by this well is apparently not the basal Magothy, but a coarse-grained zone 100 feet higher. Well S5901, only 0.2 mile from S5902, did not penetrate productive water-bearing material in the Magothy(?) and was abandoned. This is one of a very few places in central Suffolk County where difficulty has been encountered in obtaining water. At most other places, where adequate supplies of water are not available from the upper Pleistocene, ample supplies have been developed from the Magothy(?) formation.

The highly productive beds of the Magothy(?) are by no means confined to the basal zone, but there is no other zone in which a reliable supply can be predicted. Rather it is a case of drilling carefully until material of appropriate grain size and permeability is found. Both of the deep wells at Brookhaven National Laboratory penetrated considerable material in the Magothy(?) from which water might be obtained. Well S6434 was screened temporarily between 656 and 676 feet and tested by pumping. Even with only 20 feet of screen, no gravel pack, and little development the zone yielded water at a specific capacity of 15 gpm per ft of drawdown.

CONFIGURATION OF THE MAGOTHY(?) SURFACE

Between the Late Cretaceous and the end of Tertiary time, the aritan and Magothy(?) formations were tilted gently to the south nd considerably dissected by streams. The shape of the land surface hus formed is important for it is related to the thickness and distribuion of the younger deposits resting on it. As these younger deposits ave somewhat different hydrologic properties than the Cretaceous eds, their thickness is a matter of considerable importance to this eport. In particular, extensive valleys now filled with permeable deosits occur in the western part of Long Island. If similar valleys are present in central Suffolk County, they might provide buried channelways for the movement of ground water. Although few wells penerate to the Cretaceous in central Suffolk County, the general shape of the surface may be inferred from its configuration in the western part of the Island, where more data are available, and by inference from the general geology.

When the coastal plain formed on the Magothy(?) deposits began to be eroded, the lower reaches of the ancestral Housatonic and Connecticut Rivers probably were the first main streams flowing south or southeast across the area which subsequently became Long Island. As these streams trenched themselves, tributaries called subsequent streams developed along the outcrops of the less resistant beds and in particular along the contact of the Cretaceous deposits and the crystalline bedrock. As the main streams cut deeper, the tributaries which followed this contact migrated southward down the slope of the surface of the more resistant bedrock and removed in the process a wider and wider strip of the Cretaceous cover. The inner lowland so formed is the site of Long Island Sound, and the cuesta ridge to the south of it forms the core of Long Island. Thus, in general, the surface of the Cretaceous deposits of Long Island in pre-Pleistocene time probably consisted of gentle south-dipping slopes (dipslopes), steep northfacing slopes (scarp slopes) scarred by short steep valleys, and a few main stream valleys, the original consequent streams, which traversed across or detoured around the cuesta ridges.

Whether or not such a major stream valley crossed central Suffolk County is not known. Veatch and others (1906, pl. 6*A*) suggest that the ancestral Housatonic River at first crossed the area not far west of the present site of Brookhaven National Laboratory. Well records suggest that there is a buried valley extending at least a few miles south of Mount Sinai Harbor, but there is no evidence to show that this valley extends across the island. Even if the Housantonic River crossed the island, such a remnant of its valley might well be a short segment only across the higher part of the postulated cuesta ridge.

Veatch (1906, pls. 6*B and* 6*C*) believed that the ancient Housatonic and Connecticut Rivers were eventually deflected westward where they entered the inner lowland, as the result of steam piracy, and flowed across the west end of Long Island as the ancient Sound River. Veatch thought that this river flowed to the west rather than to the east, partly because the Delaware, Susquehanna, and Potomac Rivers turn west where they cross the basal Cretaceous beds, and partly because well records revealed segments of buried valleys in southern Queens County and in south-central Kings County. Veatch (1906, pl. 6*D*) suggested also that the ancestral Housatonic and Connecticut Rivers were deflected east around the end of Long Island during the late Pleistocene time.

Many of the well records in central Suffolk County are generalized, and the correlations are somewhat questionable. However, within and a short distance south of the Laboratory area, several test wells were cored and the samples carefully studied. Interpretations as to the position of the Cretaceous surface at these wells are considered to be reasonably accurate. Data were particularly sought in the area south and southeast of Brookhaven National Laboratory, for this is the general direction of movement of the ground water from the Laboratory. These core identifications show that the Cretaceous surface is 92 feet below sea level at the southwest corner of the laboratory tract (well S6409, pl. 2). From here the surface slopes down gently to the south and southeast to 149 feet below sea level at well S6457 near Route 27, and it slopes down to about 140 feet below sea level at well S6460 (pl. 2). Still farther south, the position of the upper surface of the Cretaceous beds is uncertain, but it may be as much as 250 to 300 feet below sea level to the south according to interpretation of drillers' logs. Conceivably some of the clay correlated as Gardiners may be part of the Magothy(?) formation.

Beneath Brookhaven National Laboratory north of well S6409, the Cretaceous surface slopes to the north and is 161 feet below sea level at the northeast corner of Brookhaven National Laboratory (well S6458, pl. 2). Still farther north, few reliable well records are available, but the surface probably rises along the north shore in the vicinity of Shoreham, perhaps even to altitudes above sea level. West along the north shore, near Mount Sinai Harbor, is the valley already referred to, and still farther west, in Port Jefferson, well records and one exposure show clearly that the Cretaceous surface is 50 feet or more above sea level. A small buried ridge which appears to trend east-west beneath the southern boundary of Brookhaven National Laboratory may be part of a minor cuesta.

East of Brookhaven National Laboratory, beneath the valley of the modern Peconic River, there may be a buried valley of considerable

12819

ent. Wells at Manorville and Riverhead reached the Magothy(?) considerable depths below sea level.

The total relief on the surface of the Cretaceous deposits in central ffolk County is about 400 feet. Except for parts of the north shore, hich are outside of the area of immediate interest to Brookhaven ational Laboratory, the Cretaceous surface is very gently sloping, d the valleys and ridges referred to are but very minor undulations a generally flat and nearly level surface.

DEPOSITS OF PLEISTOCENE AGE

During the Pleistocene epoch there were four major glacial stages. hese were separated by three relatively warm interglacial stages. ong Island is about at the southern limit of the last major advance of e ice, the Wisconsin stage, and perhaps near the limit of the ice ront of the earlier glacial stages.

In central Suffolk County, the deposits of Pleistocene age comrise: the Gardiners clay, believed to be a shallow marine deposit of he last major interglacial stage; and a complex sequence of glacial nd nonglacial deposits, probably all of Wisconsin age, grouped under he name upper Pleistocene deposits. (See pl. 2.) The Jameco gravel ound in western Long Island and the Mannetto gravel identified near the Nassau-Suffolk County boundary have not been recognized in entral Suffolk County.

GARDINERS CLAY

In about the southern half of central Suffolk County, the Magothy(?) formation is overlain unconformably by a fossiliferous marine clay that probably is the equivalent of the Gardiners clay as defined and described by Fuller (1914, p. 92). The type locality of this formation is on Gardiners Island at the east of Peconic Bay. It is not possible to trace the deposits from the type locality to Long Island proper; therefore, the name Gardiners clay in this report is restricted to the fossiliferous clay beneath much of the southern part of the area that is between the upper Pleistocene deposits above and the Magothy(?) formation below.

In most of Long Island, except where it has locally been deformed by ice shove, the top of the Gardiners clay is about 50 feet or more below present sea level. In central Suffolk County, it is everywhere about 100 feet below sea level or deeper. The nonmarine clays exposed at or about sea level along the north shore of Long Island, described by Fuller as Gardiners clay, are no longer believed to be part of that formation (Weiss, 1954, p. 148).

As used in this report, the Gardiners clay comprises three somewhat different types of material that occur in three separate bodies and

that may or may not be contiguous with one another. These bodies are somewhat different lithologically and thus have somewhat different effects on the movement of ground water.

One of these is a thin body of clay or clay and sand that extends, in the area where it is best known, from about the northern border of Brookhaven National Laboratory as far south as Route 27 at well S6457 (pls. 1, 2). Similar deposits were penetrated by wells S128 and S95 to the west. Most wells in the area do not penetrate the Cretaceous beds, so the extent and continuity of the Gardiners is not known. However, it appears to underlie a belt around 6 miles wide north and south, roughly north of Route 27, and extending east and west across central Suffolk County. In this belt, the Gardiners clay is about 10 feet thick. The altitude of its upper surface is 101 feet below seal evel at S6456 (pl. 2), 91 feet below at S 6459 (pl. 2), and 130 feet below at S 6457 (pl. 1). Where penerated by these wells, the formation is composed of tough dark-gray to green sandy clay that contains a few pebbles. The green color is in part due to a small amount of glauconite and a small amount of green clay minerals.

A few pelecypod and gastrapod shells were found in the Gardiners clay at several of the wells in this area. At well S6409, a thin layer of dark brown peat underlies the clay. None of this material was particularly diagnostic; the peat being described by E. S. Barghoorn (Harvard Univ., written communication, 1952) as yielding only conifer pollen grains, Lycopodium spores, and other evidence of arboreal flora, which suggests a climate similar to, or more probably, slightly colder than the present.

Microfossils in the Gardiners were somewhat more indicative. Lawrence Weiss, formerly of the Geological Survey, prepared a report (1954) of the foraminifera obtained from cores and other samples. The foraminifera, and to a lesser degree the diatoms (K. E. Lohman, written communication, 1950), suggest strongly that the thin northern part of the formation in the vicinity of the laboratory was deposited in a shallow body of brackish water, not unlike the bays that fringe the southern shore of Long Island today. The fossil forms are largely identical with those living in the present bays. They do not resemble the forms living in the less well protected and more saline water of Long Island Sound. Similar forms are also found in protected waters to the north along the New England coast, which suggests that the Gardiners clay was formed during an interglacial period when the climate was similar to or perhaps a little colder than now. This conclusion agrees with the less conclusive evidence furnished by the peat. Also indicative of a somewhat colder climate is the altitude of the top of the clay, which suggests that sea level at the time of

13819

osition was 50 to 100 feet lower than at present. This could be e if the glaciers and polar icecaps of the time were more extensive n those of today. MacClintock and Richards (1936, p. 330–331) ggest that the Gardiners clay is the equivalent of the Cape May mation of New Jersey, and they indicated on a map the probable sition of the shoreline in New Jersey, New York, and Connecticut en the Cape May formation and the Gardiners clay were deposited. this map, the sea level is shown as higher than at present in New rsey, but lower than at present in Long Island and Connecticut. his would suggest that the land had been susequently tilted, or that e two formations are not actually contemporaneous.

The second body of the Gardiners clay, as here considered, comprises e thick clay penertated by wells S5591, S8549, and others (pl. 2), uth of Route 27. The upper surface of this clay is at about 130 et below sea level, but the lower contact slopes seaward so that the it attains its greatest apparent thickness at well S8549 (pl. 2), where consists of a nearly continuous body of tough generally green clay. similar sequence, not quite so thick, was penetrated in well S5591 pl. 2). Predominantly clay beds, as much as 80 feet thick, occur at pths of 130 feet below sea level at other southerly wells such as S6187 nd S152. Thus, these thick clays may extend along the entire shore rom Blue Point to Westhampton Beach and possibly beyond.

Clays of such thickness seem to be inconsistent with the apparent node of deposition of the thin clay to the north. Also, the basis for an ge determination is not firm. Hence, the thick clay may not be enrely of Gardiners age and may include beds of the Magothy(?) ormation. Similar thick clays have been found farther west beneath Fire Island Beach, and Cretaceous foraminifera have been found in ome of them (Perlmutter and Crandell, 1959, p. 1066–1067). However, the writer feels that lithologically the clay here discussed is not ypical of the Magothy(?), and believes that if it is not Gardiners it nust wholly or partly belong to some intervening formation hitherto unidentified.

A third body of deposits tentatively correlated with the Gardiners clay comprises certain fossiliferous sands and clays found in wells in the Riverhead area and south of Mount Sinai Harbor. As explained n foregoing paragraphs, it is likely that valleys were cut into the surface of the Magothy(?) formation at both of these places during the Tertiary. These valleys may have been invaded by the sea during deposition of the Gardiners clay. At well S5140 in Riverhead, Weiss (1954) found microfossils similar to those present in the Gardiners clay beneath Brookhaven National Laboratory and considered that the beds represent a shore facies of the Gardiners clay. These fossils

were present in two sand layers and in an intervening clay penetrated between depths of 70 and 101 feet below sea level. Shells also were reported in fine sand at 33 feet below sea level at about 1.5 miles eastnortheast, but no samples were available for study. The fossiliferous sand 33 feet below sea level is presumably pre-Wisconsin if it is overlain by glacial outwash. However, at this comparatively shallow depth, the overlying material may be of Recent age.

In the Mount Sinai Harbor area, clay or sand and clay containing shells have been found in several wells at depths below sea level as follows: S43, −60 to −200 feet; S2650, −10 feet; S9067, −60 to −70 feet; and S108 at about −100 feet. These are approximate figures, and as the area was overridden by later ice sheets, the clay may have been deformed by ice shove. The foraminifera from well S2650 were briefly examined by N. M. Perlmutter who found them similar to those described by Weiss from the Gardiners clay. The material is therefore, like the sand at Riverhead, probably interglacial, and possibly contemporaneous with the Gardiners clay.

WATER-BEARING PROPERTIES

With respect to water-bearing properties, the chief concern is with the predominantly clayey parts of the Gardiners that lie beneath and south of Brookhaven National Laboratory. Beneath the laboratory and roughly north of Route 27, the thin supposedly lagoonal portion of the Gardiners, as here distinguished, lies between the highly permeable upper Pleistocene deposits above and the moderately permeable Cretaceous formations below. The effectiveness of this part of the Gardiners clay as a barrier to ground-water movement is an important factor in determining whether contamination reaching the ground water in the glacial sands would be carried down to the lower aquifers. The beds of tough clay are probably relatively impermeable, but they do not appear to occur in sufficiently thick and continuous strata to form a fully effective barrier to ground-water movement. If the Gardiners clay was indeed formed in a bay such as those which now fringe the south shore of the Island, and if the sea level rose from −140 feet to −90 feet during deposition, the formation would then probably consist of overlapping lenses of clay with zones of coarser grained silt and sand around the margins and local silty or sandy zones throughout. Indeed, the logs of wells S6457 and S6459 indicate that such sandy zones exist. Accordingly, this part of the Gardiners clay is apparently not a continuous and complete barrier to ground-water movement over the whole area, although the tough clay zones probably are effective barriers locally.

14819

Certain hydrologic data, discussed more fully by de Laguna (written mmunication, 1962) bear out this conclusion. The hydraulic head fferential across the clay in the area south of the Laboratory, as easured at wells S6456, S6459, and S6460 is on the order of half a ot. The clay therefore must be sufficiently impermeable to restrict mewhat the movement of water, which here is from upper to lower rata. However, the sandy zones in the clay, which as far as is known ay occur anywhere, would offer relatively little restriction to the ovement of water, which could then pass downward wherever the ydraulic gradient is favorable. Thus, taking the unit as a whole, ater can pass through the Gardiners clay, although at a slow rate, small amounts and probably at most places only by circuitous routes.

The thicker beds of clay and sand and clay beneath the south shore f the island, which were referred to the Gardiners clay, are doubtless ppreciably more effective as a barrier to the movement of ground water than the thin beds of clay farther north. This is due not only o their greater thickness but also to the inferred greater continuity of he clays, although the log of well S1592 (pl. 2) suggests that there re sandy zones even in this material. However, the significance of hese characteristics is less than in the clay to the north, because the outhern clay beds lie within the area where ground water is moving upward rather than downward. The thick clay in the vicinity of well S5591 and southward greatly retards the actual movement of water from the deeper formations. In fact, it may force relatively large amounts of water to discharge upward in more northern areas, perhaps through more permeable deposits such as those penetrated by well S1592.

The scattered fossiliferous sands and clays in the Riverhead and Mount Sinai Harbor areas are impossible to evaluate hydrologically as their structure and distribution are not known. It would appear, however, that they are but a part of a geologically complex filling of the buried valleys in these areas, and that the details of the hydrology of these areas is likely to be similarly complex. These areas are remote from the Laboratory and their hydrology is of correspondingly small importance to the basic problems of this report.

UPPER PLEISTOCENE DEPOSITS

The term upper Pleistocene deposits was used by the writer in 1948 (de Laguna, 1948, p. 16) to include all the Pleistocene deposits on Long Island above the Gardiners clay. Fuller (1914, p. 106–176) divides this material into three formations: the Jacob sand, thought to grade downward into the Gardiners clay; the Manhasset formation, thick glacial deposits presumably of Illinoian age; and a thin, surficial veneer considered to be Wisconsin drift. Subsequent work

suggests that the Jacob sand is not a separate formation, and that the Manhasset formation is actually largely, if not entirely, of Wisconsin age.

The Jacob sand, as described by Fuller (1914, p. 106), consists of very fine sand, silt, and rock flour, which are plastic when wet, but which contain little true clay. The color is very light gray, or yellow or buff. Fuller gives no thickness for the unit. According to Fuller, the Jacob sand is exposed at several places in wave-cut bluffs at or near sea level along the north shore of Long Island and at the type area at Jacobs Point, 15 miles northeast of Brookhaven National Laboratory. At places, the Jacob sand grades downward into a brown silty clay which Fuller believed to be the Gardiners clay, but this clay contains no fossils and is no longer believed to be Gardiners. Also, Fuller's suggestion (1914, p. 105–106 and fig. 77) that the nonfossiliferous Jacob sand at the type locality and elsewhere along the north shore is equivalent to fine-grained fossiliferous sand which overlies the Gardiners clay on Gardiners Island probably is incorrect. This fossiliferous sand probably should be considered part of the Gardiners clay (MacClintock and Richards, 1936). In its type area the Jacob sand does not appear to be a true stratigraphic unit, but rather to comprise beds and lenses, each of rather limited extent, of fine sand, silt, and rock flour probably deposited in quiet water ponded along the ice front. Deposits comparable to the Jacob sand are not recognized in well logs beneath the central or southern part of Long Island.

The type locality of the Manhasset formation of Fuller is in Manhasset in northern Nassau County, where thick deposits of glacial sand and gravel contain a thin intercalated bed of clayey till. The lower gravel Fuller called the Hempstead gravel member, the till was called the Montauk till member (after the type locality at Montauk Point), and the gravel above the till was called the Herod gravel member, although the correlation of this particular gravel with the sand and gravel at Herod Point in central Suffolk County is also uncertain. Fuller believed that only the top few feet of till which overlies the Manhasset formation at the type locality was deposited by the Wisconsin ice sheet. This belief was based on an interpretation of the physiography with which subsequent workers have not been in agreement. Wells (1935, p. 121–122) and Fleming (1935, p. 222) state that they could find no evidence of weathering or erosion to indicate that there was an interglacial period at any time subsequent to the deposition of the Gardiners clay. The writer agrees with this opinion.

Fleming (1935, p. 216–238) proposes a three-fold subdivision of the post-Gardiners glacial material into Herod, Montauk, and Latest, as

15-619

believes that three separate advances of the Wisconsin ice were presented. The writer found no evidence in central Suffolk County, wever, of three ice sheets. The glacial deposits observed in the ookhaven National Laboratory area appear to be the product of o ice advances similar in character and probably both of Wisconsin e.

The Ronkonkoma and Harbor Hill moraines as mapped by Fuller 914, pl. 1) are accepted with slight modification; and the bulk of e upper Pleistocene deposits are considered to be outwash from the me glaciers that formed the moraines. The chief points of disagreement with Fuller are: (1) the Manhasset formation, as defined by uller, is not considered to occur within the area and does not underlie e two outwash deposits at shallow depth as he believed; (2) the twash is believed to be substantially thicker than Fuller thought; d (3) the thin till (supposedly ground moraine of the Ronkonkoma lvance), which Fuller maps as underlying central Suffolk County and nsiderable territory to the north and west, is not believed to be resent. This last unit is here replaced by Ronkonkoma and Harbor ill outwash as discussed in the following paragraphs.

On the other hand, some units are here recognized in the upper leistocene that Fuller had little or no chance of observing. The first f these, called the unidentified unit (Weiss, 1954, p. 148), occurs at he base of the upper Pleistocene deposits. The second unit is clay, ome of it varved, which is best known from cores from a test well t Manorville. Lastly are some thin surficial fine-grained deposits, ot typical outwash, that occur in the upper part of the Harbor Hill utwash in the headwaters of the Peconic River in or near the eastern art of Brookhaven National Laboratory.

Thus in summary, the upper Pleistocene deposits in the vicinty of Brookhaven National Laboratory comprise the Harbor Hill and Ronkonkoma moraine deposits and outwash, which are indistinguishable n the basis of texture and composition alone, but which occupy somewhat different physiographic positions; and three minor units, differentiated on the basis of their composition: the unidentified unit, the clay at Manorville, and fine-grained surficial deposits of limited but uncertain extent.

UNIDENTIFIED UNIT

South of Brookhaven National Laboratory, and for an unknown distance east and west, the Gardiners clay is overlain by 25 to 50 feet of sand or clay and sand characterized by a greenish color which is referred to as the unidentified unit. Beneath the southern half of the laboratory tract, and south to Route 27, this material forms the basal part of the upper Pleistocene deposits. Its relation to the other units

in this area is shown in plate 2. Similar greenish deposits are reported in wells as far west as Patchogue (well S7519) and as far east as West Hampton Beach (wells S9978 and S152). It probably extends beyond these areas. The northern limit of the unit has been located only at Brookhaven National Laboratory where test drilling indicates that this unit extends north of well S6459 (pl. 2). To the south, the unit can be traced nearly as far as well S1592 (pl. 2), but beyond this point the greenish deposits cannot be distinguished in well logs from similar material that may be part of the Gardiners clay or older deposits. The data from other wells along the south shore of the Island are not adequate to define the unit.

The unidentified unit, in the vicinity of Brookhaven National Laboratory, where it is most clearly defined, is composed of fine- to medium-grained white and gray sand, and 5 to 10 percent of interstitial green clay. The sand grains consist mostly of quartz, but some other minerals also are present, principally feldspar, amphibole, and garnet. The green clay was identified by Clarence Ross (written communication, 1949) as nontronite, but probably there are other clay minerals present. Some broken grains of reworked glauconite are also present; and the nontronite may well have been formed by the weathering of glauconite. Elsewhere, the unit apparently contains considerable clay or sandy clay.

Samples of sand were collected for mechanical analysis from well S6456. The texture of the sample of greenish sand is not distinctive. The amounts and proportions of fine and medium sand are similar to those in some of the upper Pleistocene outwash; the content of coarse and very coarse material is small. Mineralogically the greenish sand differs from the overlying outwash mainly in the apparent absence of biotite and the presence of glauconite. It appears to have a more varied mineral content than the Gardiners clay.

The origin of the unit is uncertain, but it is here considered to be part of the upper Pleistocene deposits because of its general mineralogic and lithologic similarity to the sands of those deposits. The glauconite may well have been derived from the shallow marine deposits in Long Island Sound, then dry, by the first advance of the ice across this area, and it need not have come from the area of the Atlantic Ocean to the south.

WATER-BEARING PROPERTIES

The unidentified unit, although very similar in texture to much of the outwash, contains less coarse sand, and probably on the average a little more clay. The difference is difficult to estimate quantitatively.

16819

owever, it may be inferred that the movement of the ground water the unidentified unit is somewhat slower than it is in the overlying aterial. Even a small difference may be of some importance. As own in a later section, a body of contaminated liquid of even slightly reater density than the normal ground water will tend to sink to the ottom of the aquifer. Also, the adsorptive and ion-exchange ca-acity of the nontronite and glauconite in the unit is appreciably igher than that of the overlying outwash. It is concluded, therefore, hat following a spill or leak, any contaminated water which sinks nto the unidentified unit at the bottom of the upper Pleistocene, will nove less rapidly and be subject to more adsorption than it would be n the overlying material.

MORAINE DEPOSITS AND OUTWASH

The moraine deposits and outwash comprise four separate units: he Ronkonkoma moraine, outwash and other meltwater deposits from the Ronkonkoma ice, the Harbor Hill moraine, and outwash from the Harbor Hill ice. These units are distinguishable topo-graphically, but not lithologically with present information.

The Ronkonkoma moraine is a line of irregular hills that lies im-mediately south of Brookhaven National Laboratory (pl. 1). It ex-tends eastward past South Manor, where it forms the south side of the Manorville Basin, and still farther east through Bald Hill. It also extends westward, paralleling the Carmans River valley at Yaphank, and then crosses that valley and includes Coram Hill and others to the west.

The Ronkonkoma outwash underlies and forms the sloping but fairly smooth terrain south of Brookhaven National Laboratory, and also the irregular hills on and among which the main Laboratory tract is situated. These hills are considered to be kames formed during the late stages of melting of the Ronkonkoma glacier.

The Harbor Hill moraine (pl. 1) lies along the north shore of Long Island and is of little direct concern in connection with the ground-water problems of the Laboratory. Outwash from the Harbor Hill ice, however, extends southward to within about 1½ miles of the north boundary of Brookhaven National Laboratory, and to the east it extends south of the Peconic River and underlies most of the Manor-ville Basin. It is believed that meltwater from the Harbor Hill ice flowed down the site of the Carmans River, through the gap in the Ronkonkoma moraine, and into the narrow tongue that broadened at the south to form a fanlike feature; the broad, flat area where the communities of Mastic and Mastic Beach are now located (pl. 1).

Within the Laboratory tract, except for the thin, surficial clay and

silt described below, all these morainal and outwash deposits are lithologically inseparable and form virtually a single water-bearing unit. As a unit, these deposits rest upon the unidentified unit and, where that unit is missing or unrecognizable, upon the Gardiners clay. At places, where the Gardiners is missing, it rests on the Magothy(?) formation. In the laboratory area, it is from 100 to more than 200 feet thick. Its thickness, altitude, relationships to underlying forma-tions, and general lithologic characteristics are shown by the cross sections in plate 2.

The moraine and outwash deposits are a crudely stratified body of clean sand and gravel which contains very little clay or silt, and only locally a few boulders. The sand grains are mostly quartz with small amounts of alkali feldspar, mica, amphibole, and other minerals. As indicated by a few exposures, the sand is well but coarsely bedded. Individual beds are difficult to define, as variations in texture are gradational.

Cores from some of the test holes reveal thin layers of silt or clay, which at most are 1 to 2 inches thick. Thicker lenses of clay are absent in the immediate vicinity of the Laboratory, but they are exposed locally along the north shore, especially at Wildwood State Park and Rocky Point (pl. 1). These lenses of silt and clay were probably deposited in small lakes formed between the retreating face of the Harbor Hill ice sheet and the Harbor Hill moraine. They are not more than 20 to 30 feet thick, and the majority are less than 10 feet thick. They appear to be at most a few hundred yards long. All these beds of silt and clay are near sea level, and they are evidently the material identified as the Jacob sand and the Gardiners clay by Fuller (1914).

No systematic variations in texture were actually observed in the glacial outwash or moraine deposits, and indeed to detect any would probably require a statistical study of a considerable number of large samples. The data available, however, suggest that the Ronkonkoma outwash becomes finer grained south of the Ronkonkoma moraine, and that the lower part of the outwash is somewhat finer than the upper part. No such generalization appears to hold for the material north of the Ronkonkoma moraine.

WATER-BEARING PROPERTIES

Because of their similarity in structure and texture, the moraine and outwash deposits are considered a hydrologic unit. In the Labora-tory area, the water table lies within what is probably the Ronkonkoma outwash, so that this deposit is of primary concern. The clean, coarse sand and gravel is very porous and highly permeable. It makes a ous soil, so that a high proportion of the rainfall infiltrates where alls; there is virtually no surface runoff. Because of their high osity, the deposits store large quantities of water. Because of r high permeability, the deposits yield large quantities of water wells and are the source of nearly all the ground water pumped in ral Suffolk County.

o far as is known there are no effective barriers to the movement water anywhere in the unit. However, because the deposits are ticular, there may be substantial variation in permeability over rt distances. The permeability of the deposits south of the Ronkoma moraine may decrease slightly with depth and with distance he south.

Some of these minor variations in water-bearing characteristics ght become significant in connection with possible movement of a taminant. As the moraine deposits and outwash were deposited by ter flowing in general from north to south, it is reasonable to ppose that individual lenses of sand and gravel are themselves ngated in this direction. Thus, there may be threads of relatively rmeable material along which water might move a little more pidly under proper hydraulic conditions. Also, there may be either e- or coarse-grained deposits localized beneath and along the valleys the principal streams, such as the Carmans or Forge Rivers.

Finally, as discussed by de Laguna (written communication, 1962) ere is apparently a substantial difference between permeabilities in e horizontal and vertical directions.

CLAY AT MANORVILLE

A test well (S10,384) drilled by a private contractor near Manorlle (pl. 1) penetrated a bed of tough clay which was underlain and erlain by outwash sand and gravel, between 2 and 33 feet below sea vel. The lower part of this clay has typical glacial varving, which dicates that it was deposited in a lake left in the Manorville basin ring the ice retreat. Similar clay was found in well S6422 from 4 62 feet below sea level. East, in the Riverhead basin, several wells enetrated what are probably equivalent beds of clay 15 to 30 feet elow sea level. Three of these reached the bottom of the clay at 74, , and 130 feet below sea level. It is tentatively suggested that the arved clay at well S10,384 is possible interglacial, at least intersubage, and may separate Ronkonkoma from Harbor Hill outwash. Whether the clays penetrated by the other wells to the east and to the est are of the same unit is not known. There are, however, clay and ilt of Gardiners age at about these depths in the eastern part of the Riverhead basin, and in well logs it would be impossible to distinguish

between them and the clay at Manorville. Wells for which there are reliable logs are not so located as to permit a determination of the continuity and extent of this clay. However, if the clay is post-Ronkonkoma, the temporary lake in which it formed presumably would have been limited to the north of the Ronkonkoma moraine, and the clay itself should occur correspondingly. It was not found in the Laboratory area, nor to the south of Brookhaven National Laboratory. West of the Laboratory, in the upper valley of the Carmans River, there are few data, and none to indicate the presence of a comparable clay.

The clay at Manorville, if laterally extensive, probably exerts a considerable influence on the movement of the ground water in the upper Pleistocene deposits in the area where it occurs. The water table is some 35 feet above sea level at Manorville, so that there is about 35 feet of saturated sand and gravel above the clay. The clay at well S10,384 is about 31 feet thick, and it is underlain by about 42 feet of sand and gravel. Movement of water between the upper and lower strata is certainly considerably impeded by the clay, and presumably artesian conditions prevail in the lower strata, although water-level measurements are not available to indicate the head difference. It is also possible that in some parts of the Manorville basin the water in the deposits beneath the clay flows southeastward toward and eventually to the south shore, whereas the water in the deposits above the clay discharges into the Peconic River. The clay appears to terminate, however, well to the east of the Laboratory, so that it does not influence directly the movement of ground water in the areas of potential contamination, but it may well be an important factor in the hydrology of the central and lower Peconic River valley.

SURFICIAL SILT AND CLAY

In the east third of the Laboratory area, test drilling and shallow excavations have revealed in places thin deposits of silt and clay. The material is discontinuous and unevenly distributed. It is at most 5 or 10 feet thick, and is generally found at or very near the surface; and not deeper than 20 to 30 feet. It appears to be more widespread in the slightly lower land along the Peconic River and minor headwater tributaries than in higher ground. It may have been first deposited by the wind as loess, shortly after the retreat of the ice sheets and before a vegetative cover had developed; and subsequently moved by running water and redeposited on lower land. Some of it may have originated as waterlain material, and some may be unreworked loess. The extent of the deposits is determined in part by hydrologic data.

These deposits are sufficiently fine grained so that they appreciably impede the movement of shallow ground water. They hold water at or near the land surface, and thus locally form swampy areas or ponds.

1889

so, they impede the downward movement of water enough so that times when the level in the main underlying water body declines, ey support perched or semiperched water bodies. Similarly, when e level in the main underlying water body rises, these fine-grained posits confine the water under slight artesian pressure. These re- tionships are areally complex because the deposits are discontinuous nd occur close to the water table. The deposits affect the movement f shallow water into and out of the Peconic River and associated onds, swamps, and drainage ditches in a rather complex way, and hus they have a bearing on the possible movement of contaminated aters in and outside the eastern part of the Laboratory area.

DEPOSITS OF RECENT AGE

Deposits of Recent age comprise gravel and sand on beaches, or- ganic matter, silt and clay in tidal swamps, gravel, and sand and ilt in stream channels. These deposits are thin and discontinuous, nd they occur chiefly along the shores of the present Long Island Sound, the open ocean, bays behind barrier beach and various bars, nd along the channels of the few larger streams. They are not suffi- ciently extensive to make it important to differentiate them from underlying deposits (almost everywhere the upper Pleistocene de- posits) upon which they rest unconformably.

They are generally neither thick enough nor extensive enough to comprise any appreciable ground-water reservoirs. Nearly all these deposits are remote from the Laboratory and there is no immediate problem in regard to their possible contamination.

REFERENCES CITED

Burr, W. H., Hering, Rudolph, and Freeman, J. R., 1904, Report of the commission on additional water supply for the City of New York: New York, Martin B. Brown Co., 980 p.

Crosby, W. O., 1910, Report of the geological relations of the ground water of Long Island: New York City Board of Water Supply, open-file report, 64 p.

Darton, N. H., 1893, The Magothy formation of northeastern Maryland: Am. Jour. Sci., 3d ser., v. 45, p. 407–419.

de Laguna, W., and Brashears, M. L., Jr., 1948, The configuration of the rock floor in western Long Island: New York Water Power and Control Comm. Bull. GW–13, 86 p.

Fleming, W. L. S., 1935, Glacial geology of central Long Island: Am. Jour. Sci., 5th ser., v. 30, p. 216–238.

Fuller, M. L., 1914, The geology of Long Island, N.Y.: U.S. Geol. Survey Prof. Paper 82, 231 p.

Johnson, A. H., and others, 1952, Record of wells in Suffolk County, N.Y.: New York Water Power and Control Comm. Bull. GW–31, 137 p.

Legette, R. M., and others, 1938, Record of wells in Suffolk County, N.Y.: New York Water Power and Control Comm. Bull GW–4, 19 p.

Lusczynski, N. J., and Johnson, A. H., 1951, The water table in Long Island, New York, in January 1951: New York Water Power and Control Comm. Bull. GW–27, 28 p.

MacClintock, Paul, and Richards, H. G., 1936, Correlation of late Pleistocene marine and glacial deposits of New Jersey and New York: Geol. Soc. America Bull., v. 47, no. 3, p. 289–338.

Oliver, J. E., and Drake, C. L., 1951, Geophysical investigations in the emerged and submerged Atlantic Coastal Plain: Geol. Soc. America Bull., v. 62, p. 1287–1296.

Perlmutter, N. M., and Crandell, H. C., 1959, Geology and ground-water supplies of the south-shore beaches of Long Island, N.Y.: New York Acad. Sci. Annals, v. 80, art. 4, p. 1060–1076.

Roberts, C. M. and Brashears, M. L., Jr., 1945, Record of wells in Suffolk County, N.Y., supplement 1: New York Water Power and Control Comm. Bull. GW–9, 155 p.

Spear, W. E., 1908, Long Island sources, an additional supply of water for the City of New York: New York City Board of Water Supply, v. 1, p. 55–102.

Suter, Russell, de Laguna, Wallace, and Perlmutter, N. M., 1949, Mapping of geologic formations and aquifers of Long Island, N.Y.: New York State Water Power and Control Comm. Bull. GW–18, 178 p.

Thompson, D. G., Wells, F. G., and Blank, H. R., 1937, Recent geologic studies on Long Island with respect to ground-water supplies: Econ. Geology, v. 32, no. 4, p. 451–470.

Veatch, A. C., and others, 1906, Underground water resources of Long Island, N.Y.: U.S. Geol. Survey Prof. Paper 44, 394 p.

Von Engeln, O. D., 1942, Geomorphology, systematic and regional: New York, The MacMillan Co., 655 p.

Weiss, Lawrence, 1954, Foraminifera and origin of the Gardiners clay (Pleistocene), eastern Long Island, N.Y.: U.S. Geol. Survey Prof. Paper 254–G, p. 143–162.

Wells, F. G., 1935, Reconsideration of the Pleistocene geology of Long Island [abs.]: Geol. Soc. America Proc., 1934, p. 121–122.

Wenzel, L. K., 1942, Methods for determining permeability of water-bearing materials: U.S. Geol. Survey Water-Supply Paper 887, 192 p.

19 of 19

Appendix 1.3-3
1 of 14

Dan Raviv Associates, Inc.
Consultants in ground water hydrology, water quality and landfill hydrology

PHASE I EVALUATION
GEOHYDROLOGIC/WATER QUALITY CONDITIONS
SUFFOLK COUNTY AIRPORT AND VICINITY
WESTHAMPTON, NEW YORK

Job No. 83C146

Prepared
for the

Environmental Protection Bureau
New York State Department of Law

Attention: Nancy Sterns, Esq.
Norman Spiegel, Esq.
Greg Shkuda, Ph.D.

October 25, 1983
Revised: April 1984

5 Central Avenue, West Orange, New Jersey 07052 (201) 325-0806

(2) Well or sample depth (when available); and

(3) Month sampled

Water quality data presented on Figure 6 ranges from non-detected concentrations to about 1,000,000 ppb. Many of the compounds were reported as present and were not quantified. Taking into account that the high concentrations may have been an analytical error, a contaminated ground water area south of the tank farm can nevertheless be delineated.

Number of Detected Compounds

A graphic representation of the most frequently detected organic compounds in ground water versus the type of compound found was constructed (Figure 7).

The reported detection for the monitoring wells were tabulated for all compounds detected in two or more samples and were placed on the graph. This graph represents the frequency of compounds detected in ground water samples regardless of their concentrations.

4.2 Geology

The geology of the region has been extensively studied, primarily because of the importance of ground water to Long Island. Glacial deposits, consisting of till and outwash sands and gravels of Pleistocene Age, mantle much of Long Island. In this area, they are found to a depth of about 100 feet below sea level and unconformably overlie the sediments of the Cretaceous Magothy Formation on an erosional surface. The Magothy Formation consists of silts, sands, gravels, and clays and is reported to be 800 to 1,200 feet thick in this area (Jacob, 1968; Anderson & Berkebile, 1976). The underlying Cretaceous sediments and bedrock are not considered here because they are found well below the depth of the fresh water aquifer and the contamination.

Descriptions of samples obtained during drilling for installation of monitoring wells in the vicinity of the Suffolk County Airport indicate that the glacial material is composed primarily of fine to coarse sand with some silt and gravel. Glacial material is often variable in lithology and depositional mode within relatively small areas. Local variations could affect ground water quality, in particular clay particles may adsorb organic compounds in percolating water. Variations in depositional mode, resulting in different bedding structures, could affect ground water flow paths. Detailed logs, continuous from the surface to the total depth of any monitoring well should be obtained whenever possible.

The constructed hydrogeologic profiles (Figures 4 and 5) display the depths of some of the wells and the lithologies encountered. Based on available information about the area, the lithology is described in the profiles as fine to coarse glacial sands and gravels.

4.3 Geohydrology

Geohydrologic conditions of the region are known based on numerous investigations (Nemickas, 1982; Berkebile, 1975; Holzmacher, McLendon and Murrel, 1968). Underneath Long Island fresh ground water occurs in a lenticular shaped deposit overlying salt water. The deposit is thickest toward the center of the island, thinning rapidly along the coasts. The fresh ground water near the Suffolk County Airport is usually under phreatic water table conditions. As a result, the elevation of the water table generally parallels the topography. The principal aquifers in the area are the upper Glacial aquifer and the deeper Magothy aquifer. These aquifers have hydraulic properties which are similar. For the purpose of this study, we are mainly concerned with the upper Glacial aquifer. The transmissivity of the upper Glacial aquifer ranges from about 45,000 to 75,000 gallons per day per foot (gpd/ft) (Nemickas, 1982). The horizontal hydraulic conductivity is on the average about 350 ft/day and the specific yield ranges from 0.20 to 0.30. The saturated thickness of the aquifer is about 50 feet.

The water level contour map, constructed from the March 1982 measurements in the NYDOT wells indicate that the water table in the study area generally slopes to the south and is affected by streams to the SE and SW (Figure 3). We have assumed that these measurements indicate "static" conditions because: (a) most private wells in the area have not been in use since 1977; (b) we do not have pumping records from the SCWA supply wells along Meetinghouse Road to indicate variations in the pumping rate from 3,000 gpm; and (c) water level measurements have not been obtained from the monitoring wells on a consistent basis to indicate water level changes with time. Based on the water table elevations from Figure 3, the hydraulic gradient is on the order of 1.5×10^{-3} ft/ft. The velocity of ground water flow in the glacial aquifer is computed from on Darcy's Law:

$$v = \frac{Ti}{dn} \qquad (1)$$

where: v = acutal velocity of ground water, ft/day

T = transmissivity - ranges from 6,000 to 10,000 ft^2/day

i = hydraulic gradient, ft/ft

d = saturated thickness of the aquifer, feet

n = porosity, assumed equal to specific yield

The computed groundwater velocity is therefore about 0.6 to 1.5 ft/day.

The depth to water in the vicinity of the tank farm is on the order of 30-36 feet. The NYDOT elevations are tied into an assumed elevation which was adjusted for the construction of the contour map (Figure 3). Most of the elevations of the few other wells in which water levels have been measured are not known. Water levels in private wells usually cannot be measured due to the inaccessibility of the wells. Without water level measurements tied into an elevation, and taken at regular intervals over a period of time, it is difficult to correlate water table fluctuations with precipitation, stream flow, artificial recharge, or variations in pumpage. Since many of the wells are only installed into the top of the water table, relatively large variations in the water table elevation may not be measurable. As stated earlier, we have assumed that the NYDOT well measurements reflect current conditions. We have also assumed that the water table elevation does not fluctuate more than an inch or two in response to factors mentioned above and its configuration remains relatively constant.

The available depths to water were indicated on the hydrogeologic profiles (Figures 4 and 5). Some surface elevations, which were not available from the files, were approximated from the contours on the regional topographic sheet. These profiles display the general topography with relationship to the depth to water. In addition, considering the fact that the aquifer extends to a depth between 50 and 100 feet below land surface, it is apparent from the hydrogeologic profiles that ground water sampling is not representative of the total aquifer depth. In most cases, only the top few feet of the aquifer were sampled.

4.4 Surface Water and Recharge

The area south of the airport is bounded by two streams (Aspatuck and Quantuck Creeks) that join to form Quantuck Bay to the south. The Quogue Wildlife Refuge ponds and streams, which are on the east side of the airport, drain south into Quantuck Creek. Aspatuck Creek also flows south on the western side of Peters Lane. Although no culvert is present under the railroad and road to the north of Aspatuck Creek, it was noted through our field observation that this area (which is adjacent to the tank farm) slopes toward the creek.

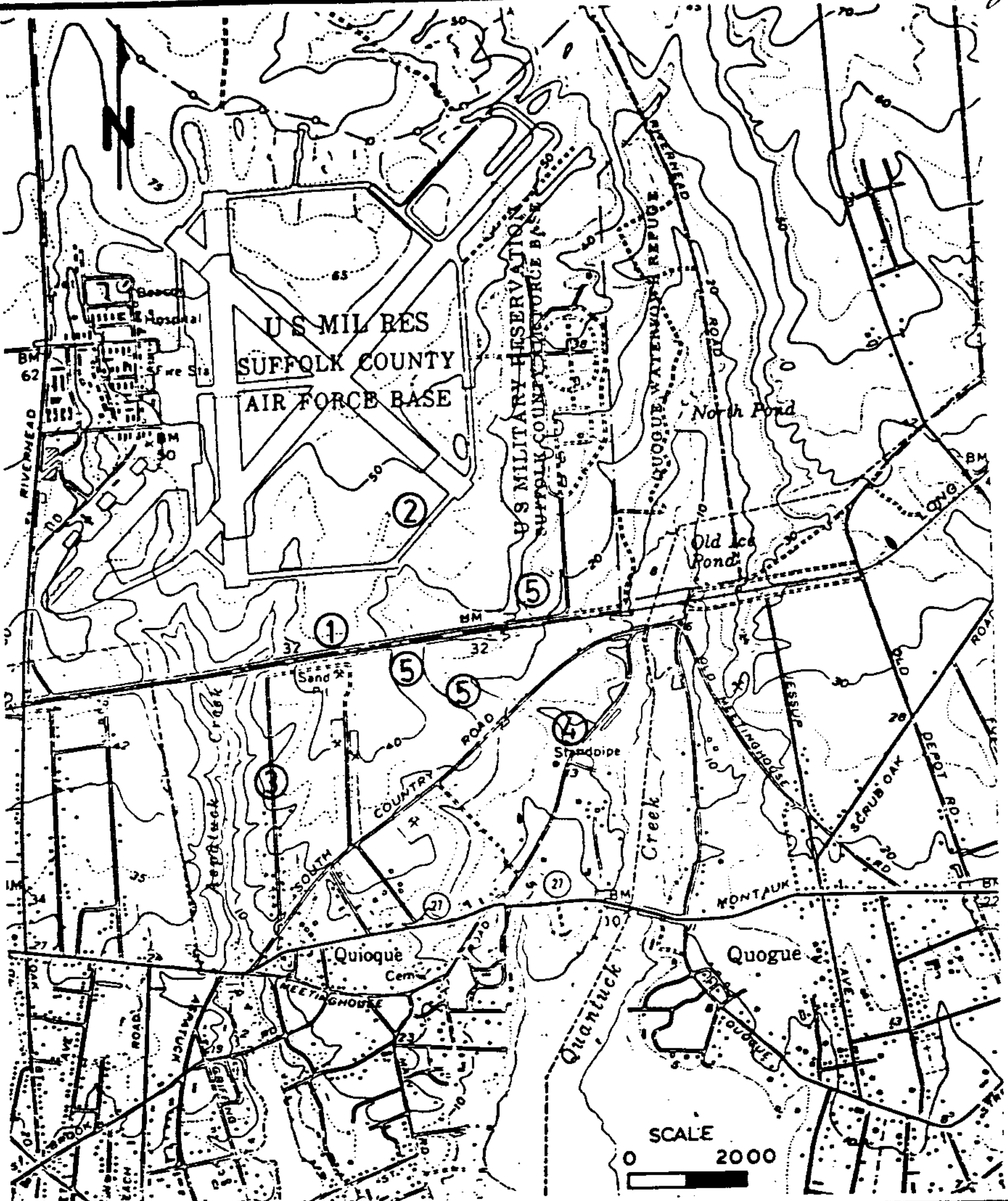
The average precipitation for the area is 43 inches per year, based on the 30-year precipitation records of the National Weather Service (Nemickas, 1982). The amount of overland runoff from precipitation is relatively low because the soil and subsurface are highly permeable. Much of the precipitation is infiltrated through the unsaturated zone to the water table. Therefore, the surface water consists mainly of ground water discharge.

The division between infiltration and runoff of a contaminant "slug" such as the 10,000 gallons of fuel spilled is dependent upon several factors including: precipitation amount and duration, land surface slope and the characteristics of the unsaturated material above the water table. It is generally assumed that the soils and glacial sands allow for rapid infiltration and recharge. However, based on local drainage, a spill of such magnitude could in part reach surface water bodies.

4.5 Water Quality

4.5.1 Ground Water

The water quality of the glacial aquifer in the area has generally been found to be potable in most parts. Iron, chloride and nitrate often occur in concentrations higher than drinking water standards of background concentrations. Concentrations of iron in the majority of water samples (March 1983) taken from the wells installed adjacent to the Quogue Wildlife Refuge were found to be above the New York State limits for drinking water (0.3 mg/l). The remaining parameters tested were within the drinking water standards. No volatile organics were detected in the surface water of the Wildlife Refuge. Other studies of the glacial aquifer ground water have found the water to be of good quality (Nemickas and Koszalka, 1982).



APPROXIMATE
LOCATION OF:

① TANK FARM

② FIRE PIT

③ PETERS LANE

④ SCWA WELL FIELD

⑤ LANDFILL

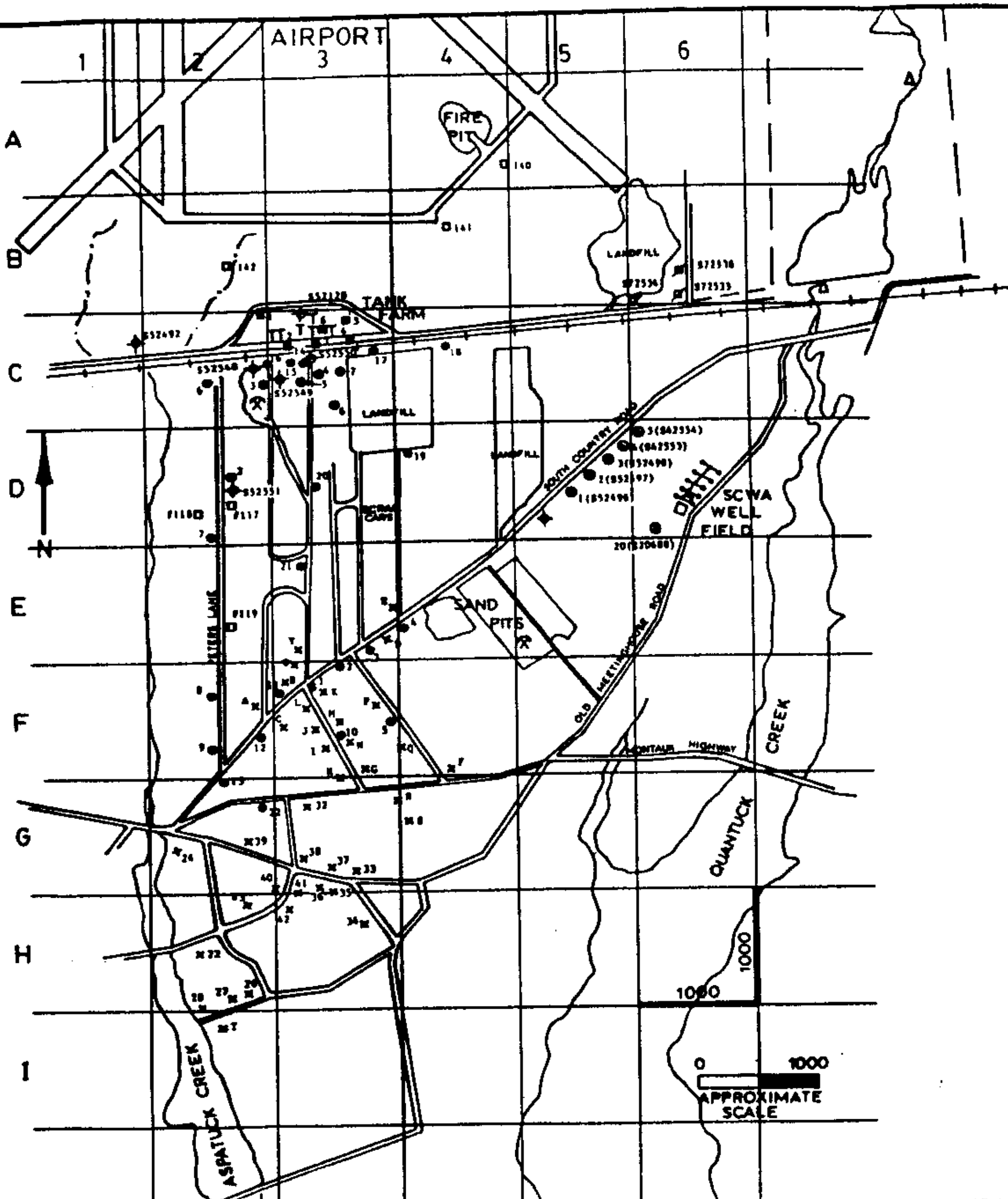
Dan Raviv Associates, Inc.

588 Eagle Rock Avenue, West Orange, New Jersey 07052

SUFFOLK COUNTY AIRPORT
PROJECT LOCATION MAP

NEW YORK DEPARTMENT OF LAW
ENVIRONMENTAL PROTECTION BUREAU

Prepared By JMH	Date AUG./SEPT. 1983
Job No. 83C146	Figure No. 1

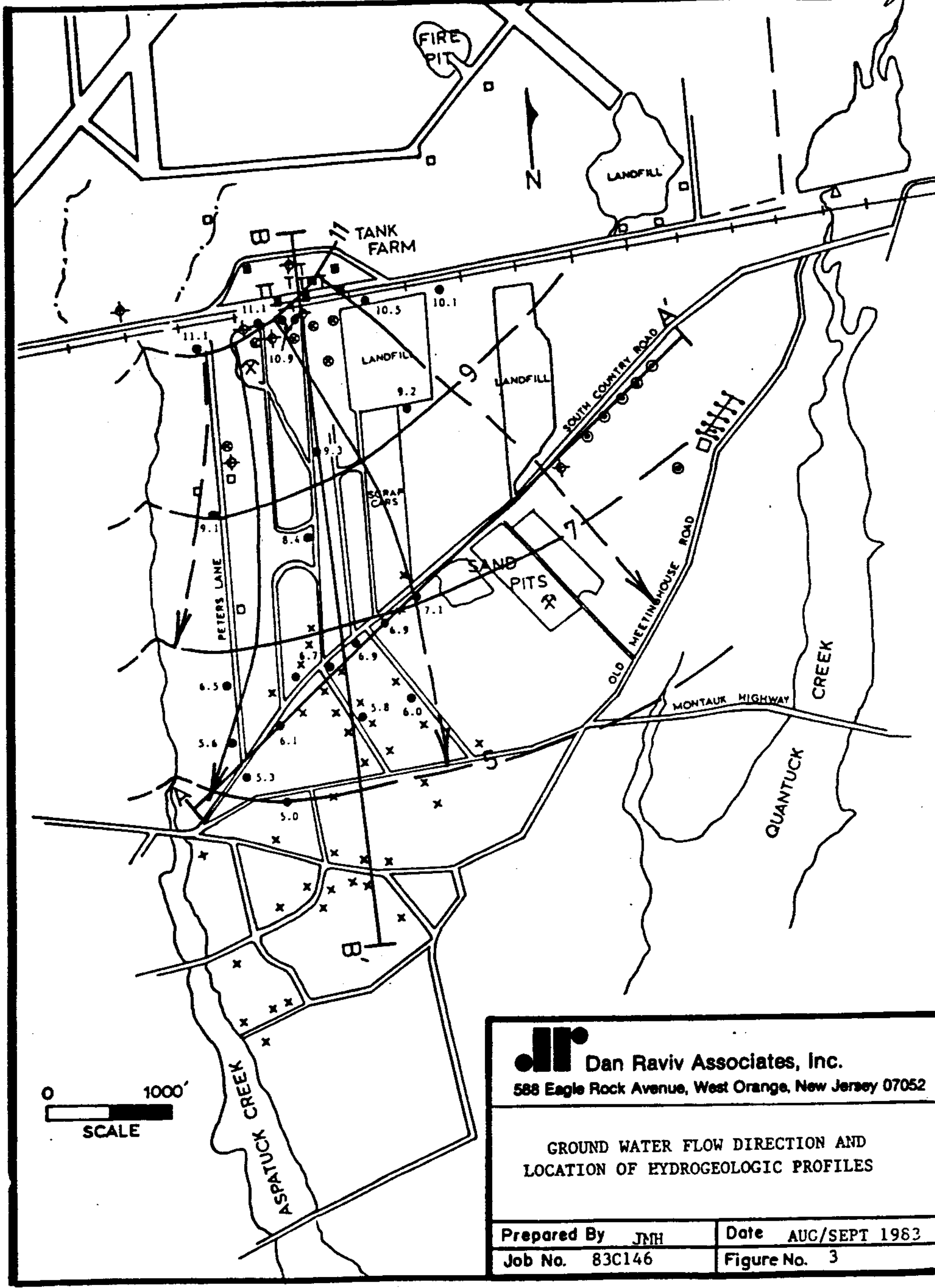


WELL DESIGNATION AND DATA

SYMBOL	WELL NO.	DATE DRILLED	WELL DEPTH (ft.)	COMMENTS
■	NEW YORK AIR GUARD			
	1	MAY 1983	[illegible]	
	2	MAY 1983	[illegible]	
	3	MAY 1983	[illegible]	
	4	MAY 1983	[illegible]	
	5	MAY 1983	[illegible]	
	6	MAY 1983	[illegible]	
●	NEW YORK DEPARTMENT OF TRANSPORTATION (DOT)			
	1 - 22	MARCH 1983	-	[illegible]
●	SUFFOLK COUNTY DEPARTMENT OF HEALTH (SCDH)			
	[illegible]	DECEMBER 1981	[illegible]	[illegible]
	[illegible]	DECEMBER 1981	[illegible]	
	[illegible]	DECEMBER 1981	[illegible]	
	[illegible]	DECEMBER 1981	[illegible]	[illegible]
	[illegible]	DECEMBER 1981	[illegible]	
	[illegible]	DECEMBER 1981	[illegible]	
	[illegible]	DECEMBER 1981	[illegible]	
□	SCDH INVESTIGATION ([illegible])			
	117	JUNE 1977	[illegible]	
	118	JUNE 1977	[illegible]	
	119	JUNE 1977	[illegible]	
	140	JULY 1977	[illegible]	
	141	JULY 1977	[illegible]	
	142	JULY 1977	[illegible]	
⊠	S72534	March 1982	[illegible]	
	S72535	March 1982	[illegible]	
	S72536	March 1982	[illegible]	
◆	MONITORING WELLS OF SCDH ([illegible])			
	[illegible]	JUNE 1974	[illegible]	
	[illegible]	JULY 1974	[illegible]	
	[illegible]	AUGUST 1974	[illegible]	
	[illegible]	AUGUST 1974	[illegible]	
	[illegible]	AUGUST 1974	[illegible]	
	[illegible]	AUGUST 1974	[illegible]	
⊕	SUFFOLK COUNTY WATER AUTHORITY (SCWA) MONITORING WELLS			
	1([illegible])	AUGUST 1974	[illegible]	
	2([illegible])	AUGUST 1974	[illegible]	
	3([illegible])	AUGUST 1974	[illegible]	
	4([illegible])	AUGUST 1974	[illegible]	
	5([illegible])	AUGUST 1974	[illegible]	
	20([illegible])	JANUARY 1962	[illegible]	
✕✕	SCWA SUPPLY WELL FIELD SUCTION SYSTEM	FROM 1903 TO 1962	FROM 46 TO 58	
✕	PRIVATE, RESIDENTIAL			
	[illegible]	-	[illegible]	[illegible]

Dan Raviv Associates, Inc. 575 Eagle Rock Avenue, West Orange, New Jersey 07052	
WELL LOCATION, OWNERSHIP, DESIGNATION AND INFORMATION	
SUFFOLK COUNTY AIRPORT - NYSDOL	
Prepared By JMH	Date AUG/SEPT 1983
Job No. 83C146	Figure No. 2

10 of 14



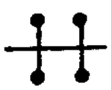
Dan Raviv Associates, Inc.
588 Eagle Rock Avenue, West Orange, New Jersey 07052

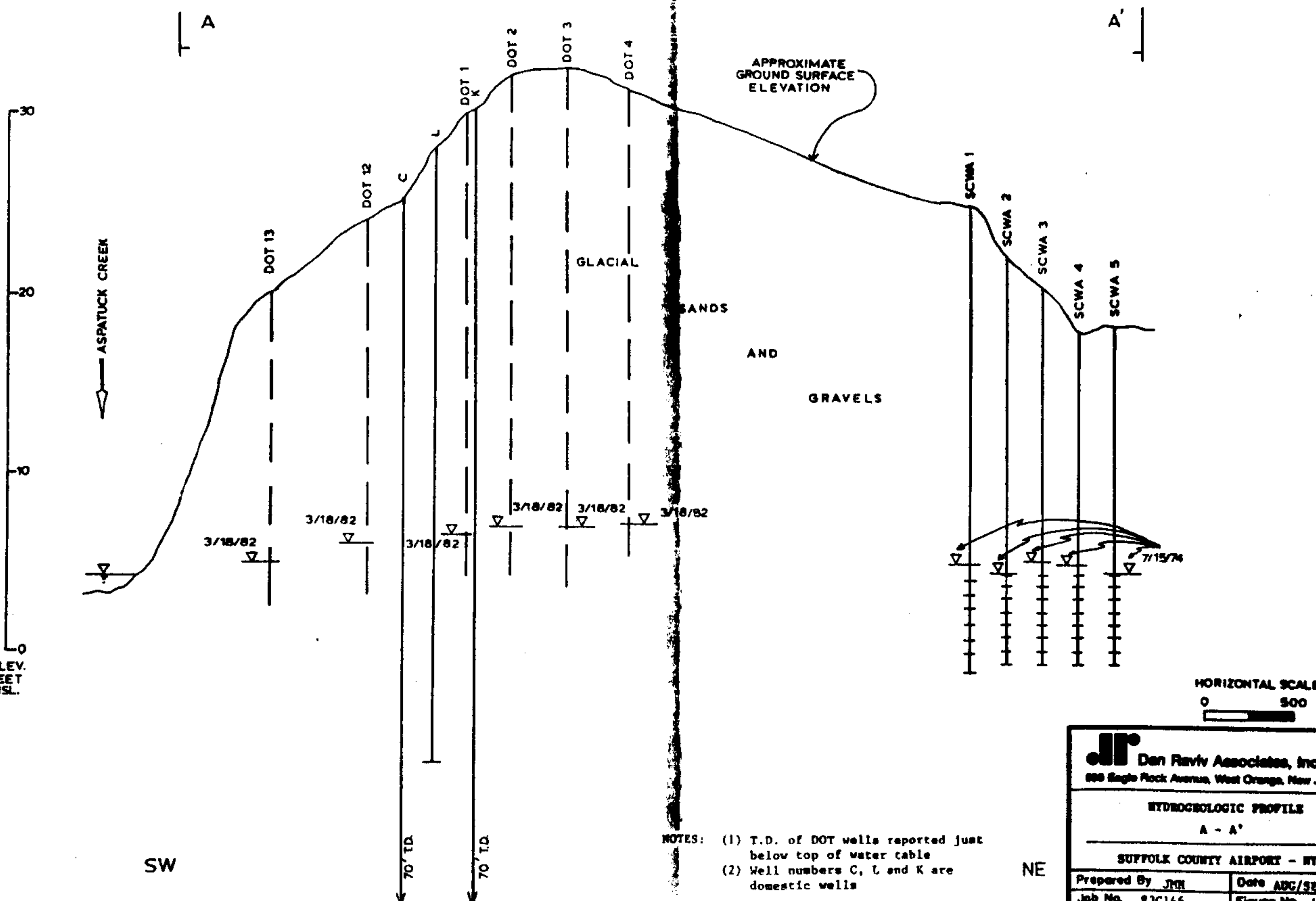
GROUND WATER FLOW DIRECTION AND
LOCATION OF HYDROGEOLOGIC PROFILES

Prepared By JMH	Date AUG/SEPT 1983
Job No. 83C146	Figure No. 3

Figure No. 3 cont'd

EXPLANATION

SYMBOL	DESCRIPTION
●	NEW YORK DEPARTMENT OF TRANSPORTATION WELL Sampled 3/82
×	PRIVATE, RESIDENTIAL WELL Sampled 2-3/82
⊗	SUFFOLK COUNTY DEPARTMENT OF HEALTH (SCDH) WELL Sampled 12/81 & 3/82
⊙	SUFFOLK COUNTY WATER AUTHORITY(SCWA) MONITORING WELL Sampled 12/81 & 1/82
	SCWA PUBLIC SUPPLY WELLS
■	NEW YORK AIR GUARD WELL Sampled 5/82
△	QUOGUE WILDLIFE REFUGE WELL OR SURFACE WATER SAMPLE POINT Sampled 3/83
⌖	"S" MONITORING WELL OF SCDH SYSTEM
□	SCDH INVESTIGATION WELL (no sample data since 1977)



NOTES: (1) T.D. of DOT wells reported just below top of water table
(2) Well numbers C, L and K are domestic wells

Dan Raviv Associates, Inc.
Eagle Rock Avenue, West Orange, New Jersey 07052

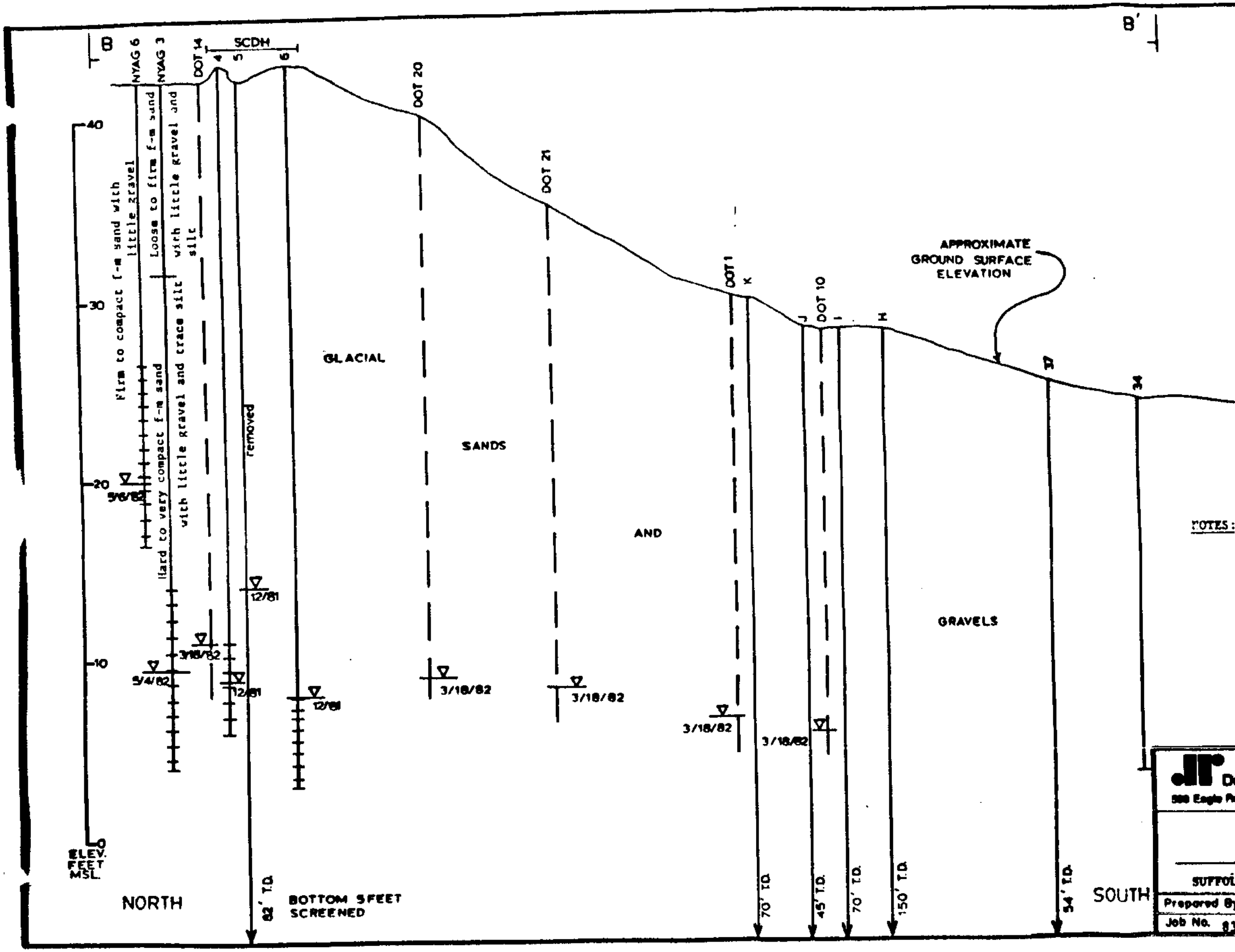
HYDROGEOLOGIC PROFILE

A - A'

SUFFOLK COUNTY AIRPORT - NYSDOL

Prepared By JMH	Date AUG/SEPT 1983
Job No. 83C146	Figure No. 4

138/14



NOTES: (1) T.D. of DOT wells reported just below top of water table

(2) Well numbers 34, 37 H, I, J, and K are domestic wells

HORIZONTAL SCALE
0 500

Dan Raviv Associates, Inc.
300 Eagle Rock Avenue, West Orange, New Jersey 07052

HYDROGEOLOGIC PROFILE
B - B'

SUFFOLK COUNTY AIRPORT - HYSBOL

Prepared By JIH	Date AUG/SEPT 1983
Job No. 83C146	Figure No. 5

14 of 14

Appendix 1.34
1 of 3

Hydrogeology of Suffolk County, NY
Jensen & Soren
1974

F MAP UNITS

QUATERNARY

TERTIARY(?)

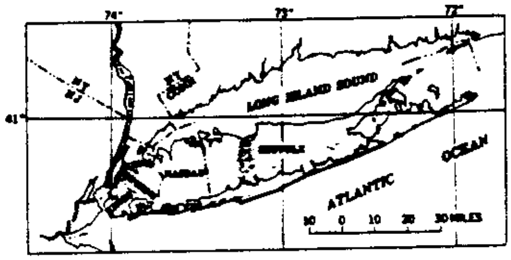
N MAP UNITS

SALT-MARSH DEPOSITS
UNDIFFERENTIATED
RAINE
MORAINE
ND MORAINE
MORAINE
FFERENTIATED
IFFERENTIATED

INTRODUCTION

WATER NEEDS OF SUFFOLK COUNTY

Water pumped from aquifers underlying Suffolk County (index map) is the sole source of water used for public supply, agriculture, and industry. The county's population grew from less than 200,000 in 1940 to 1.1 million in 1970. Most of the growth occurred after 1950. Ground-water pumpage increased from 40 mgd (million gallons per day) in 1950 to 155 mgd in 1970 (New York State Department of Environmental Conservation, written commun., June 1, 1971). The projected ground-water use for an anticipated population of 2 million in the county by 1990 is 300 mgd (New York State Conservation Department, 1970, p. 26–27).



INDEX MAP SHOWING LOCATION (SHADED) OF SUFFOLK COUNTY

PURPOSE AND SCOPE

The large and growing demand for ground water in Suffolk County has created a need for a detailed knowledge of the geometry and the hydrologic characteristics of the ground-water reservoir. Mapping of subsurface geology and hydraulic heads in the aquifers are important prerequisites to obtaining this information. Maps of the subsurface geologic units of Long Island were first shown in a report by Suter and others (1949, pls. VIII to XXI). But those maps were highly generalized, because there were few data on deep borings and wells in the county when the report was prepared. Since 1949, additional data from many deep borings and wells in the county have been collected.

In 1968, as part of a continuing cooperative program of water-resources studies with the Suffolk County Water Authority and Suffolk County Department of Environmental Control, the U.S. Geological Survey began an updating of the hydrogeologic and hydrologic maps of all the county. The basic data in Jensen and Soren (1971), the first product of the program, are the basis for the hydrologic maps in this report.

ACKNOWLEDGMENTS

The authors appreciate the cooperation of well-drilling companies, their employees, and the many officials of public and private water companies who furnished geologic and hydrologic data for use in this report.

GEOLOGIC AND HYDROGEOLOGIC UNITS

Pleistocene glacial drift generally mantles the county's surface. Pleistocene deposits overlie unconsolidated deposits of Late Cretaceous age. The Cretaceous strata lie on a peneplain that was developed on Precambrian(?) crystalline rocks.

Major landforms include ridges, valleys, and plains. These landforms are roughly oriented in belts parallel to the county's length. The northern and the central parts are traversed by irregular sandy and gravelly ridges of terminal moraine. The crest of the northern ridge ranges in height from 100 to 300 feet above sea level and the crest of the central ridge from 150 to 400 feet. The highest altitudes in the inter-ridge area range from 100 to 200 feet. Irregular plains and rolling hills, formed from sandy and gravelly ground moraine and outwash deposits of sand and gravel lie in the area between the ridges. An outwash plain slopes at a near-uniform gradient from the southern base of the central ridge, which is about 100 feet above sea level, southward to Great South Bay and the ocean. Along the north shore, steep bluffs as high as 100 feet and generally narrow sandy and gravelly beaches face Long Island Sound. The barrier-bar system at the southernmost side of the county is composed of sandy beach and dune deposits. The highest altitudes of the barrier bars generally range from 10 to 45 feet.

The ground-water reservoir system of Suffolk County is composed of hydrogeologic units that include lenses and layers of clay, silt, clayey and silty sand, sand, and gravel. A hydrogeologic unit consists of a geologic unit or a group of contiguous geologic units classified by hydraulic characteristics. These units include aquifers, which are principal water sources, and confining layers, which separate the aquifers. The aquifers are, from the land surface downward, the upper glacial aquifer, the Magothy aquifer, and the Lloyd aquifer. The major areal confining layers are, in descending order, the Gardiners Clay, the Monmouth greensand, and the Raritan clay. The base of the ground-water reservoir is the crystalline bedrock. Characteristics of the geologic and the hydrogeologic units are summarized in the table, and the following data of hydrologic significance are shown on the maps: base of ground-water reservoir, altitudes of aquifers, altitudes and limits of confining layers, and distribution of surficial deposits. The hydrogeologic sections show the vertical relations of the units to each other.

The sharp angular shapes of some of the contours reflect the fact that in places the contours are drawn on stratigraphic tops of the hydrogeologic units and in places the contours are drawn on erosional surfaces. The sharp angles result from the juncture of a stratigraphic top and an eroded surface.

GROUND-WATER SYSTEM

RECHARGE AND DISCHARGE OF FRESH GROUND WATER

Precipitation is the sole source of fresh-water recharge in the county. Average annual precipitation is about 45 inches; it generally ranges from 40 inches at the eastern end of the county to 50 inches in the middle and is nearly evenly distributed over the year (Miller and Frederick, 1969, plate 1). About half the precipitation seeps into the ground and percolates downward to the water table to become ground water; nearly half the precipitation is returned to the atmosphere by evaporation and plant transpiration; and a small amount of the precipitation, about 5 percent, enters streams by direct runoff (Cohen and others, 1968, p. 36–40, and Cohen and others, 1970, p. 11 and 14).

Ground water moves to discharge seaward mainly by subsurface outflow to salty ground water that is hydraulically connected with the sea and by seepage into streams that discharge into tidewater.

More than 50 streams discharge fresh water into the bordering bays, Long Island Sound, and the ocean. Most of the surface divide for the streams that drain the county lies in the northern half and extends from Melville, on the west, eastward through the Centereach area to the vicinity of the Brookhaven National Laboratory. From the area of the Brookhaven National Laboratory, the divide bifurcates into branches that approximately traverse the central lengths of the county's north and south forks. Streams flow to tidewater north and south of the divides, except for the Peconic River, which flows eastward to tidewater from the branching of the divides.

The total annual streamflow discharging into tidewater from about 1945 to 1971 averaged 390 cfs (cubic feet per second), or 253 mgd, distributed as follows (D.E. Vaupel, written commun., January 1969, and A.G. Spinello, oral commun., August 1971): most of the discharge, 280 cfs, from the southern part of the county into Great South Bay and, to a lesser extent, into the ocean; 60 cfs into Peconic Bay and other bays, between the north and south forks; and 50 cfs from the northern part of the county into Long Island Sound. Ground-water seepage constitutes about 95 percent of stream outflow.

MAN-MADE CONDITIONS

The effects of man's development on the ground water of Suffolk County has primarily been the diversion of part of it by wells and a return of the used, and generally chemically altered, ground water to the soil and ground-water reservoir. Used ground water is currently returned to the ground-water reservoir principally through cesspools. Some waste water from industrial processes returns to the ground through seepage pits; and ground water pumped for air conditioning and industrial cooling is returned, with higher temperatures, through recharge wells to the ground-water reservoir. Ground water pumped for crop irrigation and lawn sprinkling mostly represents a net loss from the system by evapotranspiration. Artificial filling of marshy shore areas has probably reduced evapotranspiration.

In 1970, gross ground-water pumpage in Suffolk County was 155 mgd (New York State Department of Environmental Conservation, written commun., June 1, 1971). An unknown amount of the pumpage was consumed by evapotranspiration, and virtually all the remainder (probably more than 75 percent) was returned to the ground through local waste-disposal facilities.

MOVEMENT OF GROUND WATER

Ground water moves from three major drainage subareas toward discharge at or near the shore. These subareas are (1) the main land area of the county from the Nassau County boundary to a point near the Brookhaven National Laboratory, (2) the north fork, from the Brookhaven National Laboratory to Orient Point, and (3) the south fork, from the Brookhaven National Laboratory to Montauk Point. The ground-water divides of these subareas form a "Y"-shaped pattern that approximately coincides with the major surface-water drainage divides. The arms of the Y radiate from the general area of the Brookhaven National Laboratory through the centers of the north and the south forks. Ground water moves northward toward Long Island Sound and southward toward Great South Bay and the ocean; lesser amounts in the Brookhaven National Laboratory and Riverhead areas percolate eastward toward Peconic Bay. Ground-water drainage from the north-fork area moves northward to Long Island Sound and southward into Peconic and Gardiners Bays and Block Island Sound; in the southfork

QUALITY OF THE GROUND WATER

The concentrations of chemical constituents in the ground water in most of Suffolk County are generally below the recommended maximum limits of the U.S. Public Health Service (1962, p. 7). However, some local water-quality problems exist, both natural and man-made.

ACIDITY

The pH of ground water ranges from 5.5 to 7.2 but is generally less than 7.0. The water commonly is sufficiently acidic to be corrosive. The Public Health Service has set no standards on acidity of drinking water other than that it should not be excessively corrosive to the supply system (1962, p. 7). Accordingly, water from many public-supply systems is treated with alkaline compounds to reduce acidity before distribution.

DISSOLVED IRON

According to the U.S. Public Health Service (1962, p. 7), dissolved iron concentrations in drinking and culinary water should not exceed 0.3 mg/l (milligram per liter). Excessive iron impairs the taste of water and of food and beverages prepared with the water; it also stains laundry and stains and clogs plumbing fixtures. High iron concentrations, locally more than 1 mg/l, are common in water from the Magothy and the Lloyd aquifers. As a result, many public-water suppliers remove excessive iron.

CHLORIDE

Along the seaward margins of the county, the fresh ground water is underlain and bordered by salty ground water that is hydraulically connected to the ocean, the bays, or Long Island Sound. Zones of mixed water, called zones of diffusion, separate the fresh and the salty ground water. The thickness of these zones probably ranges from a few feet in the upper glacial aquifer to as much as 500 feet in the Magothy aquifer (Lusczynski and Swarzenski, 1966, p. 23). The chloride content of the ground water in the zone of diffusion ranges from less than 10 mg/l to that of sea water—about 18,000 mg/l.

Contamination of the fresh ground water with salty ground water associated with the upward and landward movement of the zones of diffusion has not resulted in the abandonment of many wells in Suffolk County. However, the long-term potential threat of increased contamination of this type is of concern to numerous agencies and individuals in the county. A detailed discussion of this potential problem is beyond the scope of this report, however, considerable insight to the problem can be obtained from reports by Crandell (1962, p. 17–19, and 1963, p. G28–G31), Perlmutter and DeLuca (1963, p. B31–B34), Lusczynski and Swarzenski (1966, p. F66–F69), Holzmacher, McLendon, and Murrell (1970, p. 247–271), Collins and Gelhar (1970, p. 144–150), and Soren (1971b, p. A31–A34).

DETERGENT CONSTITUENTS (MBAS)

More than 95 percent of the ground water used for domestic supply in Suffolk County is returned to the ground through cesspools, septic tanks, and similar structures. As a result, the ground water and the ground-water-fed streams locally contain measurable amounts of certain substances of sewage origin, including foaming agents derived from synthetic detergents, commonly referred to as MBAS or methylene blue active substance. MBAS has been noted mainly in water from the upper glacial aquifer (Perlmutter and Guerrera, 1970, p. B14) and in the streams (Cohen, Vaupel, and McClymonds, 1971). Apparently, little or no MBAS had been found in water in the Magothy and the Lloyd aquifers. Where MBAS has been found in the water, the content is commonly less than 0.5 mg/l, the maximum limit in public-supply water recommended by the U.S. Public Health Service (1962, p. 24). However, locally, as much as 5 mg/l has been found in the ground water; and in some areas the MBAS content of the water seems to be increasing. As a result, the Suffolk County Legislature recently (1971) passed a law banning the sale of certain detergents in the county. In addition, plans have been developed for the construction of widespread sanitary-sewer systems that will discharge treated waste water into the sea.

NITRATE

The amount of nitrate in the ground water of Suffolk County is of concern of water managers and health officials. According to the U.S. Public Health Service (1962, p. 7) more than 45 mg/l nitrate (10 mg/l NO_3-N) in water supplies may be harmful, especially to infants. Perlmutter and Koch

Moriches and Shinnecock Bays and the ocean.

Movement of water in the aquifers of Suffolk County is more rapid horizontally than vertically. This partly reflects the low vertical hydraulic conductivity of the near-horizontal interbedded clay and silt lenses and beds. The estimated average rates of horizontal movement in the upper glacial, the Magothy, and the Lloyd aquifers are 0.5, 0.2, and 0.1 foot per day, respectively, in areas remote from pumping wells, and hundreds of feet per day near the screens of pumping wells (Soren, 1971a, p. 16). Vertical rates of movement are described in the following section.

HYDRAULIC INTERCONNECTION OF AQUIFERS

The aquifers of Long Island are hydraulically interconnected. Layers of clay and silt within an aquifer, or clayey and silty units between aquifers, confine the ground water; but these units do not completely prevent the vertical movement of water through them.

On the average, the vertical hydraulic conductivity of and rates of vertical flow through the upper glacial aquifer are greater than those of all other hydrogeologic units in Suffolk County. The vertical movement of water through the Magothy aquifer is impeded by intercalated lenses and beds of clay and silt; but, locally, vertical movement through the aquifer is facilitated by the lateral discontinuity of clay and silt beds. Vertical movement of water through clay and silt beds of the Magothy aquifer is very slow. The Raritan clay effectively confines water in the underlying Lloyd aquifer because the Raritan clay is thick, is areally persistent, and is of very low hydraulic conductivity. Movement through the bedrock is negligible.

The contact between the upper glacial and the Magothy aquifers is not a smooth plane. Glacial deposits fill buried valleys that were cut in the Magothy aquifer, and these deposits are in lateral contact with truncated beds in the Magothy aquifer. In the buried valleys, water enters the Magothy aquifer at depths of hundreds of feet directly from the upper glacial aquifer. Near Huntington, a buried valley cuts completely through the Magothy aquifer and extends into the Raritan clay; in the Ronkonkoma basin, the Magothy aquifer seems to be nearly completely cut through; and along the north shore, where locally all the pre-Pleistocene deposits were completely eroded, the upper glacial aquifer is in contact with the full thickness of the Magothy aquifer. (See map showing altitude of top of Magothy aquifer and hydrogeologic sections, sheet 1.)

Where the upper glacial aquifer lies directly on sandy beds of the Magothy aquifer, good vertical hydraulic continuity exists between the two aquifers. Head losses between the water table in the upper glacial aquifer and the base of the Magothy aquifer in the area of the main ground-water divide in western Suffolk County (a vertical distance of as much as 900 feet) in 1968 generally were less than 2 feet (Soren, 1971a, p. 17–19). Furthermore, in areas of Long Island where ground-water withdrawals from both the upper glacial and the Magothy aquifers are large, the cones of depression in their water-level surfaces caused by pumping are similar in areal extent and configuration (Soren, 1971b, p. 15; and Kimmel, 1971, p. B227–B228). These observations confirm the high degree of hydraulic continuity between the two aquifers in many parts of the county.

In the south shore area, the Gardiners Clay and the Monmouth greensand effectively confine water in the Magothy aquifer; and the high degree of confinement helps to prevent the downward movement of salty ground water into the Magothy aquifer. Wells that tap the Magothy aquifer on the barrier bars yield fresh water and commonly flow at land surface.

Recharge to the Lloyd aquifer results from downward movement of water from the Magothy aquifer and from the upper glacial aquifer through the Raritan clay. The main recharge area of the Lloyd aquifer seems to be in the Ronkonkoma area. Head losses across a thickness of 150 to 180 feet of Raritan clay in the county generally ranged from 6 to 42 feet in 1968 (Soren, 1971a, p. 17).

GROUND-WATER LEVELS

THE WATER TABLE

The water table on Long Island was first mapped in 1903 (Veatch and others, 1906, pl. 12). At that time its highest point in Suffolk County was 100 feet above sea level, near Melville on the main ground-water divide near the Nassau County border, and was 70 feet above sea level at another high point on the divide in the Lake Ronkonkoma-Selden area. Subsequent maps show that water-table altitudes have continued to be highest in these two areas but had declined to 80 and 65 feet respectively in both 1943 and 1951 (Jacob, 1945, pl. 1; and Lusczynski and Johnson, 1951, pls. 1–2); recovered to 90 and 70 feet by 1958 (Lubke, 1964, pl. 5); and had reached new lows of 70 and 65 feet by 1968 (Soren, 1971a, p. 20). This latest significant decline probably resulted mainly from a regional drought from 1962 to 1966 (Cohen, Franke, and McClymonds, 1969, p. 1).

The water-table map shows the altitude of the water table in early 1971. At that time, in the Melville area it was about 5 feet higher than in 1968, and in the Lake Ronkonkoma-Selden area it was about 5 feet lower. The water table still has not recovered from the apparent effects of the 1962–66

ground level of nitrate in ground water of Nassau and Suffolk Counties was less than 1 mg/l (less than 0.2 mg/l NO_3-N).

Numerous wells in Kings County (G.E. Kimmel, written commun., August 1971), Queens County (Soren, 1971b, p. A30–A31), Nassau County (Perlmutter and Koch, 1972), and Suffolk County (Harr, 1971) yield water containing more than 0.2 mg/l NO_3-N. Moreover, at least 50 wells on Long Island yield water containing more than 10 mg/l NO_3-N.

3 of 3

The amount of water having more than 0.2 mg/l NO_3-N, its rate of increase, and the depth at which it is found seem to increase westward on Long Island as a whole, as well as in Suffolk County. These relations probably largely reflect the westward increase in population density, the westward increase in the age of the communities, and the associated degree of contamination of the ground water related to man's activities.

In Suffolk County, the two major sources of nitrate nitrogen in the ground water are (1) disposal of waste water into the ground and (2) agricultural activities, especially those involving the use of fertilizers. A planned countywide sanitary-sewer system is intended to reduce sewage as a source of nitrate nitrogen in the ground water of Suffolk County.

GROUND-WATER PUMPAGE

Pumpage from Suffolk County's aquifers increased from about 40 mgd in 1950 to about 155 mgd in 1970, to supply a population that has been increasing rapidly since the end of World War II. The greatest increases in population and ground-water pumpage have been in the western part of the county. Before about 1960, wells tapping the upper glacial aquifer supplied nearly all the water used in Suffolk County. Since then, pumpage from the Magothy aquifer has increased, and in 1970, the wells tapping the Magothy aquifer supplied about one-third the water used. (See map showing areal distribution of major pumpage by aquifer 1970.)

CHANGES OF GROUND WATER IN STORAGE

An area of about 140 square miles in west-central Suffolk County is underlain by about 4.5 trillion gallons of fresh water (Soren, 1971a, p. 20). By extrapolation, the total fresh ground water beneath all the county is probably 4 to 5 times this volume.

Withdrawals of ground water have caused the water table in some parts of the county to decline as much as 25 feet from earliest known levels in 1903 (map showing net change in the position of the water table) and have probably caused a small regional but generally undetected landward advance of salty ground water. The decline of the water table reflects a loss of 60 to 80 billion gallons of fresh water from the ground-water reservoir between 1903 and 1971. However, this loss of ground water from storage is less than 1 percent of the total ground water in storage in Suffolk County.

SELECTED REFERENCES

Cohen, Philip, Franke, O.L., and Foxworthy, B.L., 1968, An atlas of Long Island's water resources: New York Water Resources Comm.[1] Bull. 62, 117 p.

——— 1970, Water for the future of Long Island, New York: New York State Dept. Environmental Conserv. Water Resources Bull. 62A, 36 p.

Cohen, Philip, Franke, O.L., and McClymonds, N.E., 1969, Hydrologic effects of the 1962–66 drought on Long Island, New York: U.S. Geol. Survey Water-Supply Paper 1879-F, 18 p.

Cohen, Philip, Vaupel, D.E., and McClymonds, N.E., 1971, Detergents in the streamflow of Suffolk County, Long Island, New York, *in* Geological Survey Research, 1971: U.S. Geol. Survey Prof. Paper 750-C, p. C210–C214.

Collins, M.A., Gelhar, L.W., 1970, Ground-water hydrology of the Long Island aquifer system: Mass. Inst. Technology, Hydrodynamics Lab. Rept. no. 122, 185 p.

Crandell, H.C., Jr., 1962, Geology and ground-water [illegible] of Plum Island, Suffolk County, New York: U.S. [illegible] Survey Water-Supply Paper 1539-X, 35 p., 4 pls.

——— 1963, Geology and ground-water [illegible] Town of Southold, Suffolk County, New [illegible] Geol. Survey Water-Supply Paper 1619-GG, [illegible]

de Laguna, Wallace, 1948, Geologic [illegible] wells in Kings County, New York: New York State [illegible] Power and Control Comm.[1] Bull. GW-17, 35 p., 3 pls. [illegible]

——— 1963, Geology of Brookhaven National Laboratory and vicinity, Suffolk County, New York: U.S. Geol. Survey Bull. 1156-A, 35 p., 2 pls.

Fuller, M.L., 1914, The geology of Long [illegible]: U.S. Geol. Survey Prof. Paper 82, 231 p.

Harr, C.A., 1971, Partial chemical analyses of water from selected sources in Nassau and Suffolk Counties, Long Island, New York: U.S. Geol. Survey open-file rept., 21 p.

Holzmacher, McLendon, and Murrell, Consulting Engineers, 1970, Comprehensive public water supply study, Suffolk County, New York: CPWS-24, v. II, 373 p.

Isbister, John, 1966, Geology and hydrology of northeastern Nassau County, Long Island, New York: U.S. Geol. Survey Water-Supply Paper 1825, 89 p., 5 pls.

Jacob, C.E., 1945, The water table in the western and central

Appendix 1.3-5
1067

Hydrology of Brookhaven National Laboratory and Vicinity Suffolk County, New York

By M. A. WARREN, WALLACE DE LAGUNA and N. J. LUSCZYNSKI

STUDIES OF SITES FOR NUCLEAR ENERGY FACILITIES—
BROOKHAVEN NATIONAL LABORATORY

GEOLOGICAL SURVEY BULLETIN 1156-C

This report concerns work done on behalf of the U.S. Atomic Energy Commission

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1968

STUDIES OF SITES FOR NUCLEAR ENERGY FACILITIES—BROOKHAVEN NATIONAL LABORATORY

HYDROLOGY OF BROOKHAVEN NATIONAL LABORATORY AND VICINITY, SUFFOLK COUNTY, NEW YORK

By M. A. Warren, Wallace de Laguna, and N. J. Lusczynski

ABSTRACT

The Brookhaven Natonal Laboratory is in central Suffolk County, Long Island, New York. The area studied surrounds and includes the Laboratory and is referred to herein as the Upton area. It extends across the island in a band about 18 miles wide from the Atlantic Ocean to Long Island Sound between longitudes 72°45′ and 73°00′. Its climate is characterized by mild winters and relatively cool summers. Precipitation averages about 45 inches a year evenly distributed throughout the year. The soil and the immediately underlying sediments are generally sandy and highly permeable. Water penetrates them readily and except in periods of intense precipitation there is very little direct overland runoff to streams.

Permeable Pleistocene deposits, 100–200 feet thick, constitute the uppermost aquifer. It receives recharge from precipitation (the only source of fresh water on the island) and discharges mainly into streams, the ocean, and the sound and to a some lesser extent into lower aquifers. The lower aquifers, several hundred feet in total thickness, transmit water under artesian pressure from the high central part of the island toward its edges where it is discharged into streams or into bodies of salt water. Streamflow is supported throughout the year very largely by ground-water discharge.

Within this broad pattern the details of the movement and behavior of water are determined by the geology, the topography, and the seasonal and local distribution of precipitation. Tests at the Laboratory site indicated that under favorable conditions water may move from the land surface to the water table at a rate of about 30 feet per day. Under less favorable conditions it may move 1 foot a day or less.

The topography of the water table conforms only generally to that of the land surface. Ground-water divides between the small streams in the area differ significantly from topographic divides and explain apparent differences in the rates of discharge per square mile. At the Laboratory site most of the ground-water movement is southward toward the Atlantic Ocean, but part of it is eastward to Peconic Bay. Ground-water movement in a part of the Laboratory area is either to the south or to the east, depending upon the stage of the water table, and is controlled by the presence of relatively impermeable beds near the surface.

287

5 to 10 feet above mean high tide. Long Island was also visited by two hurricanes in 1954. Unconfined ground water in low-lying areas near the shore is salted by sea water blown inland during hurricanes.

The maximum depth of freezing in the soil zone is 15 inches; the average is much less. Because the soil is not frozen during most of the winter season, recharge to the water table is possible during the winter, and because evapotranspiration is low, most of the ground-water recharge does, in fact, take place during the colder months, from December to May.

PRECIPITATION

Precipitation, the only source of fresh water for the streams and ground water in the Upton area, is used here as the starting point of the hydrologic cycle. The average precipitation ranges from about 42 inches in the western part to about 46 inches in the eastern part of Long Island. In an average year, about 120 days have 0.01 inch or more of precipitation. Long Island is supplied with moisture from the Gulf of Mexico and from the Atlantic Ocean through the action of winds of cyclonic storms. The general current of the prevailing westerlies plays only a small part in producing precipitation in Long Island. Natural variations in precipitation are largely due to physiographic and storm-pattern factors.

The Upton area of Long Island has little relief and thus monthly, and especially yearly, precipitation does not differ much from one locality to another within the area. Such differences as do occur are due largely to local summer storms or to differences in the local details of the rain gage or its exposure. But, though geographic variations are not large, a careful study of cumulative records shows some variation in rainfall within the Upton area.

RECORDS AVAILABLE

Precipitation records for eight stations within a 13-mile radius of the center of the Brookhaven National Laboratory are used in this report. Three of these stations are on the Laboratory grounds; no two stations are more than 20 miles apart (fig. 1). The length of record at the end of 1953 ranges from 5 complete years (at two gages within the Laboratory area) to nearly 69 complete years at Setauket (tables 1 and 2). The earliest records are for 1864–82 at the village of Brookhaven. The record at Setauket began in 1885.

The rainfall records and the values for average, minimum, and maximum precipitation proved satisfactory for correlating precipitation with surface-water stages and flows and with ground-water levels. Precipitation data for periods of less than a month are discussed briefly, because they have some bearing on the problems of ground-water contamination (de Laguna, 1966).

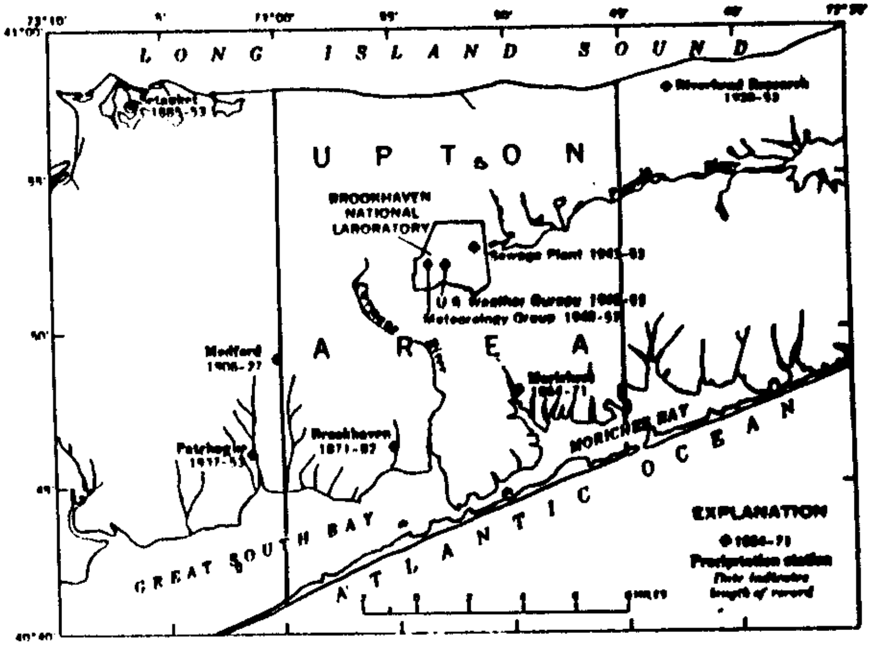


FIGURE 1.—Location of study area and precipitation stations.

The precipitation data for the 1864–71 period, listed for the village of Brookhaven, were actually collected at Moriches about 5 miles to the east. From 1871 to 1882 the data were collected at the village of Brookhaven, about 7 miles south of the present Laboratory area. This record, started under the sponsorship of the Smithsonian Institute (tables 1 and 2) before the establishment of the U.S. Weather Bureau, show that the average annual precipitation from 1864 to 1882 was 46.20 inches. This precipitation record includes the maximum and minimum yearly rainfalls for the Upton area, a high of 71.38 inches in 1869 (a year of a hurricane) and a low of 27.65 inches in 1881. The 2-year average for 1868–69 was 65.51 inches; the 3-year average for 1867–69 was 62.05 inches; and the 5-year average from 1865–69 was 59.61. These are all records and are considerably in excess of any recent data.

These data, especially those for 1865–69, are accepted with some reservation because they are much greater than those recorded at other stations along the northeastern seaboard. For example, precipitation in the city of New York, about 57 miles to the west, averaged 48.45 inches during this period, or about 11.16 inches less than that at Brookhaven. The present-day average at New York City is only 2–4 inches less than that for the Brookhaven area. Furthermore, the average precipitation reported for 1865–69 at Brookhaven was 0.35 inch higher

The average annual infiltration plus overland runoff for the 12 years was 22.59 inches. This value may also be computed from the average mean monthly temperatures and average precipitation for each of the calendar months, from which one may calculate average monthly evapotranspiration. From these 12 monthly averages, an average yearly rate of infiltration plus overland runoff of 22.06 inches may be calculated; it is 0.53 inch less than the average annual value found by computing by individual months (table 5), a difference of less than 5 percent.

SUMMARY OF COMPUTED RECHARGE

During the 12 water years from October 1941 to September 1953, the precipitation averaged 43.64 inches, evapotranspiration averaged 21-22 inches, and the residual (mostly recharge to ground water) averaged about 22 inches. During this period, the residual varied appreciably from month to month and from year to year. It was over 7 inches on 3 different months and was zero for about 2-3 months in an average year. The annual rate of infiltration (plus overland runoff) was as much as 31.99 inches in 1951-52, 20.33 inches in 1947-48, 26.93 inches in 1952-53, and as little as 11.70 inches in 1946-47.

Over a 50- to 100-year period, precipitation in the Upton area varies from a minimum of perhaps less than 30 inches per year to a maximum of perhaps more than 60 inches per year. The average annual evapotranspiration, over a similar period, will range from a minimum of 15 inches per year where the soil is very sandy to a maximum of 30 inches per year, and perhaps more, in swampy areas. Replenishment to ground water in the Upton area may, therefore, be as low as 10 inches in some areas in dry years and as much as 35 inches in other areas in wet years. Locally, recharge to ground water may even vary from practically nothing in some swampy localities, when precipitation is extremely low, to as much as 45 inches in sandy localities, when precipitation is extremely high.

GROUND WATER IN UPPER PLEISTOCENE DEPOSITS

OCCURRENCE

The 200 feet of upper Pleistocene deposits in the Upton area consists of sand and gravel, some silt and clay layers, and also some till in the two morainal areas. Water first enters through the soil zone. The zone of aeration, about 50-60 feet in average depth, serves both as a sizable underground reservoir and also as the conduit for water moving downward to the zone of saturation. Locally within the zone of aeration are bodies of perched and semiperched water, held up by layers of relatively impermeable material, one each in the northern, northwestern, and eastern sections of the Laboratory tract, and one east of the Laboratory tract beyond the peconic River. A few small areas of this kind occur in the extreme west-central section of the Upton area. The major areas underlain by relatively impermeable layers above the zone of saturation are shown on plates 1-4.

The zone of saturation in the upper Pleistocene deposits averages about 140-150 feet in thickness. This zone serves both as an immense storage reservoir and also as the principal conduit for water moving from points of recharge to points of discharge.

THE WATER TABLE

MAPS OF THE WATER TABLE

The water table in the Upton area is defined by the position of the static water level in wells ending in the zone of saturation in the upper Pleistocene and Recent deposits. Plates 1 and 2 show the position of the water table on August 29-31, 1951, and July 28-30, 1952. The water-level contours are based on readings in about 120 wells, 50 of them inside the Laboratory area, and also on the altitudes of the water surface in streams, ditches, ponds, and lakes at about 35 additional points. Only a few of the wells are plotted on plates 1 and 2. Plates 3 and 4 show the position of the water table on October 1-3, 1952, and April 25, 1953, and also the locations of all the observation wells within the Laboratory area.

NETWORK OF OBSERVATION WELLS

A table giving complete information on the location, owner, use, depth, method of construction, size of casing, screen setting, altitude of measuring point, and height above land surface for all wells used in this study is on file with the U.S. Geological Survey and State and Laboratory authorities. The well numbers, assigned by the New York State Water Power and Control Commission in chronological order, have no particular geographical significance. The letter S preceding the number signifies Suffolk County. The code numbers of the points used in determining surface-water stages were assigned by the Survey staff at Brookhaven National Laboratory. Letters C and P preceding the number are for measuring points on or near the Carmans and Peconic Rivers, respectively. Some points on the larger lakes or ponds are identified only by their names. The tables on file also give information on the location of all measuring points other than wells, and also their descriptions, altitudes, and the altitude of the accompanying bench marks.

Third-order accuracy (or better) was maintained in the leveling used to determine the altitudes of the measuring points at wells, of the surface-water observation stations, and of bench marks; that is,

487

the error of closure of the level circuit, in feet, did not exceed the length of circuit, in miles, divided by 0.5. For short runs the allowable error of closure, in feet, did not exceed the number of setups divided by 0.008. All levels are referred to the 1929 mean sea-level datum of the U.S. Coast and Geodetic Survey. Observed water levels are accurate within at least 0.1 foot.

RELATION OF WATER TABLE TO SHALLOW, PARTLY CONFINING LAYERS

In some areas (see pls. 1–4) of low permeability, beds of silt or clay occur in the zone of aeration. In these areas, where shallow water is perched or semiperched, the water table is defined by water levels in wells screened below this material. The maximum depth of this retarding zone below land surface is about 30 feet; only at well S9123 east of the Laboratory was the bottom of the less permeable material found to be deeper, at about 50 feet below land surface. The water surface, mapped in plates 1–4 will be referred to as the water table, even though the water is confined to some degree part of the time in localities where less permeable material occurs at shallow depths.

In the Peconic River valley east of the Laboratory, from about Manorville to Riverland, an intersubstage (de Laguna, 1963, p. 32) occurs at about middepth in the glacial sands. In this locality the water-table map is based on levels in wells ending above this clay.

SIGNIFICANT FEATURES OF THE WATER TABLE

The shape of the water table reflects the location of areas of recharge, areas of discharge, and of the ground-water divides. (See pls. 1–4; fig. 34A.) The water table in the Upton area suggests the cross section of a bullet, flattened at the tip and pointing eastward; the south side is somewhat irregular. The depressions and troughs in the contour pattern are ground-water discharge areas.

In the Upton area, the main ground-water divides lies about 3–5 miles south of Long Island Sound and roughly parallel to it. East of the eastern boundary of the Laboratory tract a second ground-water divide appears, which defines the southern boundary of the area contributing ground water to the Peconic. The north branch of the divide extends beyond the Upton area into the North Fork of Suffolk County, and the south branch extends into the South Fork. There are not enough water-level data to define the south branch accurately.

North of the divide, ground water moves northward to Long Island Sound. South of the divide, the ground water moves southward to Great South Bay and Moriches Bay, either directly or by way of streams. In general, the ground water from the area between the two branches of the divide moves out eastward to the Peconic River and

Peconic Bay. Details of the movement vary with the stage and slope of the water table.

The highest part of the water table in the Upton area is the west-central section where it is about 55 feet above sea level; the lowest is along the shoreline, where it stands at about mean sea level. A few miles west of the Upton area (fig. 34A), the water table is about 60 feet above sea level (Lusczynski and Johnson, 1951). The slope of the water table ranges from more than 10 feet per mile to less than 2 feet per mile; in the Laboratory tract, the slope averages about 5 feet per mile.

DEPTH TO WATER TABLE

The depth to the water table in the Upton area ranges from less than 0.1 foot along the shorelines to more than 200 feet under the higher hills on the north shore and averages about 50–60 feet. North of the ground-water divide, and along the south branch of the divide, the average depth to the water table is about 80 feet; between the divides and to the south it is about 40 feet. Figure 8 gives five north-south profiles (pls. 1, 2) showing the water-table altitudes as of July 28–30, 1952, when the water table was slightly below the average stage for 1941–53. As the sections show, from the north shore the land surface rises abruptly about 150 feet or more to a line of hills, part of the Harbor Hill moraine. Here the depths to water are from 75 to 150 feet and locally even 200 feet. Just south of the Laboratory area, the water table is also relatively deep beneath another line of east-west hills known as the Ronkonkoma moraine. Profiles showing the approximate altitudes of the land surface and the water table are shown in figure 8. In the low land between the two moraines the water table is at somewhat shallower depths, and because this wide valley slopes gently eastward, in the eastern part of the Laboratory area and in the Manorville area the water table is even shallower, within 5–10 feet of the land surface. The Peconic River originates in this valley and flows eastward between the two moraines. The headwaters of the Carmans River also lie in this intermoraine belt. South of the Ronkonkoma moraine, the land slopes gently toward the south, and the depth to water decreases southward, so that the land surface and the water table converge.

Figure 9 shows the depth from the land surface to the water table in the Laboratory tract. The depths vary from less than 10 feet along streams in the eastern and northern parts of the Laboratory, to more than 80 feet in a belt extending from the center of the Laboratory tract, near the reactor, to the hospital in the southwest corner. The average depth to the water table is about 45 feet. Land-surface altitudes for this depth-to-water map were taken from the 10-foot con-

587

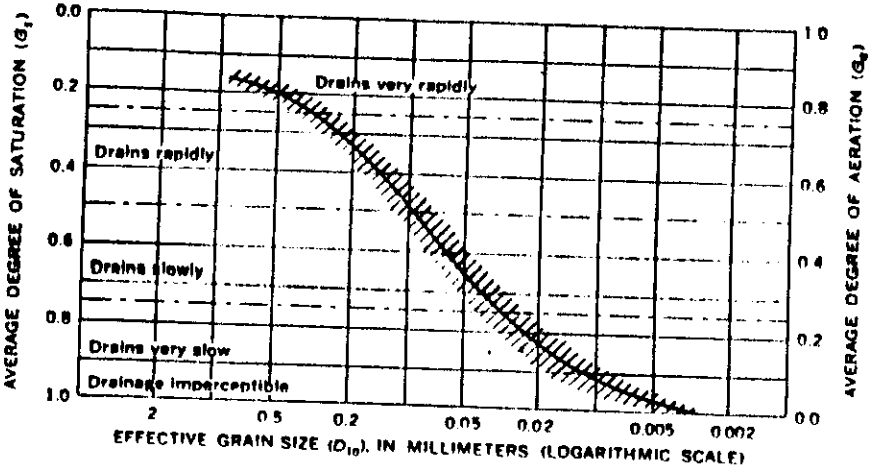


FIGURE 15.—Relation of effective grain size to average degree of liquid saturation in pores of unconsolidated formations (from field observations after Terzaghi, 1940). Diagonal lines represent probable range of seasonal variations.

to that of a sand composed entirely of grains of the effective size. The uniformity coefficient, also defined by Hazen, is the ratio of D_{60}/D_{10}, or the ratio of that grain size chosen so that 60 percent of the sample by weight is of a smaller grain size, to the effective size.

The effective size of nine samples from the upper 135 feet of well S6456 (table 6) near the center of the Laboratory area averaged 0.134 mm; the uniformity coefficient was 4.7. Samples from three wells, S6456, S6458, and S4660, selected by visual inspection as typical glacial outwash sand, were somewhat coarser grained, having effective sizes of 0.25, 0.17, and 0.30 mm and uniformity coefficients of 2.0, 2.4, and 1.8. Figure 15 shows that for a sand having an effective size of 0.20 mm, the percentage of liquid saturation ranges seasonally from 0.28 to 0.38.

TABLE 6.—*Effective size and uniformity coefficient of samples of sand, silt, and clay from well S6456*

Depth, in feet below land surface	Type of sample	Effective size, millimeter	Uniformity coefficient 60 percent size to 10 percent size
0–10	Auger	0.23	2.3
10–20	Core	.35	15.4
20–30	Bailer	.16	2.5
30–40	Bailer	.18	2.9
40–50	Bailer	.088	4.3
83	Bailer	.090	4.9
104	Bailer	.15	3.0
118	Bailer	.085	5.3
134	Bailer	.19	2.0
159	Bailer	.14	2.3
168	Bailer	.20	2.0
177	Bailer	.092	2.0
215	Core	.13	3.2

Such values appear reasonable for the glacial outwash sand in the Upton area. Both the porosity and the degree of liquid saturation of the glacial sand in the Upton area vary between wide limits under natural hydrologic conditions. Locally, under certain artificial conditions, the percent saturation has approached 100.

Veatch (Veatch and others, 1906) made many laboratory determinations of the porosity of the upper Pleistocene of Long Island, and the approximate average of these, 0.33, is used here. Specific yield and specific retention were determined from field tests; no attempt was made to determine these values in the laboratory from samples. The specific yield of the outwash sand in the Laboratory area was determined, from a 7-day pumping test, to be 0.24. The specific yield, found by filling and draining the pore space in a lysimeter built by de Laguna in 1953, was 0.26. This lysimeter, installed in the southeastern part of the Laboratory area where the average depth to the water table is 13 feet from land surface, is a vertical metal cylinder 13 feet deep and 5 feet in diameter and open at the top. It was set about 7 feet below land surface so that the bottom was 6 feet in the zone of saturation. In excavating and backfilling, care was taken to keep the material in approximately its original sequence and to compact it as nearly as possible to its original degree of compaction. However, the value of 0.24 from the pumping test is preferred because a much larger volume of sediments was involved.

A porosity of 0.33 and a specific yield of 0.24 gives a specific retention of 0.33 − 0.24, or 0.09. On the assumption that 0.28, the low value in the range of liquid saturation in figure 15, is approximately the fraction of the void space filled by specific retention, then specific retention is computed to be 0.28 × 0.33, or 0.092, which is in good agreement.

The flow-line pattern (fig. 19) in the vicinity of the well pumped during an aquifer test in December 1950 in the Laboratory area suggests that the vertical permeability of the outwash sand in the zone of saturation is about a fourth that of the horizontal permeability, or about 350 gpd per square foot. Results of an infiltration test, discussed in the following section, indicate that the vertical permeability may be as low as 75 gpd per square foot, or about one-eighteenth of the horizontal permeability.

RATE OF MOVEMENT IN THE LABORATORY AREA

High rates

If the sand is saturated with water, if the vertical permeability is 350 gpd per square foot, and if the porosity is one-third, then water will move downward in the zone of aeration at a rate of 140 feet a day.

6 of 7

DIRECTION AND RATE OF MOVEMENT OF GROUND WATER UNDER NATURAL CONDITIONS

Plates 1 and 2 show water-table contours for August 29–31, 1951, when the water table was about a half a foot below average, and for July 28–30, 1952, when the water table was 12 feet above average. The direction of ground-water flow may be taken as normal to these contours because the formation is almost isotropic. The rate of flow may be approximately determined by either of two independent methods, one of which is based on consideration of the quantities of water involved, and the other on the relation between transmissibility and the ground-water gradient.

The transmissibility of the upper Pleistocene aquifer is very close to 200,000 gpd at unit gradient. The water-table gradient is about 5 feet to the mile, so that in the Laboratory area each 1-foot width of the aquifer is carrying about 200 gpd, or 26.7 cubic feet per day, which represents a ground-water velocity of about 0.535 foot per day, or about one-third the velocity derived from consideration of the volume of recharge. Thus, in the belt between the Laboratory and the water-table divide, a large proportion of the ground-water recharge, perhaps two-thirds of the total, apparently moves into the deeper Cretaceous aquifers, and only the smaller part moves laterally through the upper Pleistocene aquifer.

A more detailed study of the direction and rate of movement of the ground water in the upper Pleistocene may be based on the map shown in figure 29. The solid flow lines in this figure are based on the water-table map for August 29–31, 1951, and the dashed flow lines on the map for July 28–30, 1952. In general, these lines follow much the same pattern, but, the slight changes in the contours of lines *C–D* and *C′–D′* produced a marked difference in the ultimate destination of the water.

The average annual recharge to the water table is about 22 inches. A strip of land 1 foot wide extending from the water-table divide for a distance of 1 mile in the direction of ground-water flow would contribute annually a volume of about 9,700 cubic feet. The water would flow from the lower end of the strip through the saturated part of the aquifer, about 150 feet thick, which has a porosity of about 0.33. The rate of movement is the same as if 9,700 cubic feet of water a year flowed through an opening 50 feet high and 1 foot wide, or about 195 feet per year or 0.535 foot per day. According to this method of analysis, the rate of movement at any point is directly proportional to the flow-line distance from the water-table divide; thus, under the center of the Laboratory tract, 2.5 miles from the divide, the rate of movement of the ground water would be about 1.6 feet per day.

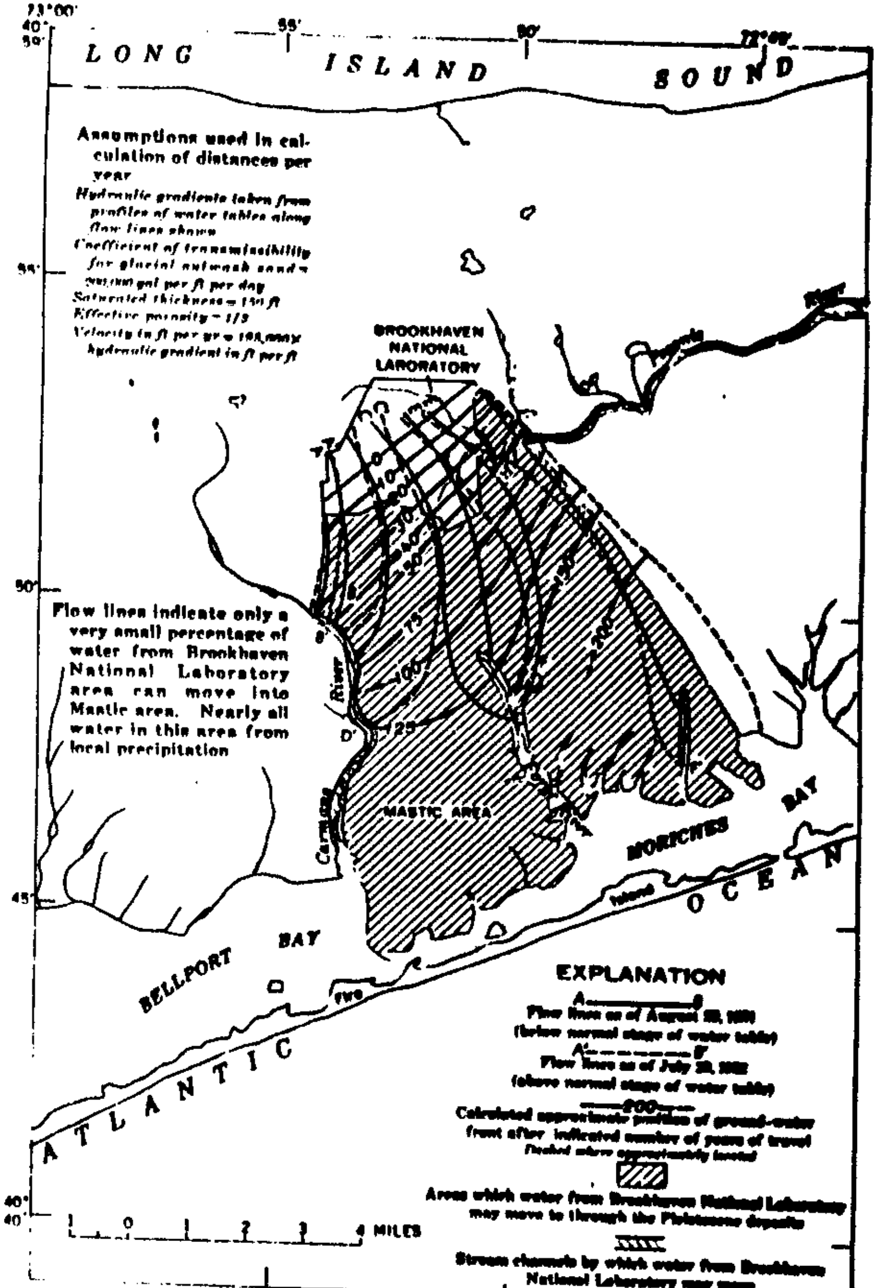


FIGURE 29.—Direction and time of travel of ground water laterally in upper Pleistocene deposits from the Brookhaven National Laboratory area to points of discharge.

7 of 7

WORKSHEET: COMMUNITY WATER SUPPLIES WITHIN A 3-mi RADIUS OF THE SITE RCA-Riverhead

Appendix 1.3-6
1 of 2

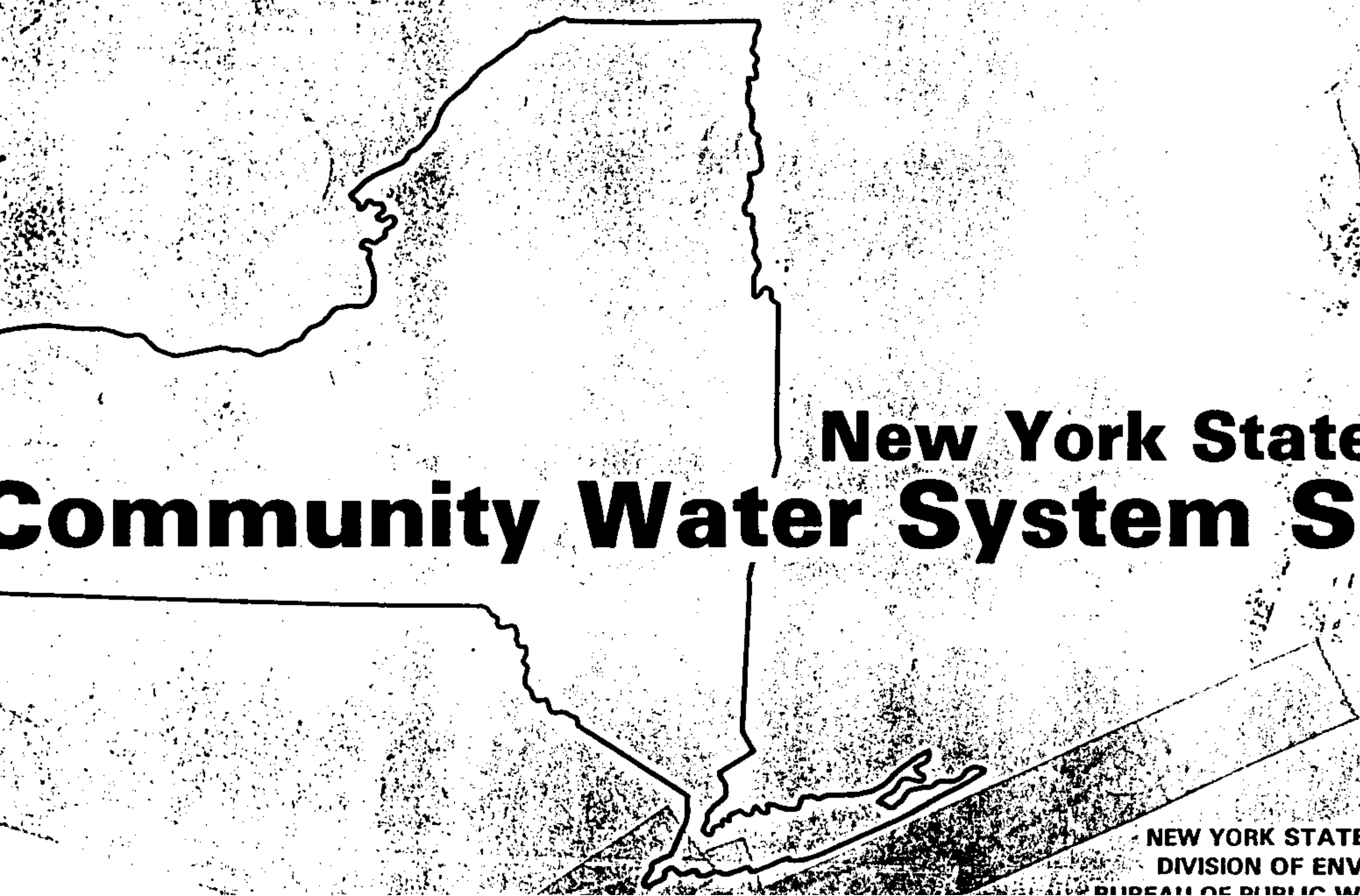
Community Water Supply	Water District	Well Field	Well	Depth (ft)	Aquifer
Riverhead		Osborne Ave	4-1S-30271	721	
			4-2S-34732	3-10	
		Middle Rd.	5S-66685		
		Pon_L+ St.	1S-1322	105	
			2S-7261	140	
			3S-15117	125	
SCWA	WB	Moriches Riverhead Rd	1S-53522	[illegible]	[illegible]
			2S-53851	[illegible]	[illegible]

Sources:

SCDHS Water Resources Division. Supply and Monitoring Well Location Maps.
SCWA. 1984. Well Descriptions.
~~SCWA. 1985. Distribution System Plates.~~
~~SCWA. 1986. Active Services Estimates and Service Area Map.~~
Holzmacher, McLendon, and Murrell, P.C. 1985. Riverhead Water District Plan of Distribution System.

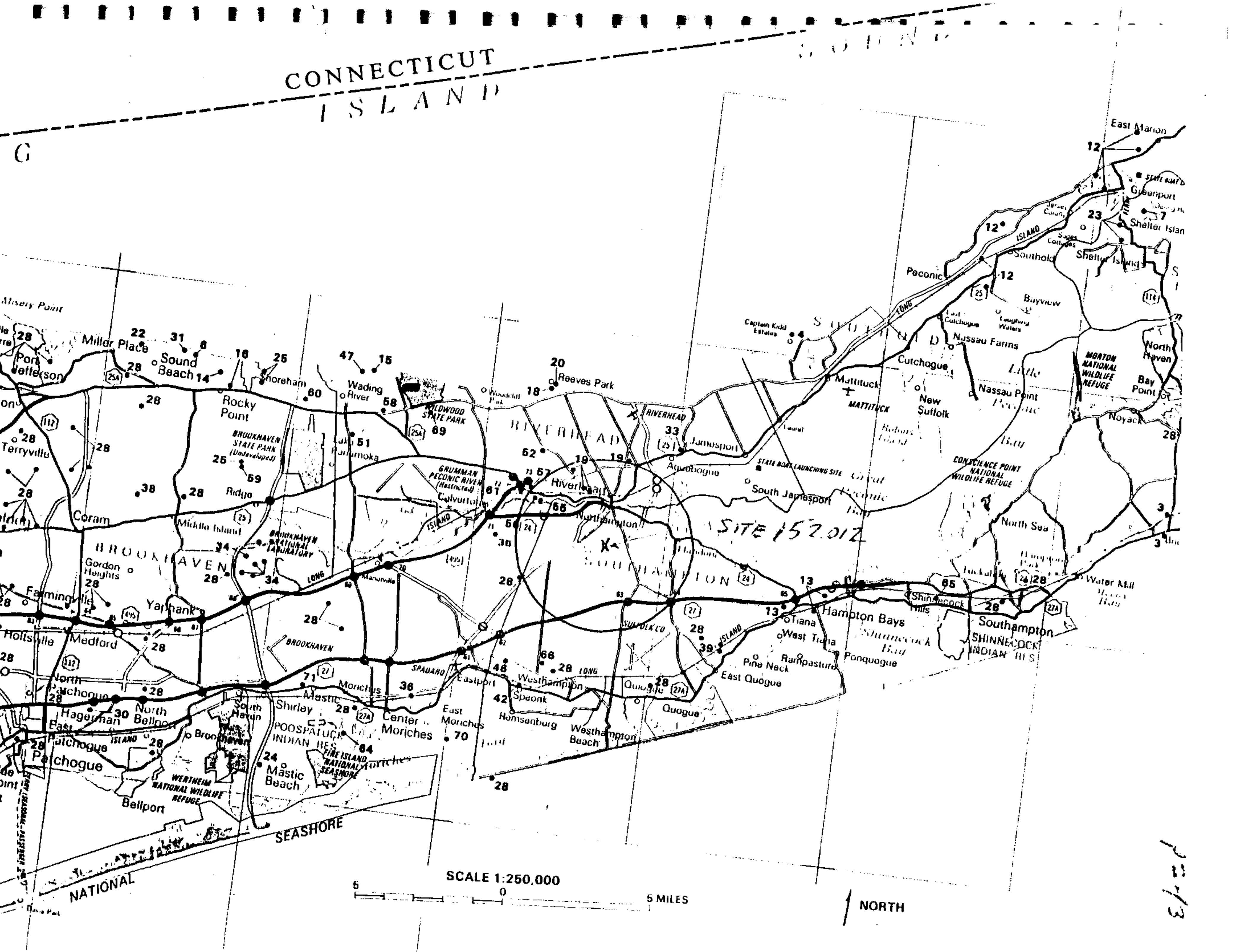
N
P.2 of 2
Riverhead W.D.
R.W.D Middle Rd
R.W.D Osborne Ave
R.H.W.D Pulaski St
Private Well
Scale 1" = 1 mile
RCA - Riverhead
152012

Appendix 1-5-1



New York State Atlas of Community Water System Sources 1982

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


CONNECTICUT
ISLAND
SITE 152.012
RIVERHEAD
SOUTHAMPTON
BROOKHAVEN
SOUTHOLD
East Marion
Greenport
Shelter Island
Southold
Peconic
Bayview
Nassau Farms
Cutchogue
New Suffolk
Nassau Point
Mattituck
MATTITUCK
Captain Kidd Estates
Jamesport
Aquebogue
South Jamesport
STATE BOAT LAUNCHING SITE
CONSCIENCE POINT NATIONAL WILDLIFE REFUGE
MORTON NATIONAL WILDLIFE REFUGE
North Haven
Bay Point
Noyack
North Sea
Water Mill
Southampton
SHINNECOCK INDIAN RES
Shinnecock Hills
Hampton Bays
Tiana
West Tiana
Rampasture
Ponquogue
Pine Neck
East Quogue
Quogue
Westhampton Beach
Westhampton
Speonk
Remsenburg
Eastport
East Moriches
Center Moriches
Moriches
Mastic
Shirley
Mastic Beach
POOSPATUCK INDIAN RES
FIRE ISLAND NATIONAL SEASHORE
Reeves Park
Riverhead
Northampton
GRUMMAN PECONIC RIVER (Restricted)
Calverton
WILDWOOD STATE PARK
Wading River
Shoreham
Rocky Point
BROOKHAVEN STATE PARK (Undeveloped)
Ridge
Manorville
BROOKHAVEN NATIONAL LABORATORY
Middle Island
Sound Beach
Miller Place
Port Jefferson
Terryville
Coram
Gordon Heights
Yaphank
Farmingville
Medford
Holtsville
North Patchogue
Hagerman
North Bellport
East Patchogue
Patchogue
Brookhaven
South Haven
Bellport
WERTHEIM NATIONAL WILDLIFE REFUGE
SEASHORE
NATIONAL
SCALE 1:250,000
5
0
5 MILES
NORTH

SUFFOLK COUNTY

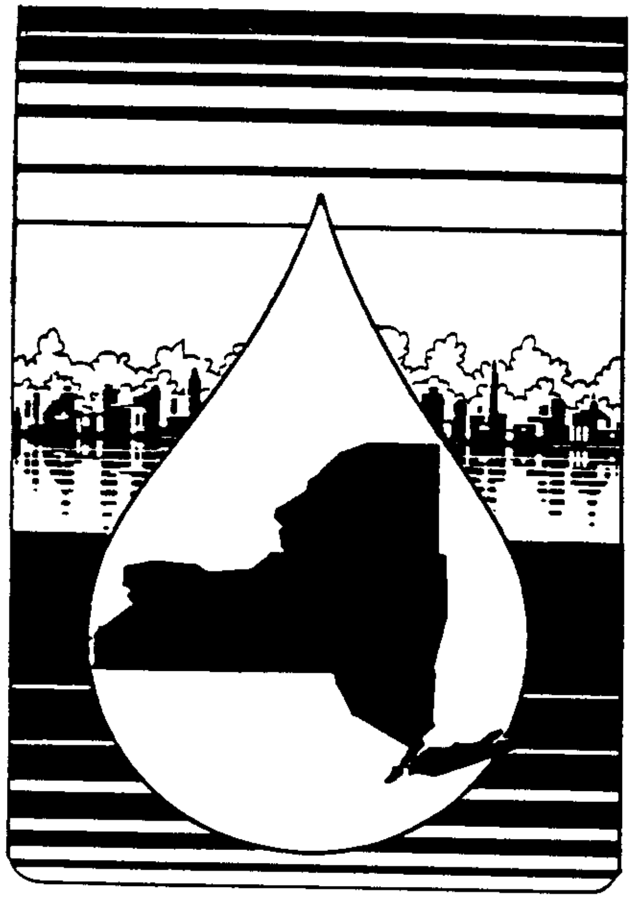
p3/3

ID NO	COMMUNITY WATER SYSTEM	POPULATION	SOURCE
	Municipal Community		
1	Bevon Water Corporation	1150	Wells
2	Brentwood Water District	25812	Wells
3	Bridgehampton Water Company	1916	Wells
4	Captain Kidd Water Company	580	Wells
5	Crab Meadow Beach	50	Wells
6	Culross Corporation (Culross Beach)	104	Wells
7	Dering Harbor Village	130	Wells
8	Dix Hills Water District	30000	Wells
9	East Farmingdale Water District	7850	Wells
10	Fishers Island Water Works Corporation	250	Barlow, Middle Farms and Treasure Ponds, Wells
11	Greenlawn Water District	40000	Wells
12	Greenport Village	6851	Wells
13	Hampton Bays Water District	9500	Wells
14	Hawthorne - Maple Civic Association	50	Wells
15	Herod Point Association	80	Wells
16	North Shores Water Company	5000	Wells
17	Ocean Beach Village	155	Wells
18	Reeves Beach Water Company	650	Wells
19	Riverhead Water District	9300	Wells
20	Roanoke Water Corporation	201	Wells
21	Saltaire Village	35	Wells
22	Scott's Beach Water Company	342	Wells
23	Shelter Island Heights Association	498	Wells
24	Shirley Water Works	3400	Wells
25	Shorewood Water Corporation	10000	Wells
26	Soundview Association	236	Wells
27	South Huntington Water District	51260	Wells
28	Suffolk County Water Authority	900000	Wells
29	Sunhill Water Corporation	3959	Wells
30	Swan Lake Water Corporation	1485	Wells
31	Terrace-on-the-Sound	400	Wells
32	Woodbury Triangle Corporation	800	Wells
	Non-Municipal Community		
33	Aquebogue Mobile Home Court	120	Wells
34	Brookhaven National Labs	3373	Wells
35	Calverton Hills Owners Association	897	Wells
36	Cedar Lodge Nursing Home	100	Wells
37	Central Islip Psychiatric Center	4525	Wells
38	Crest Hall Health Related Facility	120	Wells
39	East Quogue Mobile Estates	160	Wells
40	Good Samaritan Hospital	NA	Wells
41	Greis Mobile Park	70	Wells
42	Hampton Gateway Apartments	304	Wells
43	Kings Park Psychiatric Center	3100	Wells
44	Knox School	NA	Wells
45	Lake Hurst Lodge Adult Home	57	Wells
46	Leier's Mobile Park	350	Wells
47	Little Flower Children's Services	150	Wells
48	Montauk Air Force Station	10	Wells
49	Napeague Trailer Park	78	Wells
50	Northport VA Hospital	3000	Wells
51	Oak Park Trailer Park	50	Wells
52	Oakland Ridge Mobile Park	74	Wells
53	Park Lake Rest Home	46	Wells
54	Peacock Alley	35	Wells
55	Peconic River Trailer Park	90	Wells
56	Peconic View Adult Mobile Home Park	70	Wells
57	Pinecrest Garden Apartments	392	Wells
58	Ramblewood Mobile Homes	210	Wells
59	Ridge Rest Home	58	Wells
60	Rocky Point Family Housing	55	Wells
61	Rollin Mobile Homes	220	Wells
62	St Joseph Convent - Long Island University	1177	Wells
63	Sam A Lewison Start Center	40	Wells
64	South Bay Adult Home	40	Wells
65	Southampton College	1000	Wells
66	Speonk Mobile Home Park	50	Wells
67	Suffolk Developmental Center	3500	Wells
68	Three Mile Harbor Trailer Park	40	Wells
69	Thurm's Mobile Estates	450	Wells
70	USCG Station - Moriches	23	Wells
71	Wes Dubicki Apartments	NA	Wells

Appendix 1.5-2
p 1 of 5

NEW YORK STATE DEPARTMENT OF HEALTH

BUREAU OF PUBLIC WATER SUPPLY PROTECTION



INVENTORY —

COMMUNITY WATER SYSTEMS

NEW YORK STATE
VOLUME I - MUNICIPAL

1984

PREPARED BY

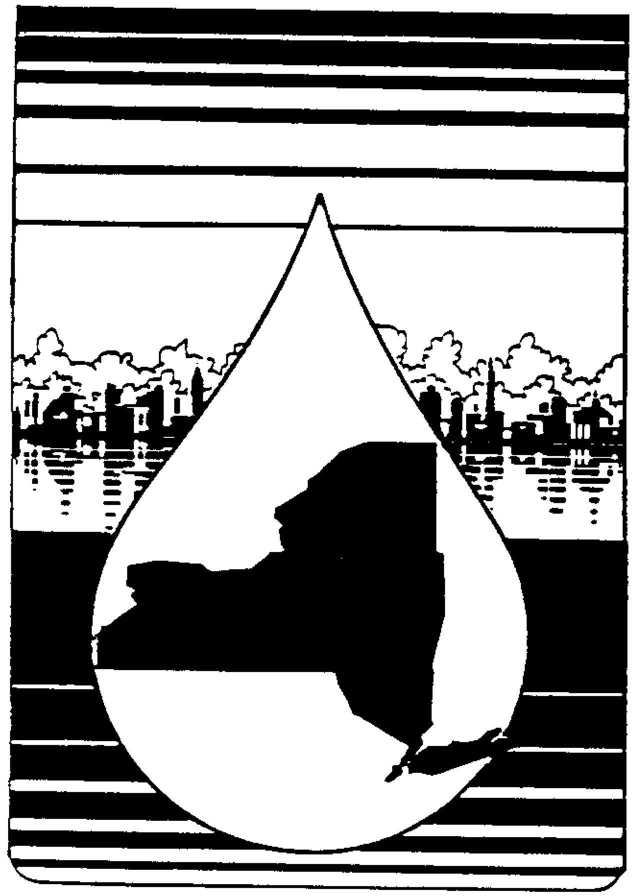
NEW YORK STATE DEPARTMENT OF HEALTH
BUREAU OF PUBLIC WATER SUPPLY PROTECTION

SUPPLYNAME	SUPPLY LOCATION (TOWN OR CITY)	DR BA	POP'N. SERVED	SOURCE TYPE G	S	P	AVE. DAILY PRODUCTION (GALLONS)	AVE. DAILY CONSUMPTION (GALLONS)	DIST'N. STORAGE (GALLONS)	PERCENT METERED R	C	I
FFOLK COUNTY OGRAM CODE 100 - MUNICIPALS												
LROSS CORP. (CULROSS BEACH) EATMENT(S): NONE	BROOKHAVEN (T)	17	104	2	0	0	30000	30000	6500	0	0	0
RING HARBOR VILLAGE EATMENT(S): SEQUESTRATION	SHELTER ISLAND (T)	17	130	2	0	0	19000	18000	100000	100	0	0
K HILLS WD EATMENT(S): CORROSION CONTROL	HUNTINGTON (T)	17	28728	15	0	0	5266000	5000000	1250000	100	100	100
ST FARMINGDALE WD EATMENT(S): DISINFECTION SEQUESTRATION CORROSION CONTROL	BABYLON (T)	17	5200	4	0	0	2271000	2271000	1500000	100	100	100
SHERS ISLAND WW CORP EATMENT(S): DISINFECTION SEDIMENTATION SAND MEDIA RAPID MIX AERATION CORROSION CONTROL COAGULATION RAPID SAND FILTRATION RCE(S): BARLOW POND (FED BY 2 PONDS &2WELL	SOUTHOLD (T)	17	4000	0	1	0	100000	100000	500000	100	100	0
ENLAWN WD ATMENT(S): DISINFECTION CORROSION CONTROL	HUNTINGTON (T)	17	40000	14	0	0	5000000	5000000	6000000	100	100	100
ENPORT VILLAGE ATMENT(S): DISINFECTION	SOUTHOLD (T)	17	6851	7	0	0	1000000	900000	330000	100	100	100
PTON BAYS WD ATMENT(S): NONE	SOUTHAMPTON (T)	17	9500	7	0	0	1100000	1100000	250000	100	100	100
THORNE - MAPLE CIVIC ASSOC ATMENT(S): SEQUESTRATION	BROOKHAVEN (T)	17	50	1	0	0	6000	5500	1000	0	0	0
OD POINT ASSOC ATMENT(S): NONE	BROOKHAVEN (T)	17	20	1	0	0	3000	3000	1000	100	100	100
TH SHORES WATER CO ATMENT(S): NONE	BROOKHAVEN (T)	17	5000	2	0	0	175000	165000	15000	100	100	0
AN BEACH VILLAGE ATMENT(S): DISINFECTION	ISLIP (T)	17	4500	2	0	0	245000	245000	100000	100	100	0
WOODS PROPERTY OWNERS ASN TMENT(S): NONE HASED FROM: STONY BROOK WD	SMITHTOWN (T)	17	60	0	0	1	0	13000	0	100	0	0
ES BEACH WATER CO TMENT(S): NONE	RIVERHEAD (T)	17	650	2	0	0	30000	29000	10000	0	0	0
RHEAD WD TMENT(S): DISINFECTION AERATION CORROSION CONTROL	RIVERHEAD	17	9900	6	0	0	1600000	1600000	900000	100	100	100

p2of5

NEW YORK STATE DEPARTMENT OF HEALTH

BUREAU OF PUBLIC WATER SUPPLY PROTECTION



INVENTORY —

COMMUNITY WATER SYSTEMS

NEW YORK STATE
VOLUME II - NON-MUNICIPAL

1984

PREPARED BY

NEW YORK STATE DEPARTMENT OF HEALTH

LYNAME	SUPPLY LOCATION (TOWN OR CITY)	DR BA	POP'N. SERVED	SOURCE TYPE G	S	P	AVE. DAILY PRODUCTION (GALLONS)	AVE. DAILY CONSUMPTION (GALLONS)	DIST'N. STORAGE (GALLONS)	PERCENT METERED R	C	I
OLK COUNTY												
RAM CODE 120 - MOBILE HOMES												
BOGUE MOBILE HOME COURT	RIVERHEAD (T)	17	120	4	0	0			3000	0	0	0
TMENT(S): DISINFECTION		CORROSION CONTROL										
QUOGUE MOBILE ESTATES	SOUTHAMPTON	17	160	4	0	0			2000	0	0	0
TMENT(S): NONE												
S MOBILE PARK	SMITHTOWN	17	70	1	0	0			120	0	0	0
TMENT(S): SEQUESTRATION		DEMINERALIZATION										
R'S MOBILE PARK	SOUTHAMPTON	17	350	2	0	0			5000	0	0	0
TMENT(S): NONE												
AGUE TRAILER PARK	EASTHAMPTON (T)	17	78	3	0	0			1650	0	0	0
TMENT(S): NONE												
PARK TRAILER PARK	RIVERHEAD (T)	17	50	1	0	0			120	0	0	0
TMENT(S): NONE												
AND RIDGE MOBILE PARK	RIVERHEAD	17	120	1	0	0	5500	5500	1000	0	0	0
TMENT(S): NONE												
NIC RIVER TRAILER PARK	RIVERHEAD	17	90	1	0	0			82	0	0	0
TMENT(S): *DISINFECTION												
NIC RIVERVIEW ADULT MHP	RIVERHEAD	17	70	2	0	0			160	0	[illegible]	
TMENT(S): *DISINFECTION		SEQUESTRATION										
LEWOOD MOBILE HOMES	RIVERHEAD (T)	17	210	2	0	0	12000	11000	4000	0	0	[illegible]
TMENT(S): NONE												
IN MOBILE HOMES	RIVERHEAD (T)	17	220	3	0	0			3000	0	0	[illegible]
TMENT(S): NONE												
NK MOBILE HOME PARK	SOUTHAMPTON (T)	17	60	2	0	0			240	0	0	[illegible]
TMENT(S): NONE												
E MILE HARBOR TRAILER PARK	EAST HAMPTON	17	40	3	0	0			1000	0	[illegible]	[illegible]
TMENT(S): SEQUESTRATION												
M'S MOBILE ESTATES	RIVERHEAD	17	450	2	0	0	38000	38000	6000	0	0	0
TMENT(S): DISINFECTION												
RAM CODE 123 - APARTMENTS												
ERTON HILLS OWNERS ASSN	BROOKHAVEN (T)	17	897	2	0	0	52000	52000	30000	0	0	0
TMENT(S): DISINFECTION												
TON GATEWAY APARTMENTS	SOUTHAMPTON T	17	60	2	0	0	500	500	1000	0	0	0
TMENT(S): IRON/MANGANESE REMOVAL												

LYN

OLK COUNTY

RAM CODE 123 - APARTMENTS

System / Treatment(s)	Supply Location (Town or City)	DR BA	Pop'n. Served	Source Type G	S	P	Ave. Daily Production (Gallons)	Ave. Daily Consumption (Gallons)	Dist'n. Storage (Gallons)	Percent Metered R	C	I
OCK ALLEY TMENT(S): NONE	SMITHTOWN	17	35	1	0	0			200	0	0	0
CREST GARDEN APARTMENTS TMENT(S): CORROSION CONTROL	RIVERHEAD	17	392	1	0	0	39000	38000	3000	0	0	0
OUBICKI APTS TMENT(S): NONE	BROOKHAVEN (T)	17	20	1	0	0			120	0	0	0
RAM CODE 150 - NURSING HOMES												
LODGE NURSING HOME MENT(S): DISINFECTION	BROOKHAVEN (T)	17	100	2	0	0			5500	0	0	0
HALL HEALTH RELATED FACL MENT(S): DISINFECTION SEQUESTRATION	BROOKHAVEN (T)	17	120	1	0	0	22000		10000	0	0	0
SAMARITAN HOSPITAL OF ISL MENT(S): NONE	ISLIP (T)	17	1650	1	0	0				0	0	0
LK DEVELOPMENTAL CENTER MENT(S): DISINFECTION SEQUESTRATION	HUNTINGTON (T)	17	3500	2	0	0	407000	400000	0	0	0	0
AM CODE 151 - INSTITUTIONS												
AL ISLIP PSYCHIATRIC CTR MENT(S): DISINFECTION CORROSION CONTROL	ISLIP (T)	17	4525	1	0	0	900000	900000	1800000	0	0	0
PARK PSYCHIATRIC CENTER MENT(S): NONE	SMITHTOWN (T)	17	3100	6	0	0	865000	865000	2750000	0	0	0
HURST LODGE ADULT HOME MENT(S): NONE	BROOKHAVEN (T)	17	57	1	0	0			160	0	0	0
E FLOWER CHILDREN'S SRVS MENT(S): NONE	RIVERHEAD (T)	17	150	4	0	0	15000	15000	20000	0	0	0
LAKE REST HOME MENT(S): NONE	ISLIP (T)	17	46	1	0	0			120	0	0	0
REST HOME ENT(S): SEQUESTRATION	BROOKHAVEN (T)	17	58	1	0	0			1000	1	0	0
LEWISON START CENTER ENT(S): NONE	HUNTINGTON (T)	17	40	1	0	0			1000	0	0	0
BAY ADULT HOME ENT(S): NONE	BROOKHAVEN (T)	17	40	1	0	0			120	0	0	0

1545

Appendix 1.5-3

EA SCIENCE AND TECHNOLOGY
A Division of EA Engineering, Science, and Technology, Inc.

COMMUNICATIONS RECORD FORM

Distribution: ( ) File , ( )
( ) , ( )
( ) Author

Person Contacted: Gary Pendzick Date: 26 Feb 86

Phone Number: (516) 727-3205 Title: Superintendent

Affiliation: Riverhead Water district Type of Contact: Phone

Address: Person Making Contact: E Bidwell

Communications Summary: There are two wells in the Osborne Ave wellfield; a 721 ft deep Magothy well and a 340 ft deep Upper Glacial well. The one well on Middle Road is 254 ft deep and also an Upper Glacial well. There are two wells on Pulaski St. one is 140 ft deep and the other 125 ft deep. They are both Upper Glacial wells, and sit right on the water table. Static water levels run between 10.5 to 13 in both wells on Pulaski Street. In 1985 the Riverhead Water district pumped 697 million /day and served an estimated population of 12,000. They also sell water to Riverside water district, serving a population of 2500.

(see over for additional space)

Signature: E Bidwell

Appendix 1.5-4

LAND USE

p.1 of 3

1981

Quantification and Analysis of Land Use for Nassau and Suffolk Counties

AREAWIDE WASTE TREATMENT MANAGEMENT

December 1982

Long Island Regional Planning Board

LEGEND

RESIDENTIAL

1 D.U. & Less/Acre (low density)

2–4 D.U./Acre

5–10 D.U./Acre

11 D.U. & Over/Acre (high density)

Commercial

Commercial Recreation

Industrial

Institutional

Open Space & Recreational

Agricultural

Transportation & Utilities

Vacant

1" = 4,650

SCALE

N

p3-13

Appendix 1.5-5

RECEIVED [illegible]

United States Department of Agriculture

Soil Conservation Service

127 East Main Street
Riverhead, New York 11901

March 13, 1986

Mr. William L. Going, Manager
Environmental Assessment Studies
EA Science and Technology
R.D. 2, Box 91
Middletown, New York 10940

Dear Mr. Going:

This office has not compiled any information on the number of acres irrigated based on specific locations in Suffolk County. The 1982 Census of Agriculture estimates that 23,232 acres are irrigated on 500 farms, however, the specific locations of this acreage is not readily available.

The major source of irrigation water in Suffolk County is groundwater through wells. There are literally thousands of wells scattered throughout the county. To locate wells within a three mile radius of the inactive hazardous waste sites would be an impossible task.

Just to inventory the irrigated acres in proximity to these sites would be very time consuming. I do not have the manpower nor the time at present to accomplish such a task.

I would be more than willing to provide you with access to our aerial photographs, soil maps, topographic surveys and other technical information which might be helpful to you in making this inventory.

If you have any questions or I may be of further assistance, call me at 516-727-2315.

Sincerely,

Allan S. Connell

Allan S. Connell,
District Conservationist

3/28/86 Mr. Connell says that the 23,232 ac/500 farms represent the vast majority ... up to 90% ... for Suffolk Co. and that I can assume all irrigated ... so I will convert ag. land [illegible]

Appendix 1.5-6

EA SCIENCE AND TECHNOLOGY
A Division of EA Engineering, Science, and Technology, Inc.

COMMUNICATIONS RECORD FORM

Distribution: ( ) Suffolk Co General, ( ) ______
( ) ______, ( ) ______
( ) Author

Person Contacted: Mr. Dan Fricke Date: 4-1-86

Phone Number: 516 727 7850 Title: Coop Ext. Ag. Agent

Affiliation: Suffolk Co. Coop Ext. Assn. Type of Contact: Phone

Address: 264 Griffing Ave. Riverhead NY Person Making Contact: Bond

Communications Summary: I asked Dan question about irrigation practices in Suffolk Co. i.e. could Coop Ext. identify sources of irrigation water (wells + surface) and tell me for all irrigated ~~acreage~~ acreage ... which was in food production or dairy farms?

He said that all irrigation wells were supposed to be registered with the State and that perhaps SCDHS had the maps to indicate location and number (#) → (Joe Bair?) or (Steve Corey)

* He said there was no surface water used for irrigation on the Island.

He said that once we had located all the wells within required distance of sites; we would have to talk to Coop Ext about each well to find out about the use of the land; very time consuming process.

(see over for additional space)

Signature: William Bond

Appendix 1.5-7

EA SCIENCE AND TECHNOLOGY

A Division of EA Engineering, Science, and Technology, Inc.

COMMUNICATIONS RECORD FORM

Distribution: ( ) Suffolk Co. General Files, ( ) ____
( ) ____, ( ) ____
( ) Author

Person Contacted: Steve Carey Date: 4-7-86

Phone Number: 516 348 2893 Title: Chief

Affiliation: SCDHS Groundwater Section Type of Contact: Phone

Address: 225 Rabro Dr. Hauppauge NY Person Making Contact: Bill Going

Communications Summary: I asked him questions about source of irrigation water for farm land in food production---

Steve said wells greater than 45 gpm were registered by NYSDEC Reg 1 except that farms were mostly exempted.

He suggested I contact Doug Pica NYSDEC for information.

(see over for additional space)

Signature: William Going

Appendix 1.5-8

EA SCIENCE AND TECHNOLOGY
A Division of EA Engineering, Science, and Technology, Inc.

COMMUNICATIONS RECORD FORM

Distribution: ( ) Suffolk Co. General Files ( ) ____________
( ) ____________, ( ) ____________
( ) Author

Person Contacted: Mr. Doug Pica Date: 4-7-86

Phone Number: 516 751-7900 Title:

Affiliation: NYSDEC Reg 1 Water Unit Type of Contact: Phone

Address: Stonybrook NY Person Making Contact: Bud Going

Communications Summary: I asked questions about irrigation practices on Long Island and about regulation of wells (irrigation supply).

Doug said DEC regulated wells that supplied irrigation water to golf courses but did not regulate any farm supply wells because they are exempted from regulation. He therefore has no info on farm land irrigation sources.

(see over for additional space)

Signature: William Going

EA SCIENCE AND TECHNOLOGY
A Division of EA Engineering, Science, and Technology, Inc.

Appendix 1.5-9.

COMMUNICATIONS RECORD FORM

Distribution: ( ) RCA Riverhead , ( ) ______
( ) ______ , ( ) ______
( ) Author

Person Contacted: Charles Guthrie Date: 11-20-86

Phone Number: (516) 751-7900 Title: Regional Fisheries Manager

Affiliation: NYDEC Bur. Fisheries Type of Contact: phone

Address: Division of Fish & Wildlife Person Making Contact: L. Wilson
Stony Brook NY 11794

Communications Summary: Wildwood lake has a warm water fishery - Bass + pickerel and is stocked with trout. Local residence also swim in it.

(see over for additional space)

Signature: Laurence Wilson

Appendix 115-19

EA SCIENCE AND TECHNOLOGY
A Division of EA Engineering, Science, and Technology, Inc.

COMMUNICATIONS RECORD FORM

Distribution: ( ) DEC63A , ( ) ____
( ) ____ , ( ) ____
( ) Author

Person Contacted: John Ozard Date: 3-6-86

Phone Number: 5184397486 Title: Sr. Wildlife Biologist

Affiliation: NYS DEC Type of Contact: Phone

Address: Delmar NY Person Making Contact: W. Going

Communications Summary: Called John for clarification of the letter dated 26 February 1986, regarding "significant habitats"...

Q. Don't see any reference to Federally listed threatened or Endangered spp. on any of the 42 site location maps you sent back w/ your letter... does this mean there is no habitat of concern for these spp? A. yes... there is no critical habitat for (Federal spp) at any of the sites being examined.

Q. Are all the wetlands on LI in the vicinity of our sites (refer to location maps) "coastal" wetlands? A. Yes. They all have varying amounts of salt being that near the Sound or the Ocean, to be considered coastal wetlands... also refer to the ("Natural Heritage") wetlands marked in blue.

(see over for additional space)

Signature: William Going

Appendix 15-11

EA SCIENCE AND TECHNOLOGY

A Division of EA Engineering, Science, and Technology, Inc.

COMMUNICATIONS RECORD FORM

Distribution: ( ) Westhampton LF, ( ) ______
( ) ______, ( ) ______
( ) Author

Person Contacted: Mr Ken Jones Date: 22 April 86

Phone Number: 516 283 6020 Title: Chief Fire Marshal

Affiliation: Town of Southampton Type of Contact: phone

Address: 116 Hampton Rd Southampton NY Person Making Contact: Going

Communications Summary: Mr Jones does not consider or certify that the Westhampton Landfill is an imminent threat from fire or explosion.

(see over for additional space)

Signature: William Going

(47-15-11 (10/83)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DIVISION OF SOLID AND HAZARDOUS WASTE

INACTIVE HAZARDOUS WASTE DISPOSAL SITE REPORT

SITE CODE: 152012

PRIORITY CODE: ______

REGION: I

NAME OF SITE: RCA - Riverhead

STREET ADDRESS: River Road - Quogue Road

TOWN/CITY: Southampton

COUNTY: Suffolk

NAME OF CURRENT OWNER OF SITE: NYSDEC

ADDRESS OF CURRENT OWNER OF SITE: SUNY Campus, Building 40, Stony Brook, New York 11794

TYPE OF SITE: OPEN DUMP [x] STRUCTURE [ ] LAGOON [ ] LANDFILL [ ] TREATMENT POND [ ]

ESTIMATED SIZE: 1/2 ACRES

SITE DESCRIPTION:

Site was used as an open dump by RCA from 1927 to 1975. Wastes included components that contained PCB's. The site is located in the center of a 2,056 acre tract of land that is densely forested and used as a (state-managed) recreation area. The 0.5-acre site itself is completely cleared and leveled, and it is not separated from the larger property by any barrier. The site has, however, been remediated by RCA Corporation with technical guidance from NYSDEC. Wastes and contaminated soils have been excavated and removed to a disposal site.

HAZARDOUS WASTE DISPOSED: CONFIRMED [x] SUSPECTED [ ]

TYPE AND QUANTITY OF HAZARDOUS WASTES DISPOSED:

TYPE	QUANTITY (POUNDS, DRUMS, TONS, GALLONS)
PCB's	Unknown

TIME PERIOD SITE WAS USED FOR HAZARDOUS WASTE DISPOSAL:

_______________, 19 27 TO _______________, 19 75

OWNER(S) DURING PERIOD OF USE: RCA Corporation

SITE OPERATOR DURING PERIOD OF USE: RCA Corporation

ADDRESS OF SITE OPERATOR: Princeton, New Jersey

ANALYTICAL DATA AVAILABLE: AIR [ ] SURFACE WATER [X] GROUNDWATER [X]
SOIL [X] SEDIMENT [ ] NONE [ ]

CONTRAVENTION OF STANDARDS: GROUNDWATER [ ] DRINKING WATER [ ]
SURFACE WATER [ ] AIR [ ]

SOIL TYPE: Sandy loam

DEPTH TO GROUNDWATER TABLE: 32 ft

LEGAL ACTION: TYPE: none STATE [ ] FEDERAL [ ]
STATUS: IN PROGRESS [ ] COMPLETED [ ]

REMEDIAL ACTION: PROPOSED [ ] UNDER DESIGN [ ]
IN PROGRESS [ ] COMPLETED [X]

NATURE OF ACTION: Source of contamination removed

ASSESSMENT OF ENVIRONMENTAL PROBLEMS:

Soil contaminated with PCB.

ASSESSMENT OF HEALTH PROBLEMS:

Possible ground-water contamination.

PERSON(S) COMPLETING THIS FORM:

FOR NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

NAME EA Science and Technology

TITLE

NAME

TITLE

DATE: 25 March 1986

NEW YORK STATE DEPARTMENT OF HEALTH

NAME

TITLE

NAME

TITLE

DATE: