FINAL
SITE INSPECTION LETTER REPORT
E L BETH LTD SITE
PERTH AMBOY, MIDDLESEX COUNTY, NEW JERSEY

Prepared for:

U.S. Environmental Protection Agency
Region II
New York, New York 10007

Prepared by:

Roy F. Weston, Inc.
Edison, New Jersey 08837

SEPTEMBER 2000

EPA Contract No.: 68-W7-0026
WA No.: 052-SISI-02ZZ
Document Control No.: RFW052-2A-AJIF

Draft Report Originally Submitted Under
Contract No.: 68-W5-0019, DCN: START-02-F-04368

ELBETH.WPD

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Submittal Date: September 2000

Submitted By:

Prepared By: Kelley A. Curran — Date: 9-6-00
Kelley A. Curran
Project Manager

Approved By: W. Scott Butterfield — Date: 9/6/00
W. Scott Butterfield, CHMM
Site Manager

Approved By: W. Scott Butterfield for Dean Geers — Date: 9/6/00
Dean Geers
Program Manager

ELBETH.WPD

Introduction

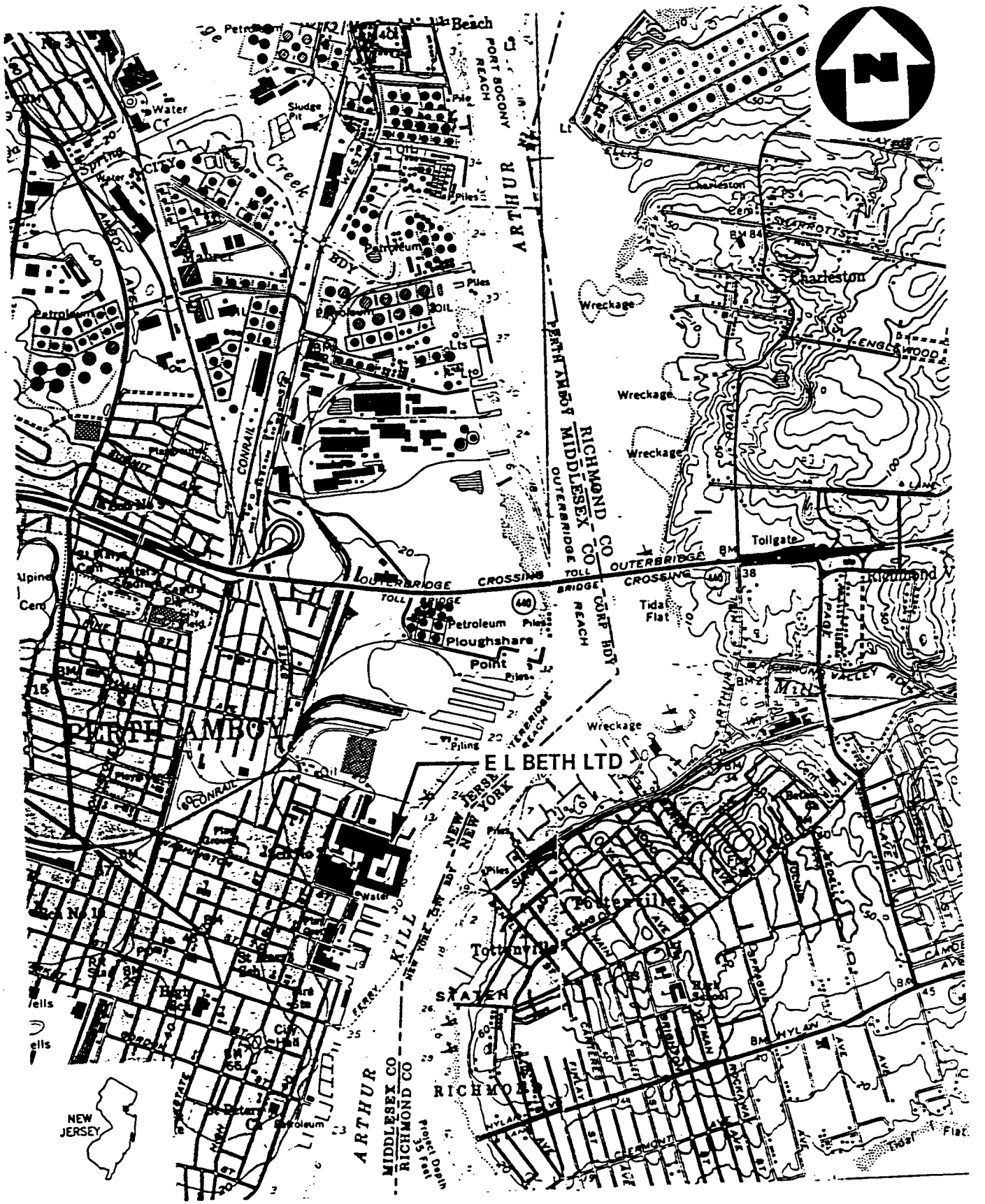
This Site Inspection (SI) Letter Report provides a description of the E L Beth Ltd site (CERCLIS No. NJD067484923) and a discussion of the investigation that has been conducted by the Region II Superfund Technical Assessment and Response Team (START) to determine the viability of further action for this site (Ref. No. 1). Based on information provided in the HALLIBURTON NUS Environmental Corporation Preliminary Assessment (PA) Report, Region II START investigation findings, and verbal discussions with U.S. EPA Task Monitor (TM), it has been determined that a focused sampling event is not required to further evaluate the site. On 19 June 2000, the U.S. EPA TM issued a Technical Direction Letter (TDL) to Region II START; the TDL directed Region II START to prepare a Letter Report to document its findings.

General Description and Site History

The E L Beth Ltd (E L Beth) site is located off of High Street in an industrial area of Perth Amboy, Middlesex County, New Jersey (Ref. Nos. 4, 14). The site lies within the northern part of the New Jersey Coastal Plain physiographic province and consists of a 0.66-acre parcel of land and a 0.41-acre pier (Ref. Nos. 2; 3, pp. 100, 101). The property is bordered on the east by the Arthur Kill, and to the west and north by industrial properties. Duane Marine, another CERCLIS-listed site, borders the southern portion of the property. The pier on the property extends into the Arthur Kill (Ref. Nos. 4, 14). A factory was located on the pier until a fire destroyed it and the pier in May 1981. The fire, reportedly caused by an overheated kiln, also destroyed company records. An earlier fire had occurred on the same tax block in July 1980. According to background information, E L Beth was apparently not affected by this fire. However, the site has been inactive since the 1981 fire (Ref. No. 3, pp. 3, 51, 242 through 245). Figures 1 and 2 present a Site Location Map and a Site Map, respectively.

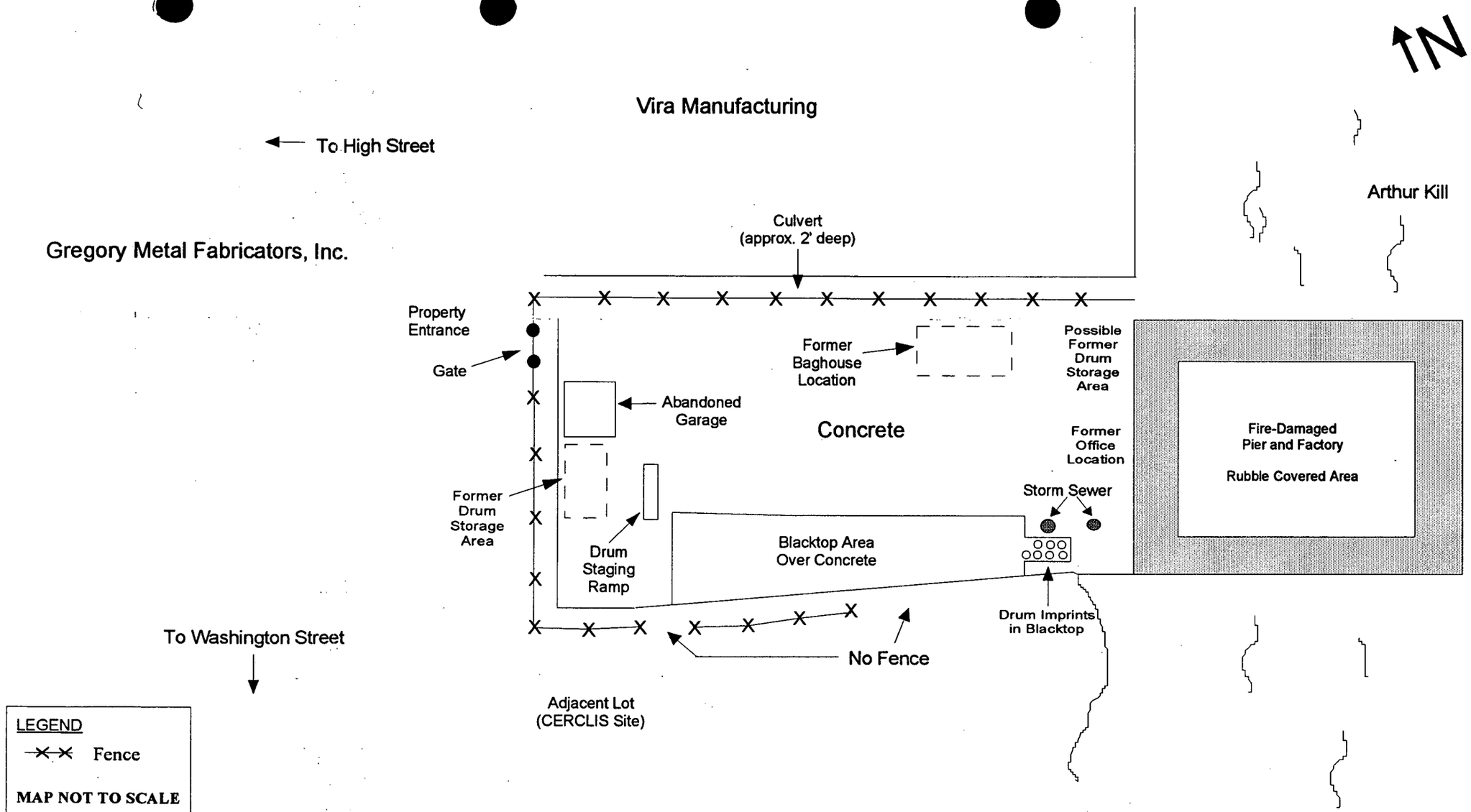
E L Beth was a foundry and secondary smelting operation that produced solder, casting metals, and lead alloys. Specifically, lead and tin scrap metals were melted, alloyed, and cast into ingots (Ref. No. 3, pp. 3, 53, 54, 77). In addition, gold was recovered from electronic scrap (Ref. No. 3, p. 39). The facility was reportedly established in October 1975 under the ownership of M.C. Canfield Sons. In late 1977 the current owners, Robert and Jack Silverman, purchased the facility and operated it as a subsidiary of M.C. Canfield Sons from 1978 to 1981 (Ref. No. 3, p. 86). In November 1980, the owners submitted a RCRA Part A permit application indicating that the facility would treat, store, or dispose of hazardous waste (Ref. No. 3, pp. 3, 38 through 45). In March 1983, the owner requested that the facility be de-listed as a treatment, storage, or disposal facility (Ref. No. 3, p. 47). The New Jersey Department of Environmental Protection (NJDEP) subsequently de-listed the facility in February 1985 (Ref. No. 3, pp. 3, 60, 61).

According to the facility's Hazardous Waste Permit Application, the wastes generated from site operations included corrosive materials and emission control dust/sludge from secondary lead smelting. Metallic constituents would be present in the emission control dusts. Chromium, lead, and cadmium may have been constituents of the secondary lead smelting sludge. Corrosive



(QUAD) PERTH AMBOY, NY-NJ

WESTON MANAGERS DESIGNERS/CONSULTANTS	Roy F. Weston, Inc. FEDERAL PROGRAMS DIVISION	EPA TM CATHY MOYIK	FIGURE 1 SITE LOCATION MAP
IN ASSOCIATION WITH RESOURCE APPLICATION, Inc. C.C. JOHNSON & MALHOTRA, P.C., R.E. SARRIERA ASSOCIATES, PRC ENVIRONMENTAL MANAGEMENT, AND GRB ENVIRONMENTAL SERVICES, INC.		START PM KELLEY CURRAN	E L BETH LTD PERTH AMBOY, NEW JERSEY



WESTON MANAGERS DESIGNERS/CONSULTANTS — Roy F. Weston, Inc. FEDERAL PROGRAMS DIVISION	EPA TM C. MOYIK	Figure 2 SITE MAP
IN ASSOCIATION WITH RESOURCE APPLICATION, INC., C.C. JOHNSON & MALHOTRA, P.C., R.E. SARRIERA ASSOCIATES, TETRATECH INC., AND GRB ENVIRONMENTAL SERVICES, INC.	START PM K. CURRAN	E L Beth Ltd Perth Amboy, Middlesex Co., NJ

material that reportedly included ammonium chloride may have been present as solidified material or sludge. Wastes were reportedly contained in drums on concrete at outdoor and indoor locations. In the application, the owner reported an estimated annual generation quantity of 50,000 pounds of hazardous wastes in drums and a process design capacity of 2,500 gallons (Ref. No. 3, pp. 3, 38 through 45, 86, 87, 94, 247 through 255). During an on-site reconnaissance performed by Region II START on 14 March 2000, imprints of approximately 8 drums were noted in blacktop at the site, near the shoreline along the southern border of the property (Ref. No. 4, p. 3). It is not known whether any hazardous wastes were present on site at the time of the May 1981 fire (Ref. No. 3, pp. 3, 242 through 245). The site is not entirely fenced and currently consists mainly of rubble. The presence of graffiti indicates that outsiders have access to the property (Ref. No. 4).

Evaluation of Existing Information

Existing information, primarily obtained from the 1992 PA Report, was used to conduct an evaluation of the E L Beth site (Ref. No. 3). According to background information, no sampling has been conducted at the E L Beth site (Ref. No. 3, p. 11). A review of past site operations indicates that metals would be the primary contaminants of concern. In addition, corrosive material that reportedly included ammonium chloride may have also been present at the site (Ref. No. 3, pp. 3, 38 through 45, 86, 87, 94, 247 through 255).

Hazard Assessment

Updated and additional information and data were collected to further evaluate the site and determine whether any remedial action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted. Data for each pathway were refined from the PA stage and incorporated into this evaluation.

Sources - It is possible that waste materials may have been deposited on the ground surface and migrated to the Arthur Kill. Likewise, it is possible that contaminants in the waste materials may still be present in fire-damaged rubble that currently comprises much of the site. Possible contaminants include chromium, cadmium, lead, and ammonium chloride; these materials are associated with past site operations.

Groundwater Pathway - There is no observed or suspected release of hazardous substances to groundwater. It is not likely that site-attributable contaminants would reach an aquifer that supplies potable water, as the site was reportedly paved prior to E L Beth activities (Ref. No. 3, p. 86). In addition, a confining unit of clay overlies the aquifer of concern (Ref. No. 3, pp. 110 through 112).

The site is located within the northern part of the New Jersey Coastal Plain physiographic province. The primary aquifer of concern is the Farrington aquifer. The Farrington aquifer is comprised of the Farrington Sand member of the Raritan Formation and is characterized by fine- to medium-grained sand that has lignite, pyrite, and local beds of clay. The aquifer has a permeability of 10^{-3} to 10^{-5} cm/sec (Ref. Nos. 3, pp. 98, 105; 12). The upper surface of the Farrington aquifer occurs at a depth of approximately 90 feet below sea level in the area of the site. The direction of groundwater flow

in the Farrington Sand is to the south; however the hydraulic connection across the Raritan River is restricted to some extent by discontinuities on the formation and the presence of relatively impermeable mud (Ref. No. 3, pp. 105, 128, 136, 137, 150). The Wisconsin Drift terminal moraine and Woodbridge Clay geologic units overlie the Farrington Sand near the site. The Wisconsin Drift has a thickness of approximately 50 feet near the site, and consists of a mixture of red clay, sand, gravel, and a few boulders. It is reported that in most areas this material is fairly impermeable. The Woodbridge Clay, an extensive, impervious confining layer that is approximately 40 feet thick in the area of the site, lies between the drift material and the Farrington Sand. The Woodbridge Clay consists of clay and clayey sands; its permeability is estimated to be 10^{-7} cm/sec or less (Ref. Nos. 3, pp. 98, 107, 110, 127 through 129, 133 through 136, 146; 12).

All known potable water supply wells are located more than 2 miles from the site and all but one are separated from the site by the Raritan River. According to the USGS well database listing for wells located within 4 miles of the site, two domestic wells that draw from the Farrington aquifer are located approximately 2.1 and 2.8 miles from the site. These wells each serve a population of approximately 3 based on 1990 census information. In addition, the Sayreville Water Department operates four wells within the target distance limit and serve a total population of approximately 38,000. However, only one of these wells is screened in the Farrington aquifer. Three wells draw from the Old Bridge Sand Aquifer. The Old Bridge Sand has not been identified in outcrop anywhere north of the Raritan River, and thus in not included in the description of the aquifer of concern (Ref. Nos. 3, p. 105; 5; 10; 14). Wellhead protection areas have not yet been delineated in New Jersey (Ref. No. 12).

Surface Water Migration Pathway - Aqueous or sediment sampling has not been conducted at the E L Beth Ltd site during previous investigations. Obtaining a source sample from the site would be difficult as the site is completely paved (Ref. Nos. 3, p. 11; 4). There is a high likelihood that a release of contaminants to surface water and/or sediment has occurred. A review of past waste disposal practices at the site indicates the potential release of contaminants to surface water. Unknown contaminants may have also been generated or released during the 1981 on-site fire. Surface drainage would be expected to flow to the Arthur Kill as a result of flow over the paved surface and discharge through the storm sewer that is present. Drainage would also be expected to flow through the pier, where much rubble is present, directly to the Arthur Kill (Ref. No. 4).

There are several 15-mile surface water migration pathways associated with the E L Beth site as it is located adjacent to waters which are tidally influenced. The majority of the water bodies within these pathways are considered saline waters of estuaries. Designated uses of the surface waters include: fishing; shellfish harvesting; maintenance, migration, and propagation of the natural and established biota; migration of diadromous fish; and primary and secondary contact recreation (Ref. Nos. 8; 9; 15; 16; 17). Approximately 78 miles of wetland frontage exist within the 15-mile surface water migration limits and six State-listed threatened or endangered species have been identified within the general vicinity of the site or in the immediate vicinity of associated waterways. In addition, Sandy Hook is located approximately 14 miles downstream from the site location. Sandy Hook has been designated a Natural Heritage Priority Site by the NJDEP (Ref. Nos. 11; 13). The site is primarily located within the 100-year flood boundary; the western portion of the property is located within the 100-year to 500-year flood boundaries (Ref. No. 7).

Soil Exposure Pathway - Soil samples have not been collected at the E L Beth Ltd site (Ref. No. 3, p. 11). An observed release to soil has not been documented and the site surface consists mainly of concrete. The site has reportedly been inactive since May 1981; therefore there are no workers on site. No residences, schools or day care facilities were observed in the vicinity of the E L Beth Ltd site (Ref. No. 4). There are no known terrestrial sensitive environments located within 200 feet of the site (Ref. Nos. 4; 14).

Air Migration Pathway - No documentation of a release of hazardous substances to the air currently exists (Ref. No. 3, p. 11). It is suspected that a potential exists for release of particulates and other contaminants that may be present in rubble at the fire-damaged factory (Ref. No. 4). Unknown contaminants may also have been generated during the on-site fire that occurred in 1981. Possible contaminants related to site operations include lead, chromium, and cadmium. Ambient readings obtained during continuous air monitoring with a flame ionization detector and photoionization detector during the March 1992 HALLIBURTON NUS on-site reconnaissance, did not significantly exceed background levels (Ref. No. 3, pp. 82 through 92). Approximately 136,800 people live within 4 miles of the E L Beth Ltd site (0 to 0.25 mile: 720; > 0.25 to 0.5 mile: 5,030; > 0.5 to 1 mile: 20,960; > 1 to 2 miles: 24,970; > 2 to 3 miles: 29,850; > 3 to 4 miles: 55,280) (Ref. No. 6). Six State-listed threatened or endangered species have been identified within the general vicinity of the site or in the immediate vicinity of associated waterways (Ref. No. 13). Approximately 1,252 acres of wetlands are located within 4 miles of the E L Beth Ltd site (0 to 0.25 mile: 0; > 0.25 to 0.5 mile: 2; > 0.5 to 1 mile: 10; > 1 to 2 miles: 132; > 2 to 3 miles: 402; > 3 to 4 miles: 706) (Ref. Nos. 11; 14).

Summary

Based on the information presented in this report, the E L Beth Ltd site does not require sampling. The on-site reconnaissance of the site determined that it is entirely paved with no areas for sample collection. Therefore, it has been determined that a focused SI sampling event is not necessary for further evaluation of the E L Beth Ltd site. It should be noted that if information affecting this evaluation becomes available in the future, further investigation of the site might become necessary.

REFERENCES

1. U.S. Environmental Protection Agency Superfund Program, Comprehensive Environmental Response, Compensation, and Liabilities Information System (CERCLIS), List-8I: Site/Action Listing, p. 107, 4 November 1999.

2. City of Perth Amboy Tax Map, Middlesex County, New Jersey.

3. Final Draft Environmental Priorities Initiative Preliminary Assessment Report, E L Beth Ltd, prepared by HALLIBURTON NUS Environmental Corporation, 30 March 1992.

4. Field Logbook No. START-02-465, E L Beth Ltd, On-site reconnaissance, Region II START, 14 March 2000.

5. Housing Units and Household Population, New Jersey, Counties and Municipalities: 1990, New Jersey State Data Center, March 1991.

6. Letters from Frost Associates, to Harry Allen, Region II START, Subject: E. L. Beth Limited, Perth Amboy, NJ, 5 and 6 March 2000.

7. Flood Insurance Rate Map for the City of Perth Amboy, New Jersey, Middlesex County, Community-Panel Number 340272 0001 C, Map Revised: 1 May 1984.

8. Surface Water Quality Standards, N.J.A.C. 7:9B, NJDEP, Office of Environmental Planning, April 1998.

9. Federal Register, 40 CFR, Part 300, Hazard Ranking System; Final Rule, Volume 55, No. 241, Environmental Protection Agency, 14 December 1990.

10. Project Note: From Kelley Curran, Region II START, to E L Beth Ltd site file, Subject: Groundwater Population (Use Summary), 23 May 2000; with attachments.

11. Project Note: From Kelley Curran, Region II START, to E L Beth Ltd site file, Subject: E L Beth Ltd Wetlands Calculations, 23 May 2000; with attachments.

12. Telecon Note: Conversation between Diane Minsavage, Region II START, and Steve Spayd, New Jersey Geological Survey. Subject: New Jersey Wellhead Protection Areas, 3 June 1999.

13. Project Note: From Kelley Curran, Region II START, to E L Beth Ltd site file, Subject: Sensitive Environments, 23 May 2000; with attachment.

14. Four-Mile Radius Map for E L Beth Ltd site, based on U.S. Department of the Interior, Geological Survey Topographic Maps, 7.5-minute series. Quadrangles for "Perth Amboy, NJ-NY," 1956, photorevised 1981; "South Amboy, NJ-NY," 1954, photorevised 1981; "Arthur Kill, NY-NJ," 1966, photorevised 1981; "Keyport, NJ-NY," 1954, photorevised 1970, photoinspected 1977; "The Narrows, NY-NJ," 1966, photorevised 1981; and "Sandy Hook, NJ-NY," 1954, photorevised 1981.

15. Fifteen-Mile Surface Water Pathway Map for E L Beth Ltd site, based on U.S. Department of the Interior, Geological Survey Topographic Maps, 7.5-minute series. Quadrangles for "Perth Amboy, NJ-NY," 1956, photorevised 1981; "South Amboy, NJ-NY," 1954, photorevised 1981; "Arthur Kill, NY-NJ," 1966, photorevised 1981; "Keyport, NJ-NY," 1954, photorevised 1970, photoinspected 1977; "The Narrows, NY-NJ," 1966, photorevised 1981, "Sandy Hook, NJ-NY," 1954, photorevised 1981; "New Brunswick, NJ-NY," 1954, photorevised 1981; "Chatham, NY-NJ," 1955, photorevised 1981; "Roselle, NJ-NY," 1955, photorevised 1981; "Elizabeth, NJ-NY," 1967, photorevised 1981; and "Plainfield, NJ-NY," 1955, photorevised 1981.

16. Water Quality Regulations, Surface Water and Groundwater Classifications and Standards, New York State Codes, Rules and Regulations, Title 6, Chapter X, Parts 700-705, New York State Department of Environmental Conservation, 31 August 1991.

17. State of New York Official Compilation of Codes, Rules and Regulations, Title 6, Conservation, Vol. D-1, Reissued July 1995.

ATTACHMENT 1

PHOTOGRAPH LOG

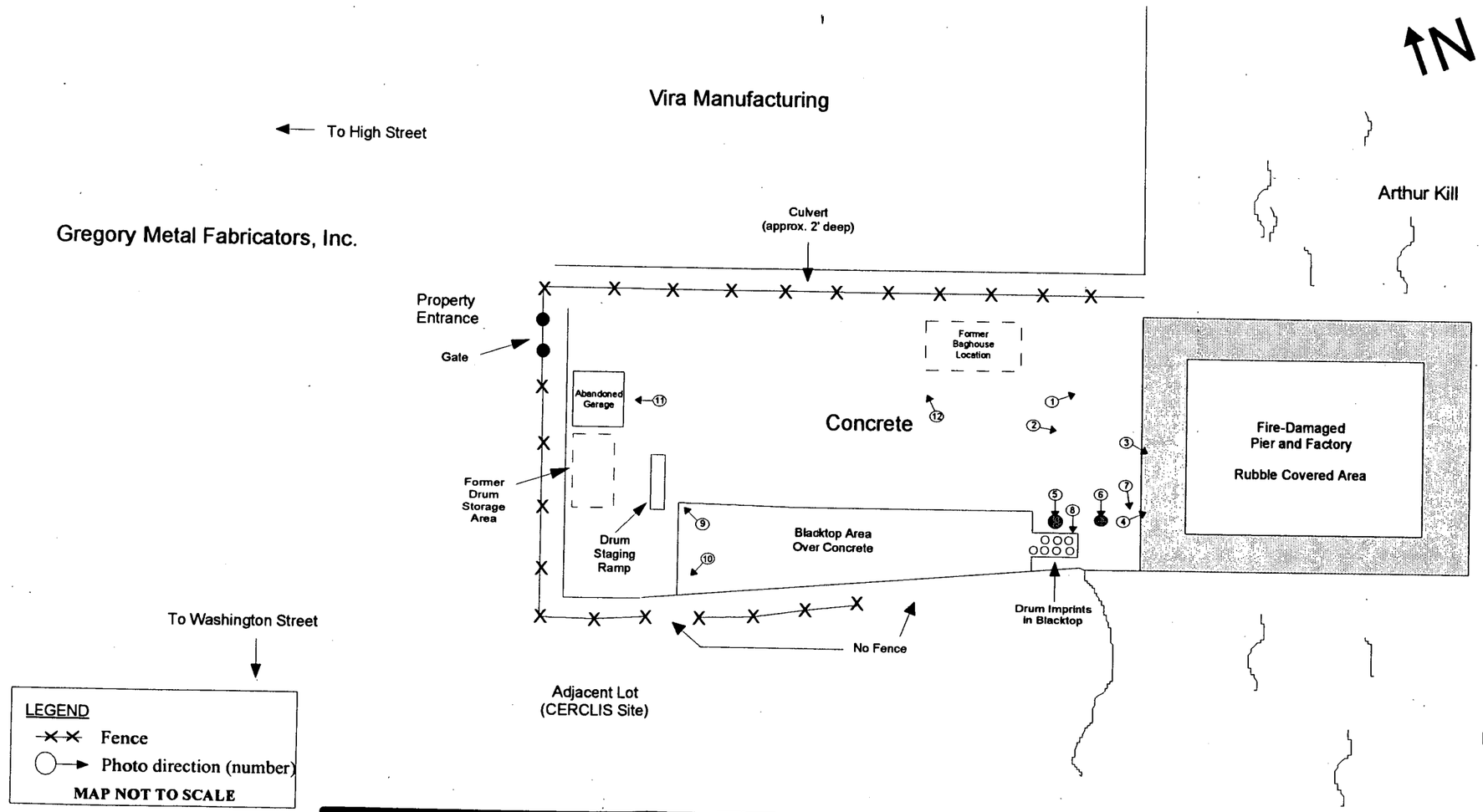
E L BETH LTD SITE, PERTH AMBOY, MIDDLESEX CO., NJ
ON-SITE RECONNAISSANCE

14 MARCH 2000

E L BETH LTD
14 MARCH 2000
PHOTOS TAKEN BY: KELLEY CURRAN

Photo ID Number	Description	Time
ELB - 1	E - View of fire-damaged factory on pier.	0905 hours
ELB - 2	ESE - View of fire-damaged factory on pier.	0907 hours
ELB - 3	SE - Rubble from fire-damaged factory. Holes in pier seen in background.	0910 hours
ELB - 4	E - Fire-damaged factory on pier. Rubble seen in foreground.	0912 hours
ELB - 5	SSW- Storm sewer.	0915 hours
ELB - 6	SSW- Storm sewer.	0917 hours
ELB - 7	S - View of southern portion of property. Rubble in foreground. Graffiti indicating access by outsiders.	0920 hours
ELB - 8	SSW - Drum imprints on blacktop.	0922 hours
ELB - 9	N - View of drum staging ramp. Abandoned garage and graffiti seen in background.	0923 hours
ELB - 10	W - View towards adjacent lot. Hole in fence on southern portion of property.	0925 hours
ELB - 11	WNW - Abandoned garage with rubble and graffiti.	0930 hours
ELB - 12	N - View of adjacent lot. Culvert in background.	0935 hours

Note: N - represents the view to the north; S - the view to the south; E - the view to the east; and W - the view to the west.



WESTON MANAGERS DESIGNERS/CONSULTANTS. Roy F. Weston, Inc. FEDERAL PROGRAMS DIVISION	EPA TM C. MOYIK	Photo Location Map
IN ASSOCIATION WITH RESOURCE APPLICATION, INC., C.C. JOHNSON & MALHOTRA, P.C., R.E. SARRIERA ASSOCIATES, TETRATECH INC., AND GRB ENVIRONMENTAL SERVICES, INC.	START PM K. CURRAN	E L Beth Ltd Perth Amboy, Middlesex Co., NJ

ELB - 1 E - View of fire-damaged factory on pier. 0905 hours

ELB - 2 ESE - View of fire-damaged factory on pier. 0907 hours

ELB - 3 SE - Rubble from fire-damaged factory. Holes in pier seen in background. 0910 hours

ELB - 4 E - Fire-damaged factory on pier. Rubble seen in foreground. 0912 hours

ELB - 5 SSW- Storm sewer. 0915 hours

ELB - 6 SSW- Storm sewer. 0917 hours

ELB - 7 S - View of southern portion of property. Rubble in foreground. Graffiti indicating access by outsiders. 0920 hours

ELB - 8 SSW - Drum imprints on blacktop. 0922 hours

ELB - 9 N - View of drum staging ramp. Abandoned garage and graffiti seen in background. 0923 hours

ELB - 10 W - View towards adjacent lot. Hole in fence on southern portion of property. 0925 hours

ELB - 11 WNW - Abandoned garage with rubble and graffiti. 0930 hours

ELB - 12 N - View of adjacent lot. Culvert in background. 0935 hours

ATTACHMENT 2

REFERENCES

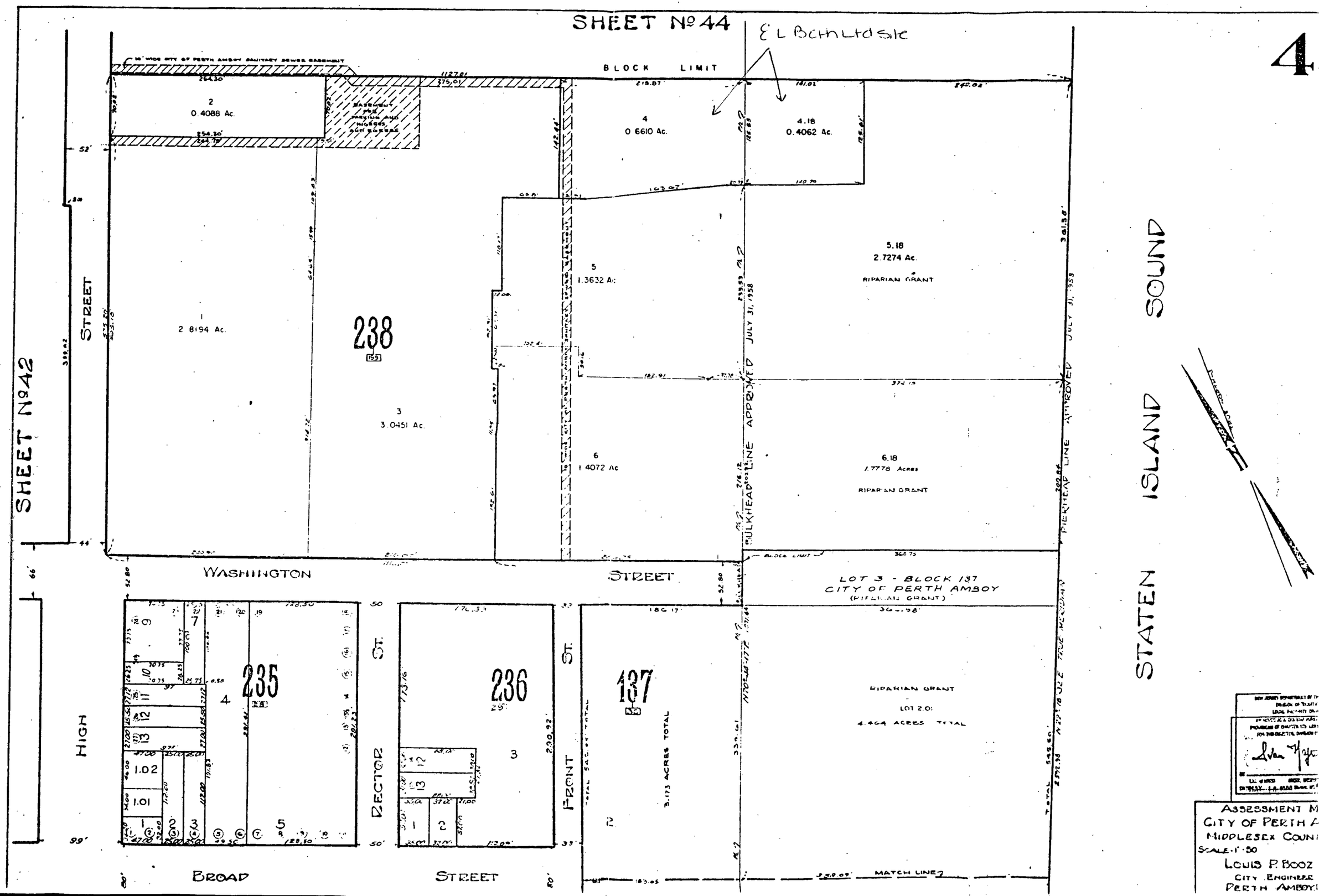
REFERENCE NO. 1

[redacted]-HOC

U.S. EPA [redacted]perfund Program
Region II
List-8I Site/Action Listing

EPA ID	Site Name Address City County Name	Zip Code	Cong Dist	NFRAP Flag	Oprble Unit	Action Type	Action Lead	Action Qualif	Actual Start Date	Actual Compl Date
NJD986639177	DUTCH BOY PAINTS 1050 STATE ST PERTH AMBOY MIDDLESEX	08861 023	13							
					00	BB 001	RP	C	04/15/93	03/15/94
						RV 001	F	S	02/12/93	05/14/93
NJD980770549	DYNAPAC MFG CO KELLY PLACE MOUNT OLIVE TW MORRIS	07828 027	13	NFA						
					00	DS 001	S			04/10/84
						PA 001	S	L	04/01/85	04/30/85
						SH 001	S	N		10/20/92
						SI 001	S	L	01/01/91	03/28/91
NJD002355774	DYNASIL CORP OF AMERICA COOPER ROAD BERLIN CAMDEN	08009 007	01	NFA						
					00	DS 001	F			01/15/89
						PA 001	F	D	04/01/89	04/15/89
						SI 001	S	N	07/01/91	09/24/91
→ NJD067484923	E L BETH LTD 500 HIGH STREET PERTH AMBOY MIDDLESEX	08861 023	06							
					00	DS 001	F			11/01/91
						PA 001	F	D	01/01/92	03/31/92
NJD980505077	E. RUTHERFORD JOINT SEWAGE FOOT OF BOROUGH AVENUE EAST RUTHERFOR BERGEN	07073 003	09							
					00	DS 001	S			05/31/85
						PA 001	S	L		05/24/85
						SH 001	S	H	05/13/93	01/05/95
						SI 001	S	H	02/05/87	03/31/87

REFERENCE NO. 2



SHEET No 44
E L Bcth Ltd site
BLOCK LIMIT
2
0.4088 Ac.
4
0.6610 Ac.
4.18
0.4062 Ac.
5
1.3632 Ac.
5.18
2.7274 Ac.
RIPARIAN GRANT
1
2.8194 Ac.
238
3
3.0451 Ac.
6
1.4072 Ac.
6.18
1.7778 Acres
RIPARIAN GRANT
BULKHEAD LINE APPROVED JULY 31, 1958
PIERHEAD LINE APPROVED JULY 31, 1958
SHEET No 42
STREET
WASHINGTON
STREET
LOT 3 - BLOCK 137
CITY OF PERTH AMBOY
(RIPARIAN GRANT)
235
236
137
RECTOR ST.
FRONT ST.
HIGH
BROAD
STREET
RIPARIAN GRANT
LOT 2.01
4.464 ACRES TOTAL
3.173 ACRES TOTAL
MATCH LINE
STATEN ISLAND SOUND
ASSESSMENT M
CITY OF PERTH A
MIDDLESEX COUN
SCALE 1"=50
LOUIS P. BOOZ
CITY ENGINEER
PERTH AMBOY

REFERENCE NO. 3

J030-RP
Rev. No. 0

SLF-3/30/92

FINAL DRAFT
ENVIRONMENTAL PRIORITIES INITIATIVE
PRELIMINARY ASSESSMENT REPORT
E L BETH LTD
PREPARED UNDER

WORK ASSIGNMENT NO. 019-2JZZ
CONTRACT NO. 68-W9-0051

MARCH 30, 1992

SUBMITTED BY:

CLAIRE BARUXIS
SITE MANAGER

GARY ROJEK
PROJECT MANAGER

DENNIS STAINKEN, Ph.D.
WORK ASSIGNMENT MANAGER

RONALD M. NAMAN
SUBCONTRACT OFFICE MANAGER

This Report was conducted
under the following
USEPA Documentation Procedure

Guidance for Performing Preliminary
Assessments Under CERCLA
Publication 9345.0-01A

SITE SUMMARY AND RECOMMENDATION

The E L Beth Ltd Site (E L Beth) is located off of High Street in a light industrial and residential area of Perth Amboy, Middlesex County, New Jersey. The property is bordered to the east by the Arthur Kill, and to the south, west, and north by industrial properties. The adjacent property to the south is also a CERCLIS site. The EL Beth property consists of a 0.66-acre area of land and a pier, approximately 0.41 acre in size, that extends into the Arthur Kill (Ref. Nos. 2; 4, pp. 4, 5; 27; 32). A factory was located on the pier; the factory and pier, as well as company records, were destroyed in a May 1981 fire. The site has been inactive since the time of that fire (Ref. Nos. 3; 4, pp. 3, 4; 6; 7, pp. 8, 15). Figures 1 and 2 present a Site Location Map and a Site Map, respectively.

E L Beth was a foundry and secondary smelting operation that produced solder, casting metals, and lead alloys. Specifically, lead and tin scrap materials were melted and alloyed and cast into ingots. In addition, gold was recovered from electronic scrap (Ref. Nos. 2; 4, p. 5; 7, p. 15; 8, p. 5). The facility reportedly was established in October 1975 under the ownership of M.C. Canfield Sons; in late 1977 the present owners purchased the facility, and operated it as a subsidiary of M.C. Canfield Sons from 1978 until 1981. From 1981 to the present, the property has been in the names of the individual owners. The owners submitted a RCRA Part A permit application in November 1980 indicating that the facility would treat, store, or dispose of hazardous waste (Ref. Nos. 2; 4, p. 1; 8, p. 5).

In May 1981 an on-site fire caused by an overheated kiln destroyed the facility. An earlier fire had occurred on the same tax block in July 1980. The 1980 fire began at a property located southeast of both the E L Beth site and the adjacent CERCLIS site, and spread through much of the block. The 1980 fire spread to the CERCLIS site adjacent to E L Beth; it is not certain, however, whether this fire reached the E L Beth property (Ref. Nos. 28, 32). In March 1983 the owner requested that the facility be delisted as a treatment, storage, or disposal facility; the facility was delisted by the New Jersey Department of Environmental Protection (NJDEP) in February 1985 (Ref. Nos. 3; 5; 6; 7, p. 15). NJDEP inspectors noted in January 1985 and June 1990 that hazardous materials were not being stored on site at the times of those inspections (Ref. Nos. 4, 5, 7). No wastes in containers are presently stored at the E L Beth site. However, much rubble, including a few burned or rusted drums, is now present at the fire-damaged factory and pier (Ref. No. 8, p. 4; see also photographs in Attachment 1).

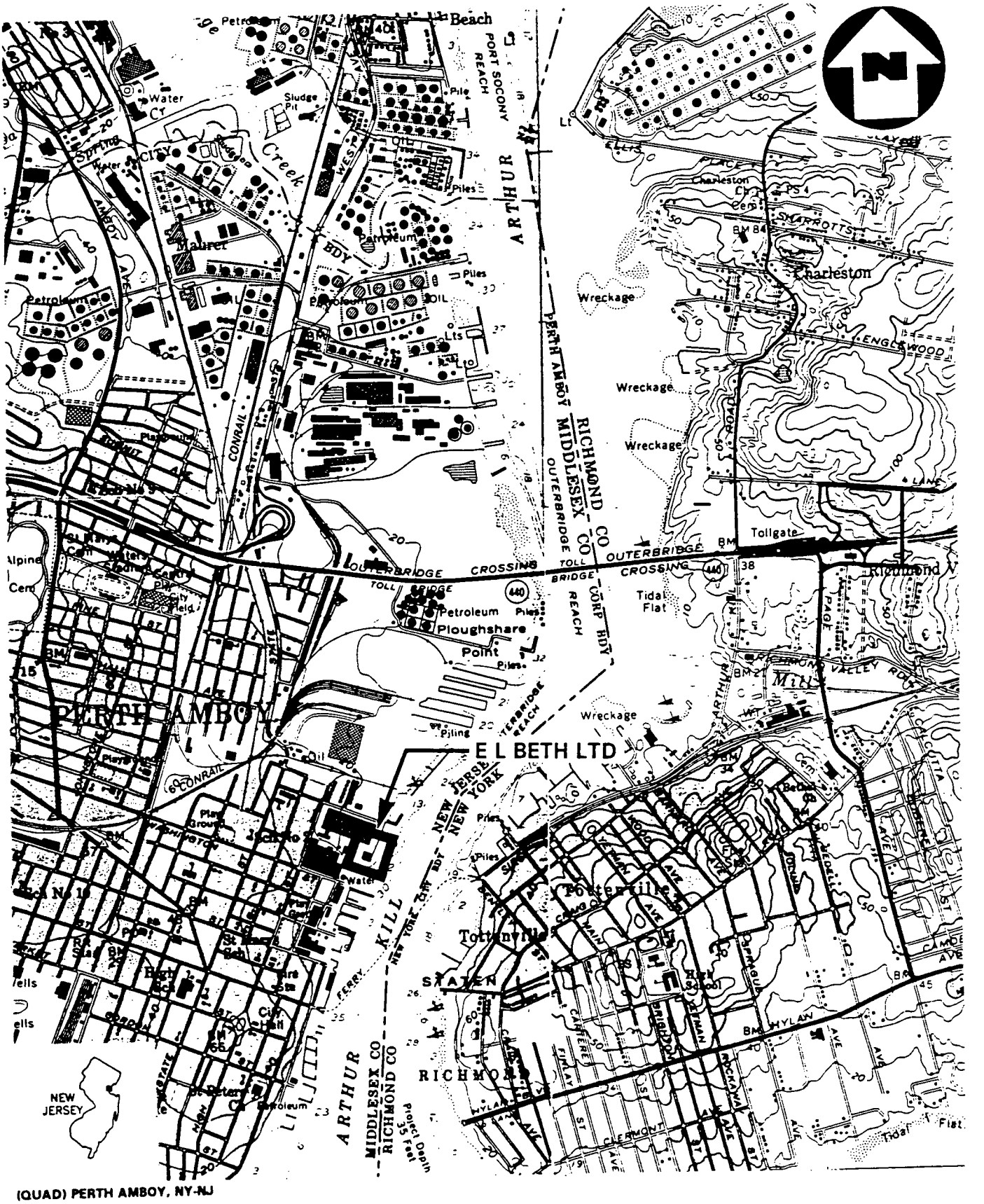
According to the facility's Hazardous Waste Permit Application, the wastes that were generated were corrosive materials and emission control dust/sludge from secondary lead smelting. "D000" waste was also reported. (It is not known what the applicant intended by the use of the designation "D000".) Wastes were reportedly contained in drums on concrete, outdoors and indoors (Ref. Nos. 2; 8, pp. 4, 5, 7; 29). During an on-site reconnaissance conducted by HALLIBURTON NUS Environmental Corporation on March 4, 1992, imprints of approximately 10 drums were noted in blacktop at the site, near the shoreline along the south property boundary (Ref. No. 8, pp. 4, 7; see also photograph No. 1P-12 in Attachment 1). In the November 1980 permit application, the owner reported an estimated annual quantity of 50,000 pounds of hazardous wastes in drums, and a process design capacity of 2,500 gallons (Ref. Nos. 2, 9). Available information indicates that no hazardous waste transportation manifests were generated by the facility after 1980. The owner informed an NJDEP inspector that wastes may have been transported to his new industrial facility in Edison, New Jersey prior to the 1981 fire. The NJDEP inspector noted that this action would have represented a violation of hazardous waste transportion regulations, but recommended no enforcement action. It is not known whether any hazardous wastes were present on site at the time of the May 1981 fire (Ref. Nos. 4, pp. 3, 4; 5; 28).

The former drum storage areas, and the large amount of debris now present at the fire-damaged factory and pier, represent a potential for contaminant migration to the Arthur Kill, which is considered to be a sensitive environment and in which limited fishing may be conducted (Ref. Nos. 21, 23 through 26). Contaminant migration to the Arthur Kill is favored by overland migration across the paved surface of the site, storm sewer discharge, and the proximity of the pier to the water surface. Particulates and other air contaminants potentially present could reach nearby worker and residential

SITE SUMMARY AND RECOMMENDATION (CONTD)

populations, and sensitive environments. It is not likely that contaminants would reach an aquifer that supplies potable water, as the site reportedly was paved prior to E L Beth activities. The nearest known potable water supply wells are located more than 2 miles from the site and are separated from the site by the Raritan River. During a HALLIBURTON NUS Environmental Corporation on-site reconnaissance that was conducted on March 4, 1992, it was noted that the site is not entirely fenced; the presence of graffiti indicates that outsiders have access to the property.

The E L Beth Site is recommended for a **SCREENING SITE INSPECTION** based upon the following: the possibility that wastes formerly stored in drums on site may have been released to the Arthur Kill; contaminants may be present in debris at the fire-damaged pier, and could readily migrate to the Arthur Kill; and the potential for air migration of contaminants that may be present in debris to affect nearby workers and residents. The Arthur Kill represents a concern with respect to both sensitive environments and human food chain considerations. Surface water and/or sediment sampling is recommended, as well as removal of the debris that is now present at the pier.



(QUAD) PERTH AMBOY, NY-NJ

SITE LOCATION MAP

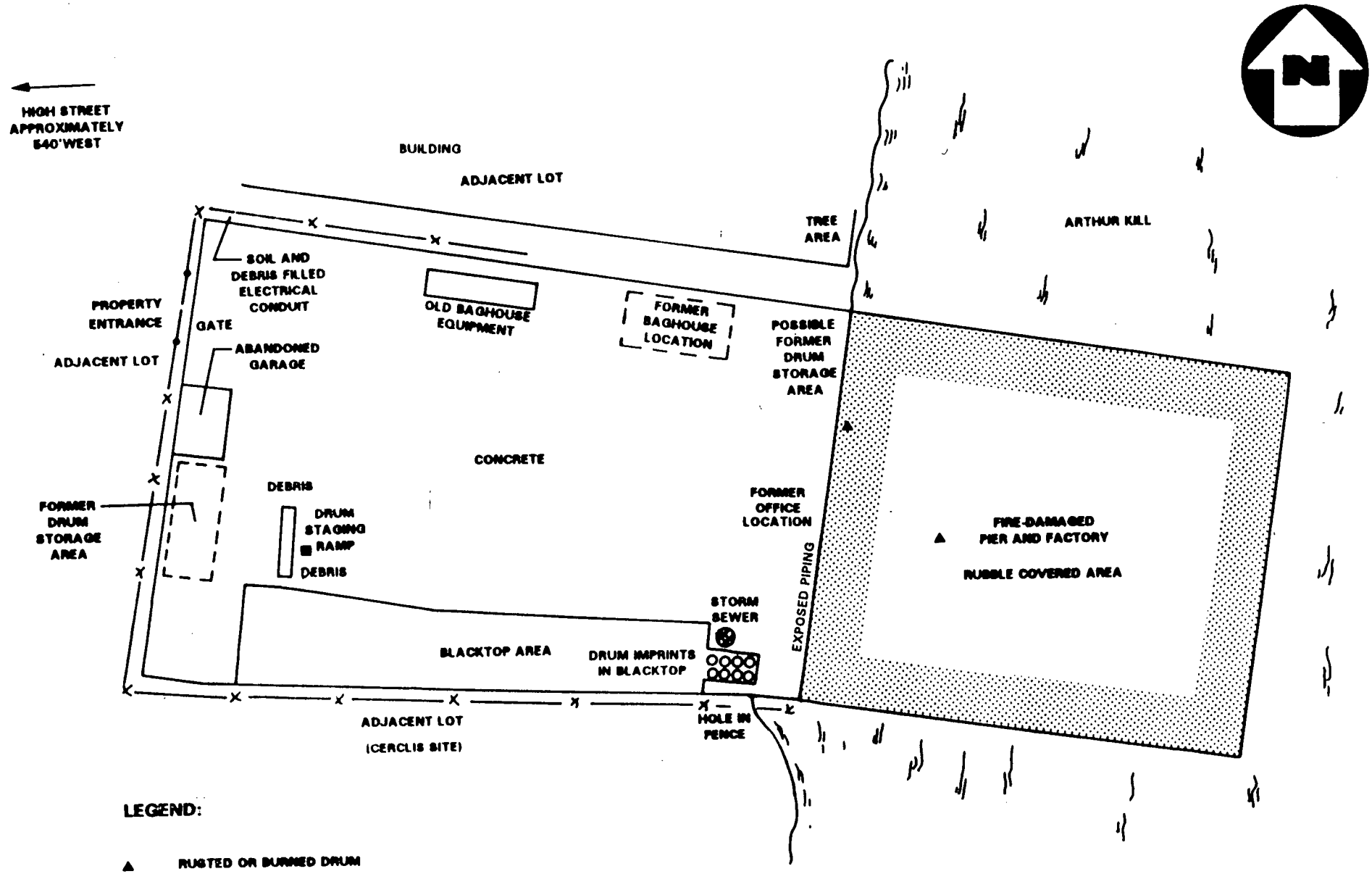
E L BETH LTD

PERTH AMBOY, N.J.

FIGURE 1

SCALE: 1" = 2000'

p. 5



SITE MAP

E L BETH LTD

PERTH AMBOY, N.J.

(NOT TO SCALE)

FIGURE 2

P6

SITE ASSESSMENT REPORT: SITE INSPECTION

PART I: SITE INFORMATION

1. Site Name/Alias E L Beth Ltd

   Street 500 High Street

   City Perth Amboy State New Jersey Zip 08861

2. County Middlesex County Code 023 Cong.Dist. 06

3. CERCLIS ID No. NJD067484923

4. Block No. 238 Lot No. 4 and 4.18

5. Latitude 40° 30′ 46" N Longitude 74° 15′ 34" W

   USGS Quad. Perth Amboy

6. Approximate size of site 1.07 acres

7. Owner Robert Silverman and Jack Silverman Tel. No. (201) 379-9447

   Street 23 Audubon Court

   City Short Hills State New Jersey Zip 07078

8. Operator (Same) Tel. No. _____

   Street _____

   City _____ State _____ Zip _____

9. Type of Ownership

   X Private _ Federal _ State

   _ County _ Municipal _ Unknown _ Other _____

10. Owner/Operator Notification on File

    X_ RCRA 3001 Date 10/9/80 _ CERCLA 103c Date _____

    _ None _ Unknown

11. Permit Information

Permit	Permit No.	Date Issued	Expiration Date	Comments
RCRA Part A	N/A	1980	N/A	Site delisted in 1985
"Other"	46339	Unknown	Unknown	Reportedly issued by NJDEP
"Other"	41104	Unknown	Unknown	Reportedly issued by NJDEP

12. Site Status

_ Active X Inactive _ Unknown

13. Years of Operation 1975 to 1981

14. Identify the types of waste sources (e.g., landfill, surface impoundment, piles, stained soil, above- or below-ground tanks or containers, land treatment, etc.) on site. Initiate as many waste unit numbers as needed to identify all waste sources on site.

(a) Waste Sources

Waste Unit No.	Waste Source Type	Facility Name for Unit
1	Containers	Drums
2	Scrap Metal or Junk Pile	Pier

(b) Other Areas of Concern

Identify any miscellaneous spills, dumping, etc. on site; describe the materials and identify their locations on site.

All areas of concern are discussed in Part II, Waste Source Information.

Ref. Nos. 1, 2, 6, 27, 29, 32, 33

15. Information available from

Contact Sandy Foose Agency U.S. EPA Tel. No. (908) 906-6808

Preparer Claire Baruxis Agency HALLIBURTON NUS Environmental Corporation

Date March 30, 1992

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following items.

Waste Unit 1 - Containers (Drums)

Source Type

_	Landfill	_	Land Treatment
_	Surface Impoundment	_	Chemical Waste Pile
X	Drums	_	Scrap Metal or Junk Pile
_	Tanks/Containers	_	Tailings Pile
_	Contaminated Soil	_	Trash Pile
_	Pile	_	Other

Description:

Waste material was reportedly stored in drums on concrete, indoors and outdoors. The facility's RCRA Part A submittal indicated drum storage near the western part of the site and also to the north, near the Arthur Kill. During the HALLIBURTON NUS on-site reconnaissance on March 4, 1992, the owner indicated that on-site drum storage was along the western boundary of the property, to the south of the garage. During the reconnaissance, drum imprints were noted in blacktop paving, along the south property boundary, next to the Arthur Kill; a storm sewer grating is located next to the drum imprints. According to the Hazardous Waste Permit Application that was filed by the facility owner, corrosive material and emission control dust/sludge from secondary lead smelting were generated as wastes at the facility. "D000" waste was also reported. (It is not known what the owner intended by the use of the designation "D000".) Releases of unknown hazardous materials may have occurred during the 1981 on-site fire.

Hazardous Waste Quantity

The owner reported 20,000 pounds of emission control dust/secondary lead smelting sludge, 10,000 pounds of corrosive waste, and 20,000 pounds of "D000" waste as an estimated annual quantity of waste stored in drums.

Hazardous Substances/Physical State

Metallic constituents would be present in the emission control dusts. Chromium, lead, and cadmium may have been constituents of the secondary lead smelting sludge. Corrosive material that reportedly included ammonium chloride may have been present as solidified material or sludge.

SWMU - Specific Conclusion

It is possible that waste materials may have been deposited on the ground surface and migrated to the Arthur Kill; additional information, such as surface water and/or sediment sample data, is needed before a determination can be made regarding any possible release of hazardous substances from this unit.

Ref. Nos. 2; 8, pp. 4, 5, 7, 11; 9; 29; 30

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following items.

Waste Unit 2 - Pier

Source Type

_	Landfill	_	Land Treatment
_	Surface Impoundment	_	Chemical Waste Pile
_	Drums	X	Scrap Metal or Junk Pile
_	Tanks/Containers	_	Tailings Pile
_	Contaminated Soil	_	Trash Pile
_	Pile	_	Other

Description:

The former manufacturing plant at the E L Beth facility was located on pilings (referred to herein as a pier) in the Arthur Kill. The pier location is designated as lot 4.18, in Block 238; this lot is approximately 0.41 acre in size. The manufacturing plant and pier were destroyed in a fire that originated in one of the facility's kilns in May 1981. Much rubble is now present at the pier. A few burned or rusted drums were noted among the rubble during the HALLIBURTON NUS on-site reconnaissance that was conducted on March 4, 1992. It appears that contaminants that may be associated with debris on the pier could migrate to the Arthur Kill as a result of surface water runoff, air migration, or possible collapse of the badly damaged structure.

Hazardous Waste Quantity

The quantity of waste that may currently be (or may have once been) present in debris at the pier is not known.

Hazardous Substances/Physical State

Hazardous substances that may be present include lead, chromium, and cadmium, which were once generated as wastes on site, and unknown substances that may have been generated during the 1981 fire. Such substances, if present, would be associated with particulate debris or other solids.

SWMU - Specific Conclusion

Based upon knowledge of wastes formerly generated at the facility, and the proximity of the plant and exposed debris to the Arthur Kill, it is possible that a release of contaminants such as lead, cadmium, or chromium, or of unknown fire-generated materials, may have occurred. Additional information, such as surface water and/or sediment sample data, is needed before a determination can be made regarding any possible release of hazardous substances from this unit.

Ref. Nos. 2; 4, p. 3; 8, pp. 4, 5; 27; 28; 29; 30

PART III. SAMPLING RESULTS

EXISTING ANALYTICAL DATA

No analytical data exist for the site.

PART IV. HAZARD ASSESSMENT

GROUNDWATER ROUTE

1. **Describe the likelihood of a release of contaminant(s) to the groundwater as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence.**

   It is not likely that site contaminants would reach the aquifer of concern. Paving that is present would favor overland contaminant migration to the Arthur Kill. Moreover, a confining unit of clay overlies the aquifer of concern.

   Ref. Nos. 8, pp. 4, 5; 10, pp. 15, 17, 18

2. **Describe the aquifer of concern; include information such as depth, thickness, geologic composition, areas of karst terrain, permeability, overlying strata, confining layers, interconnections, discontinuities, depth to water table, groundwater flow direction.**

   The site is located within the northern part of the New Jersey Coastal Plain physiographic province. The aquifer of concern is the Farrington Sand member of the Raritan Formation, the upper surface of which occurs at a depth of approximately 90 feet below sea level in the area of the site. Geologic units that overlie the Farrington Sand near the site include the Wisconsin Drift terminal moraine, which mantles the area, and the Woodbridge Clay. The Wisconsin Drift has a thickness of approximately 50 feet near the site, and consists of a mixture of red clay, sand, and gravel, and a few boulders. It is reported that in most areas this material is fairly impermeable (Ref. No. 10, pp. 3, 12, 15; Ref. No. 11, pp. 9, 10, 11, 15, 16, 17, 18; Ref. No. 12, p. 3; Ref. No. 13). It is likely that shallow groundwater flow in this material is influenced by tidal water. The Woodbridge Clay, an extensive, impervious confining layer that is approximately 40 feet thick in the area of the site, lies between the drift material and the Farrington Sand. The Woodbridge Clay consists of micaceous silts and clays; its permeability is estimated to be 10^{-7} cm/sec or less (Ref. No. 10, pp. 15, 17, Ref. No. 11, p. 17; Ref. No. 12, p. 3; Ref. No. 18).

   In Middlesex County the Farrington Sand consists of coarse- to fine-grained sand with lignite and pyrite, and locally it contains clay beds. The permeability of the Farrington Sand is 10^{-3} to 10^{-5} cm/sec. Its thickness and depth increase to the southeast. From its outcrop north of the site, to areas south of the Raritan River, it thickens from a feather edge to approximately 130 feet, and has a reported dip to the southeast of 45 to 60 feet per mile (Ref. No. 10, pp. 3, 10, 11, 13, 15; Ref. No. 11, pp. 6, 18, 19; Ref. No. 12, p. 3; Ref. No. 13; Ref. No. 18;). The direction of groundwater flow in the Farrington Sand is to the south; however, the hydraulic connection across the Raritan River is restricted to some extent by discontinuities in the formation and the presence of relatively impermeable mud (Ref. No. 10, p. 10; Ref. No. 11, pp. 10, 18, 19; Ref. No. 12, p. 7).

3. **What is the depth from the lowest point of waste disposal/storage to the highest seasonal level of the saturated zone of the aquifer of concern?**

   The lowest known point of waste storage is the paved surface on which drums were located; the estimated depth from this point of waste storage to the estimated potentiometric surface of the Farrington Sand Aquifer is approximately 50 to 60 feet.

   Ref. Nos. 8; 10, p. 19; 14

4. **Identify and determine the distance to and depth of the nearest well that is currently used for drinking purposes?**

Public water supply wells in the Borough of South Amboy are located between 2 and 3 miles south of the site and are separated from the site by the Raritan River. These wells draw from the Old Bridge Sand Aquifer at a depth of approximately 48 feet, and are currently reserved for emergency use only. Five of the Borough of Sayreville's public water supply wells, also located across the Raritan River and approximately 3.5 miles south of the site, are the nearest known wells that are currently used for drinking purposes. Two of the wells are screened at a depth of approximately 250 feet, and draw from the Farrington Sand Aquifer; three of the wells, screened at a depth of approximately 80 to 90 feet, draw from the Old Bridge Sand Aquifer. The Old Bridge Sand has not been identified in outcrop anywhere north of the Raritan River, and thus is not included in the description of the aquifer of concern. Hydraulic continuity across the Raritan River is restricted to some extent by aquifer discontinuities and relatively impermeable mud beneath the river bed.

Ref Nos. 10, p. 10; 14; 15; 16; 19

5. **If a release to groundwater is observed or suspected, determine the number of people that obtain drinking water from wells that are documented or suspected to be located within the contamination boundary of the release.**

It is not suspected that site contaminants would have reached the Farrington Sand, as the site is paved, and a confining geologic unit overlies the aquifer. Moreover, the distance to the nearest potable wells and hydraulic interference of the Raritan River further reduce the likelihood of contaminant migration to supplies obtained from the Farrington Sand Aquifer.

Ref. Nos. 8, pp. 4, 5; 10, pp. 17, 18; 11 through 13

6. **Identify the population served by wells that are not expected to be contaminated located within 4 miles of the site that draw from the aquifer of concern.**

Distance	Population
0 - ¼ mi	0
>¼ - ½ mi	0
>½ - 1 mi	0
>1 - 2 mi	0
>2 - 3 mi	8,500
>3 - 4 mi	12,000

State whether groundwater is blended with surface water, groundwater, or both before distribution.

The well field located at a distance of 3 to 4 miles from the site consists of two wells that draw from the aquifer of concern and three that draw from the more shallow Old Bridge Sand Aquifer. The water from the deep and shallow wells is mixed. Recharge water from the South River is also mixed with the well water.

Ref. No. 16

7. **Is there a wellhead protection area within 4 miles of the site?**
No; wellhead protection areas have not yet been delineated in the state of New Jersey, and there are no known wells used for potable purposes on Staten Island, New York, which is also located within 4 miles of the site.

Ref. Nos. 17, 19, 20

8. **Does a waste source overlie a designated or proposed wellhead protection area? If a release to groundwater is observed or suspected, does a designated or proposed wellhead protection area lie within the contaminant boundary of the release?**

Not applicable.

Ref. Nos. 17, 20

9. **Identify uses of groundwater within 4 miles of the site (i.e. private drinking source, municipal source, commercial, irrigation, unusable).**

Groundwater obtained within 4 miles of the site is used for industrial, commercial, and potable water supply purposes. The potable water wells are located across the Raritan River, a large water body.

Ref. No. 14, 15, 16

SURFACE WATER ROUTE

10. **Describe the likelihood of a release of contaminant(s) to surface water as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence.**

A release of contaminants to the Arthur Kill, located adjacent to the site, is suspected. Contaminants that may be associated with the wastes generated at the site include lead, chromium, and cadmium. Unknown contaminants may have also been generated or released during a 1981 on-site fire, which destroyed the facility. Much rubble remains at the fire-damaged pier, where the facility's manufacturing plant was located. A few rusted or burned drums were noted among the rubble during the HALLIBURTON NUS on-site reconnaissance that was conducted on March 4, 1992.

Ref. Nos. 2; 8, p. 4; 28; 29; 30

11. **Identify the nearest downslope surface water. If possible, include a description of possible surface drainage patterns from the site.**

The Arthur Kill adjoins the land portion of the site and is located beneath the pier on which the manufacturing plant was located. The site is very level, but surface drainage would be expected to flow to the Arthur Kill as a result of flow over the paved surface and discharge through the storm sewer that is present. During the HALLIBURTON NUS on-site reconnaissance that was conducted on March 4, 1992, drum imprints were noted in an area of blocktop paving located next to the Arthur Kill; a storm sewer grating is also located next to the drum imprints. Drainage also flows through the pier, where much rubble is present, directly to the Arthur Kill.

Ref. Nos. 2; 8, pp. 4, 7, 11; 28

12. **What is the distance in feet to the nearest downslope surface water? Measure the distance along a course that runoff can be expected to follow.**

The Arthur Kill adjoins the land portion of the site and is located beneath the pier on which the manufacturing plant was located.

Ref. Nos. 2; 8, p. 4; 28

13. **Determine the type of floodplain that the site is located within.**

The site is primarily located within the 100-year flood boundary; a portion of the property is located within the 100-year to 500-year flood boundaries.

Ref. No. 22

14. **Identify drinking water intakes in surface waters within 15 miles downstream of the point of surface water entry. For each intake identify: the name of the surface water body in which the intake is located, the distance in miles from the point of surface water entry, population served, and stream flow at the intake location.**

Intake	Distance	Population Served	Flow (cfs)

There are no drinking water intakes along surface water within 15 miles downstream of the site.

Ref. Nos. 16, 21, 23

15. **Identify fisheries that exist within 15 miles downstream of the point of surface water entry. For each fishery specify the following information:**

Fishery Name	Water Body Type	Flow (cfs)	Saline/Fresh/Brackish
Arthur Kill	Coastal Tidal Water	Not Applicable	Saline
Raritan Bay	Coastal Tidal Water	Not Applicable	Saline
Raritan River	Coastal Tidal Water	Not Applicable	Brackish
Lower NY Bay	Coastal Tidal Water	Not Applicable	Saline
Sandy Hook Bay	Coastal Tidal Water	Not Applicable	Saline

Ref. Nos. 23, 25, 26

16. **Identify surface water sensitive environments that exist within 15 miles of the point of surface water entry. For each sensitive environment specify the following:**

Sensitive Environment	Water Body Type	Flow (cfs)	Wetland Frontage (miles)
Federally-listed endangered bird species (Arthur Kill, Raritan River)	Coastal Tidal Water	Not Applicable	
State-listed endangered fish species (Arthur Kill, Raritan River, Low New York Bay, Sandy Hook Bay)	Coastal Tidal Water	Not Applicable	
State-listed threatened or endangered breeding bird population. (Sandy Hook Bay)	Coastal Tidal Water	Not Applicable	
Wetland	Coastal Tidal Water	Not Applicable	6.3
Wetland (Federally Protected; Raritan River)	Coastal Tidal Water	Not Applicable	

Ref. Nos. 23, 24

17. **If a release to surface water is observed or suspected, identify any intakes, fisheries, and sensitive environments from question Nos. 12-14 that are or may be located within the contamination boundary of the release.**

Intake: Not Applicable

Fishery: Arthur Kill

Sensitive Environment:
- Federally-listed endangered bird species at Arthur Kill
- State-listed endangered fish species at Arthur Kill

Ref. Nos. 23 through 26

SOIL EXPOSURE PATHWAY

18. **Determine the number of people that occupy residences or attend school or day care on or within 200 feet of the site property.**

There are no residences, schools, or day care facilities on or within 200 feet of the site property.

Ref. No. 8, pp. 14, 15

19. **Determine the number of people that regularly work on or within 200 feet of the site property.**

It is estimated that no more than 100 people may work within 200 feet of the site property; a large warehouse is located within 200 feet of the site, and work is ongoing outdoors, next to the site.

Ref. No. 8

20. **Identify terrestrial sensitive environments on or within 200 feet of the site property.**

There are no known terrestrial sensitive environments on or within 200 feet of the site property.

Ref. Nos. 8, 23

AIR ROUTE

21. **Describe the likelihood of release of contaminants to air as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release define the supporting analytical evidence.**

It is suspected that a potential exists for release to air of particulates and other contaminants that may be present in debris at the fire-damaged factory. Unknown contaminants may have been generated during the on-site fire that occurred in 1981. Contaminants that may be associated with the wastes formerly generated include lead, chromium, and cadmium. During the HALLIBURTON NUS on-site reconnaissance that was conducted on March 4, 1992, ambient readings that were obtained during continuous air monitoring with an OVA and HNu did not significantly exceed background. Locations of above background readings include the following: at an opening in the concrete at the interface of the land-based portion of the site and the pier; from an open container labeled "roofing tar with asbestos" (apparently not associated with former site operations); and at an open container labeled "another pentanone

product", approximately 1 gallon in size.

Ref. No. 8, pp. 4, 9, 12, 13

22. **Determine populations that reside within 4 miles of the site.**

Distance	Population
0 - ¼ mi	279
>¼ - ½ mi	4,567
>½ - 1 mi	19,400
>1 - 2 mi	19,821
>2 - 3 mi	25,530
>3 - 4 mi	43,847

Ref. No. 31

23. **Identify sensitive environments, including wetlands and associated wetlands acreage, within ½ mile of site.**

0 - ¼ mile Sensitive Environments/Wetland Acreage	¼ - ½ mile Sensitive Environments/Wetland Acreage
• Possible presence of federally-listed endangered bird species and state-listed endangered fish species.	• Possible presence of federally-listed endangered bird species and state-listed endangered fish species. • Approximately 2.3 acres of wetland

Ref. Nos. 23, 24

24. **If a release to air is observed or suspected, determine the number of people that reside or are suspected to reside within the area of air contamination from the release.**

Approximately 280 people live within 0.25 mile of the site.

Ref. No. 31

25. **If a release to air is observed or suspected, identify any sensitive environments, listed in question No. 23, that are or may be located within the area of air contamination from the release.**

The potential exists for the presence of a federally-listed endangered bird species and a state-listed endangered fish species within 0.5 mile of the site, and approximately 2.3 acres of wetland are present within 0.5 mile of the site. The potential distance of the migration of particulates that might remain from site operations is not known.

Ref. Nos. 8; 23; 24

ATTACHMENT 1

EXHIBIT A

PHOTOGRAPH LOG

E L BETH LTD
PERTH AMBOY, NEW JERSEY

ON-SITE RECONNAISSANCE: MARCH 4, 1992

PHOTOGRAPH INDEX

E L BETH LTD
PERTH AMBOY, NEW JERSEY
MARCH 4, 1992

ALL PHOTOGRAPHS TAKEN BY CLAIRE BARUXIS

PHOTO NUMBER	DESCRIPTION	TIME
1P-1, 1P-3	Photograph taken from the southeastern corner of the land portion of the site, facing west to northeast.	1045
1P-4, 1P-5	Photograph taken from the southeastern corner of the land portion of the site facing north.	1045
1P-6, 1P-7, 1P-8	View of the fire damaged factory and pier along the Arthur Kill, at the E L Beth site.	1048
1P-9	Closer view of the fire-damaged pier.	1050
1P-10	Closer view of another part of the fire-damaged pier, taken from the land portion of the site.	1051
1P-11	Photograph of the location of OVA reading, at the interface of the pier and the land portion of the site.	1055
1P-12	Photograph of a storm sewer grating, blacktop area with drum imprints, and broken fencing, taken facing the southeastern corner of the land portion of the site.	1058
1P-13	Photograph of the on-site conduit that contains soil and debris, and the adjacent property along the northern border of the E L Beth site, taken facing northeast.	1105
1P-15	Photograph of debris and the former garage at the site, taken facing west.	1112
1P-16	Photograph facing southeast, of the blacktop paving along the southern border of the site. A CERCLIS site borders the E L Beth property to the south.	1115
1P-17	Photograph of debris and the former drum staging ramp at the site, taken facing west.	1117
1P-18	A former on-site drum storage location along the western border of the property, next to the garage.	1119
1P-19	Photograph of debris and an overturned can at the former drum staging ramp. The label on the can describes the contents as "roofing tar with asbestos", and "check-a-leak plastic roof cement". An OVA reading and an HNu reading were obtained at the overturned can.	1120

E L BETH LTD
PERTH AMBOY, NEW JERSEY
MARCH 4, 1992

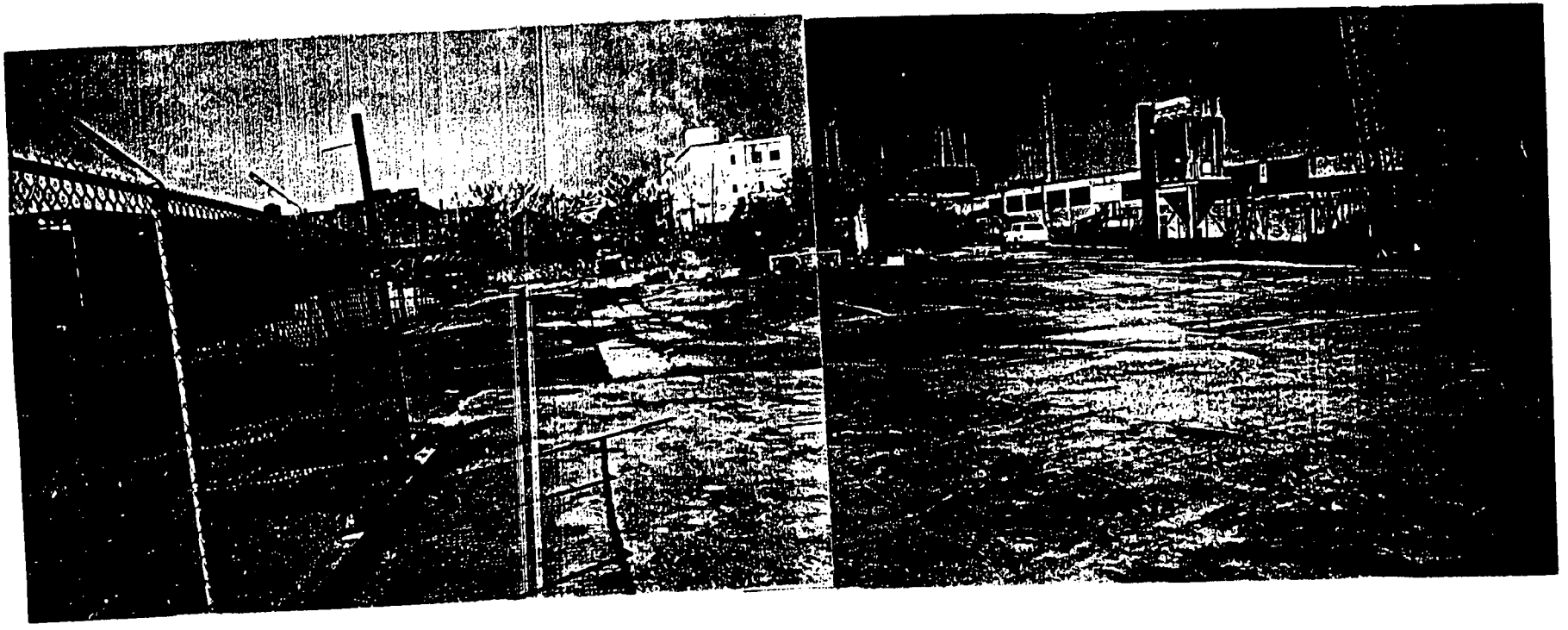
ALL PHOTOGRAPHS TAKEN BY CLAIRE BARUXIS

PHOTO NUMBER	DESCRIPTION	TIME
1P-22	Photograph of the entrance to the properties at 500 High Street, taken from the street.	1150

p. 22

PHOTOGRAPH LOG

E L BETH LTD
PERTH AMBOY, NEW JERSEY



1045

1P-1, 1P-3 March 4, 1992
Photograph taken from the southeastern corner of the land portion of the site, facing west to northeast.

p23

PHOTOGRAPH LOG

E L BETH LTD
PERTH AMBOY, NEW JERSEY

1P-4, 1P-5 March 4, 1992 1045
Photograph taken from the southeastern corner of the land portion of the site facing north.

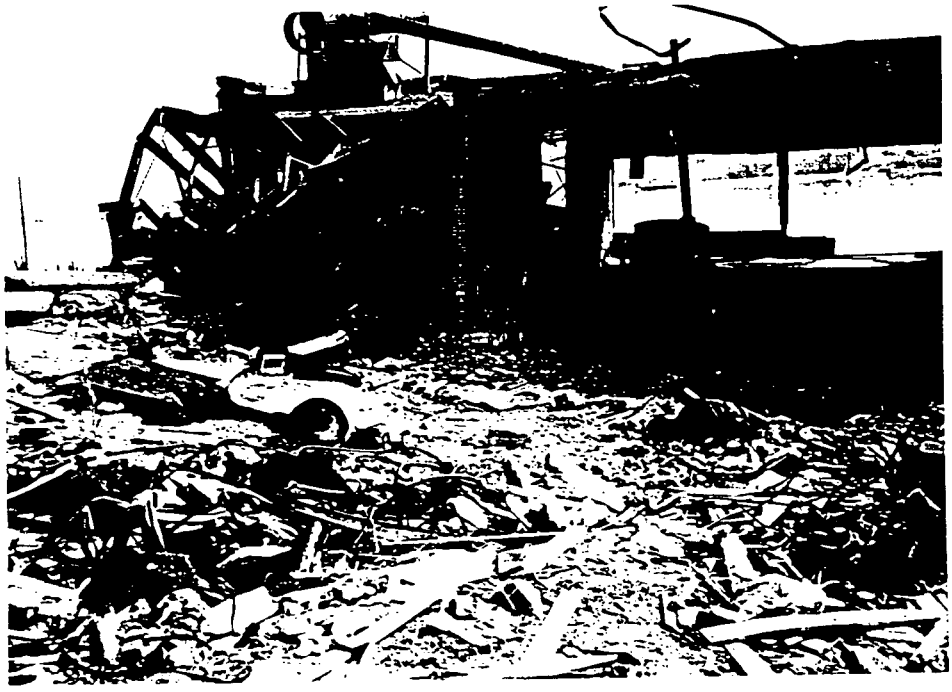
E L BETH LTD
PERTH AMBOY, NEW JERSEY

1P-6, 1P-7, 1P-8 March 4, 1992 1048
View of the fire damaged factory and pier along the Arthur Kill, at the E L Beth site.

PHOTOGRAPH LOG

E L BETH LTD
PERTH AMBOY, NEW JERSEY

1P-9 March 4, 1992 1050
Closer view of the fire-damaged pier.



1P-10 March 4, 1992 1051
Closer view of another part of the fire-damaged pier, taken from the land portion of the site.

PHOTOGRAPH LOG

E L BETH LTD
PERTH AMBOY, NEW JERSEY

1055

1P-11 March 4, 1992
Photograph of the location OVA reading, at the interface of the pier and the land portion of the site.

1058

1P-12 March 4, 1992
Photograph of a storm sewer grating, blacktop area with drum imprints, and broken fencing, taken facing the southeastern corner of the land portion of the site.

PHOTOGRAPH LOG

E L BETH LTD
PERTH AMBOY, NEW JERSEY

1105

1P-13 March 4, 1992
Photograph of the on-site conduit that contains soil and debris, and the adjacent property along the northern border of the E L Beth site, taken facing northeast.

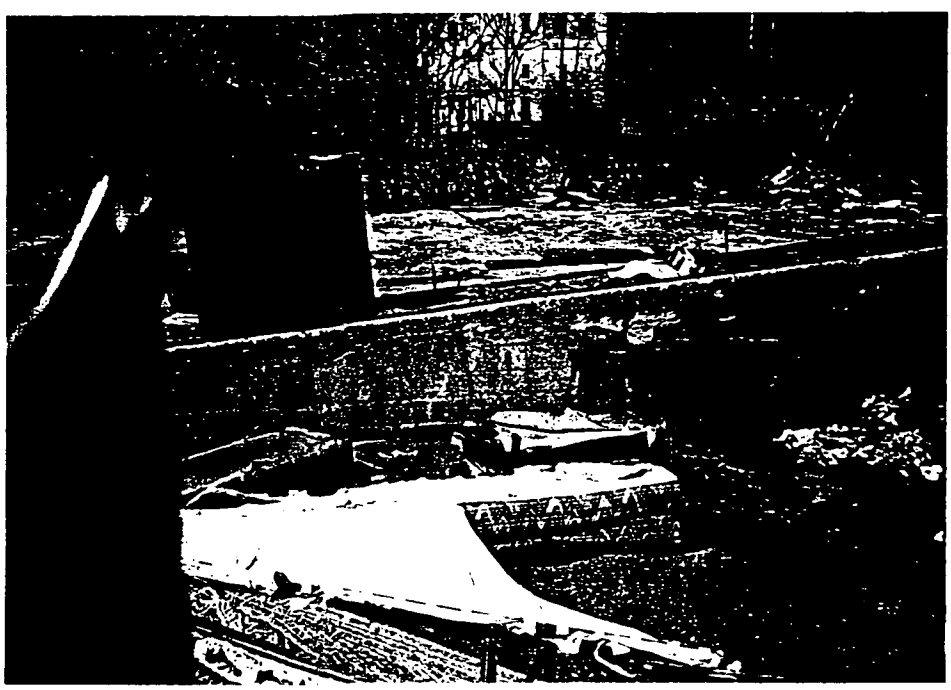
1112

1P-15 March 4, 1992
Photograph of debris and the former garage at the site, taken facing west.

PHOTOGRAPH LOG

E L BETH LTD
PERTH AMBOY, NEW JERSEY

1P-16 March 4, 1992 1115
Photograph facing southeast, of the blacktop paving along the southern border of the site. A CERCLIS site borders the E L Beth property to the south.



1P-17 March 4, 1992 1117
Photograph of debris and the former drum staging ramp at the site, taken facing west.

PHOTOGRAPH LOG

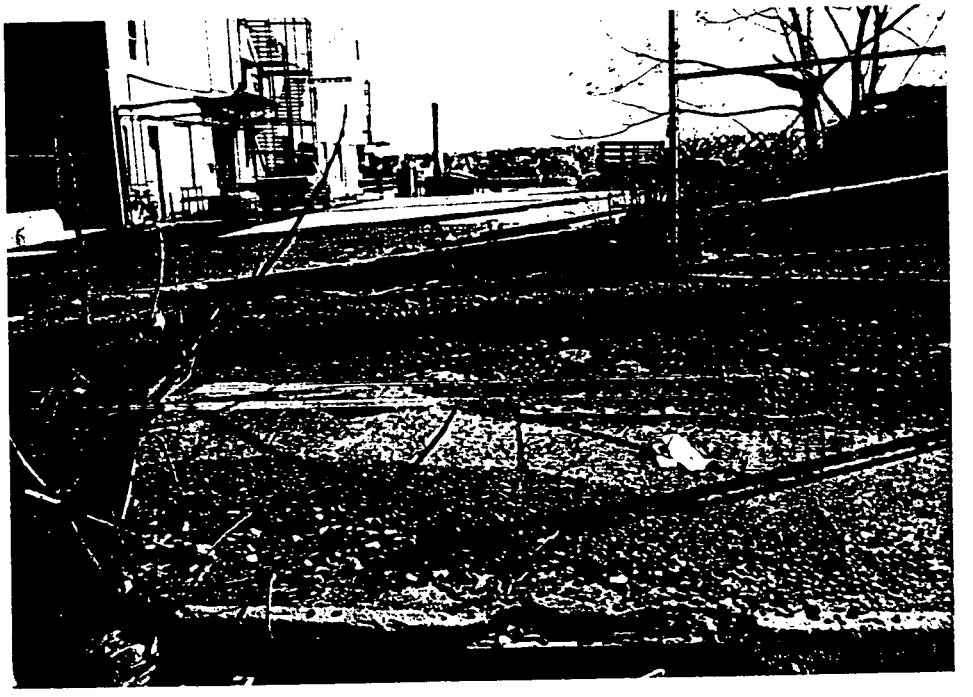
E L BETH LTD
PERTH AMBOY, NEW JERSEY

1P-18 March 4, 1992 1119
A former on-site drum storage location along the western border of the property, next to the garage.

1P-19 March 4, 1992 1120
Photographs of debris and an overturned can at the former drum staging ramp. The label on the can describes the contents as "roofing rar with asbestos:, and "check-a-leak plastic roof cement". An OVA reading and an HNu reading were obtained at the overturned can.

PHOTOGRAPH LOG

E L BETH LTD
PERTH AMBOY, NEW JERSEY



1150

1P-22 March 4, 1992
Photograph of the entrance to the properties at 500 High Street, taken from the street.

ATTACHMENT 2

REFERENCES

1. Acknowledgement of Notification of Hazardous Waste Activity (Verification). E L Beth. October 9, 1980.

2. U.S. EPA General Information Form 3510-1 Consolidated Permits Program, postmarked December 13,1980, and Hazardous Waste Permit Application 3510-3, dated November 18, 1980. E L Beth Ltd.

3. Letter from Robert M. Silverman, E.L. Beth Limited, to Frank Coolick, NJDEP Bureau of Hazardous Waste Engineering. March 14, 1983.

4. NJDEP Generator and TSD facility Inspection Form. E.L. Beth Ltd., EPA ID No. NJD067484923. January 16, 1985.

5. Memorandum from Linda Zaninelli to file through Fred Sickels (both of NJDEP), Subject: Phone Conversations. January 17, 1985.

6. Letter from Frank Coolick, NJDEP, Bureau of Hazardous Waste Engineering, to Robert Silverman, E.L. Beth. February 14, 1985.

7. NJDEP Hazardous Waste Management Facility Inspection Report. E.L. Beth Ltd., EPA ID No. NJD067484923. June 4, 1990.

8. Field Notebook Number HNUS005, E L Beth Ltd Site, NOMAD No. J030, On-site Reconnaissance, HALLIBURTON NUS Environmental Corporation, Iselin, N.J., March 4, 1992.

9. Project Note: Waste Quantity Reported for the E L Beth Site. By Claire Baruxis, HALLIBURTON NUS Environmental Corporation, March 27, 1992.

10. Geohydrology and Digital-Simulation Model of the Farrington Aquifer in the Northern Coastal Plain of New Jersey. U.S. Geological Survey Water-Resources Investigations 79-106, August 1979.

11. Barksdale, H.C. et al. The Ground-Water Supplies of Middlesex County, New Jersey. Special Report 8. State of New Jersey Water Policy Commission in cooperation with the U.S. Department of the Interior, Geological Survey, 1943.

12. Middlesex County 208 Area-Wide Waste Treatment Management Planning, Task 8 - Ground-Water Analysis. Geraghty and Miller, Inc., November 1976.

13. Geological Investigations of the Coastal Plain of Southern New Jersey. Part 2: A. Hydrogeology and the Coastal Plain. Edited by Claude M. Epstein. 2nd Annual Meeting of the Geological Association of New Jersey, sponsored by Geology Program, Stockton State College, Pomona, New Jersey.

14. NJDEP, Division of Water Resources, Well Record, Permit No. 26-7714, Stolt Terminals Inc., August 20, 1985.

15. U.S. Geological Survey Groundwater Site Inventory of wells in Middlesex County. U.S.G.S., Trenton, New Jersey, January 9, 1989.

16. Project Note: Potable water supply wells located within 4 miles of the E L Beth Site. By Claire Baruxis, HALLIBURTON NUS Environmental Corporation, March 26, 1992.

REFERENCES (CONTD)

17. Telecon Note: Conversation between Dan Van Abs, NJDEPE, and Kathy Campbell, HALLIBURTON NUS Environmental Corporation, February 14, 1992.

18. Hazard Ranking System; Final Rule, 40 CFR, Part 300, Federal Register, Vol. 55, No. 241, p. 51601, December 14, 1990.

19. Four Mile Vicinity Map based on U.S. Department of the Interior Geological Survey Topographic Maps, 7.5 minute series, "Perth Amboy Quadrangle, N.J.-N.Y.", 1956, photorevised 1981; "Aurthur Kill Quadrangle, N.Y.-N.J.", 1966, photorevised 1981; "Keyport Quadrangle, N.J.-N.Y.", 1954, photorevised 1970; "South Amboy Quadrangle, N.J.-N.Y.", 1954, photorevised 1981.

20. Geologic and Geohydrologic Reconnaissance of Staten Island, New York. U.S. Geological Survey Water-Resources Investigations Report 87-4048. 1988.

21. Surface Water Quality Standards, New Jersey Administrative Code 7:9-4.1 et seq., NJDEP, Division of Water Resources, August 1989.

22. Federal Emergency Management Agency, National Flood Insurance Program, Flood Insurance Rate Map, City of Perth Amboy, Middlesex County, New Jersey, Community Panel Number 340272 0001 C, May 1, 1984.

23. Fifteen Mile Surface Water Route Map, E.L. Beth Site. Based on U.S. Department of the Interior Fish and Wildlife Service National Wetlands Inventory Maps: "Perth Amboy, N.J.-N.Y.", 1976; South Amboy, N.J.-N.Y.-N.J.", 1976; "Authur Kill, N.Y.-N.Y., 1976; Keyport, N.J.-N.Y.", 1976; The Narrows, N.Y.", "Sandy Hook, N.J.-N.Y.". 1976

24. Project Note: Sensitive environments located along the 15-mile surface water route downstream of the E L Beth Site, Perth Amboy, New Jersey. By Claire Baruxis, March 24, 1992.

25. Telecon Note: Conversation between Mr. Robert Soldwedel, NJDEPE, and Claire Baruxis, HALLIBURTON NUS Environmental Corporation, November 18, 1991.

26. News Paper Article, "State circulates warnings on consuming certain fish", The Record, February 9, 1992.

27. Project Note: Lot and block number, and property acreage, E L Beth Site, Perth Amboy, New Jersey. By Claire Baruxis, March 27, 1992.

28. Telecon Notes:

- Conversation between Perth Amboy Fire Department representatives, and Claire Baruxis, HALLIBURTON NUS Environmental Corporation, March 24,1992.
- Conversation between Investigator Ritz, Middlesex County Prosecutor's Office, and Claire Baruxis, HALLIBURTON NUS Environmental Corporation, March 25, 1992.

29. Telecon Note: Conversation between Carol Surgens, Jones and Day, and Claire Baruxis, HALLIBURTON NUS Environmental Corporation, February 24, 1992.

30. 40 CFR, Part 261. Revised as of July 1, 1988.

REFERENCES (CONTD)

31. General Sciences Corporation, Graphical Exposure Modeling Systems (GEMS), Landover, Maryland, 1986.

32. U.S. EPA Superfund Program, Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS). Site/Event Listing, pp. 63, 65, and Site Alias Location Listing, pp. 80, 82. March 2, 1992.

33. Election Division, New Jersey Department of State, CN304, Trenton, N.J. Congressional Districts, January 1987.

REFERENCE NO. 1

EPA

ACKNOWLEDGEMENT OF NOTIFICATION OF HAZARDOUS WASTE ACTIVITY
(VERIFICATION)

This is to acknowledge that you have filed a Notification of Hazardous Waste Activity for the installation located at the address shown in the box below to comply with Section 3010 of the Resource Conservation and Recovery Act *(RCRA)*. Your EPA Identification Number for that installation appears in the box below. The EPA Identification Number must be included on all shipping manifests for transporting hazardous wastes; on all Annual Reports that generators of hazardous waste, and owners and operators of hazardous waste treatment, storage and disposal facilities must file with EPA; on all applications for a Federal Hazardous Waste Permit; and other hazardous waste management reports and documents required under Subtitle C of RCRA.

EPA I.D. NUMBER ➤ NJD067484923

E L BETH
500 HIGH ST
PERTH AMBOY NJ 08861

INSTALLATION ADDRESS ➤ 500 HIGH ST
PERTH AMBOY NJ 08861

EPA Form 8700-12B (4-80) 10/09/80

p. 36

REFERENCE NO. 2

(Fill-in areas are spaced for elite type, i.e., 12 characters/inch).

FORM 1 — GENERAL INFORMATION — EPA

ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

Form Approved OMB No. 158-R01

I. EPA I.D. NUMBER

F N J D 0 6 7 4 8 4 9

GENERAL INSTRUCTIONS

I. EPA I.D. NUMBER

II. FACILITY NAME

III. FACILITY MAILING ADDRESS

IV. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

Date Post

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any pollutant questions. Mark "X" in the box in the proper column if the supplemental form listed in the parenthesis follows the question. If the supplemental form is attached, if you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold-faced terms.

SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED
[illegible] which currently results in discharges to waters of the U.S.? (FORM 2A)		X	
C. Is this a concentrated animal feeding operation or aquatic animal production facility which currently results in discharges to waters of the U.S.? (FORM 2B)		X	
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3)	X		
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X	
L. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X	

SPECIFIC QUESTIONS	MARK 'X' YES	NO
[illegible] aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B)		X
D. Is this a proposed facility (other than those described in A, B, or C above) which will result in a discharge to waters of the U.S.? (FORM 2A)		X
F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X
H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, or by combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		X
J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X

III. NAME OF FACILITY

1 SKIP E L BETH LTD

IV. FACILITY CONTACT

A. NAME & TITLE (last, first, & title) — B. PHONE (area code & no.)

MCCABE THOMAS A PROJECT ENG'R 201 826 0800

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 500 HIGH STREET

B. CITY OR TOWN — C. STATE — D. ZIP CODE

PERTH AMBOY NJ 08861

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

500 HIGH STREET

B. COUNTY NAME

MIDDLESEX

C. CITY OR TOWN — D. STATE — E. ZIP CODE — F. COUNTY CODE (if known)

6 PERTH AMBOY NJ 08861

II. SIC CODES (4-digit, in order of priority)

A. FIRST		B. SECOND	
3341	(specify) SECONDARY SMELTING & REFINING NON FERROUS	7	(specify)
	(specify)		(specify)

VIII. OPERATOR INFORMATION

A. NAME	B. Is the name [illegible]
E L BETH LTD	

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)		D. PHONE (area code & no.)
F = FEDERAL M = PUBLIC (other than federal or state)	P (specify)	A 201 826 080

E. STREET OR [illegible]			
500 HIGH STREET			

F. CITY OR TOWN	G. STATE	H. ZIP CODE	IX. INDIAN LAND
PERTH AMBOY	NJ	08861	[illegible] facility [illegible] ☐ YES ☒ NO

X. EXISTING ENVIRONMENTAL PERMITS

[illegible]		[illegible] from Proposed Sou[illegible]	
[illegible] Injection [illegible]		E. OTHER [illegible]	
9 U		46339	(specify) N.J. DEP.
C. RCRA (Hazardous Wastes)		E. OTHER (specify)	
9 R		41104	(specify) N.J. DEP.

XI. MAP

Attach [illegible] application [illegible] map of the area extending to at least one mile [illegible] property boundaries. The [illegible] the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in [illegible] requirements. F9: A/51

XII. NATURE OF BUSINESS (provide a brief description)

TIN & LEAD SCRAP ARE MELTED AND ALLOYED AND CAST INTO INGOTS.

ELECTRONIC SCRAP IS PROCESSED TO RECOVER GOLD CONTENT.

F9: A/51

DEC 3 [illegible] 8 AM '80
NEW YORK, N.Y. 10007

XIII. CERTIFICATION (see instructions)

[illegible] attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
RICHARD STEINBERG PRESIDENT	[signature]	

COMMENTS FOR OFFICIAL USE ONLY

C

Form 3510-1 (6-80) REVERSE

(fill-in areas are spaced for elite type, i.e., 12 [illegible] characters/inch).

FORM 3 RCRA

EPA

ENVIRONMENTAL PROTECTION AGENCY

HAZARDOUS WASTE PERMIT APPLICATION

Consolidated Permits Program

(This information is required under Section 3005 of RCRA.)

Form Approved OMB No. 158-S80

I. EPA I.D. NUMBER: F N J 0 0 6 7 4 8 4

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below (mark one box only) to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your EPA I.D. Number in Item I above.

A. FIRST APPLICATION (Place an "X" below and provide the appropriate date)

☒ 1. EXISTING FACILITY (See instructions for definition of "existing" facility. Complete Item below.)

FOR EXISTING FACILITIES, PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED (use the boxes to the left)

C	YR.	MO.	DAY
8	75	10	30

☐ 2. NEW FACILITY (Complete Item below)

FOR NEW FACILITIES, PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR EXPECTED TO BEGIN

YR.	MO.	DAY

B. REVISED APPLICATION (Place an "X" below and complete Item I above)

☐ 1. FACILITY HAS INTERIM STATUS

☐ 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes the process(es) to be used at the facility. If more lines are needed, enter the code(s) in the space provided. If a process will be used at the facility but is not included in the list of codes below, describe the process (including its design capacity) in the space provided on the form (Item III-C).

B. PROCESS DESIGN CAPACITY –

1. AMOUNT – Enter the amount.

2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER (barrel, drum, etc.)	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D79	GALLONS PER DAY
LANDFILL	D80	ACRE-FEET (the volume that would cover one acre to a depth of one foot) OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS OR LITERS
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR
OTHER (Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided on the form (Item III-C))	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE

UNIT OF MEASURE	CODE	UNIT OF MEASURE	CODE	UNIT OF MEASURE	CODE
GALLONS	G	TONS PER HOUR	T	HECTARE-METER	H
LITERS	L	METRIC TONS PER HOUR	D	ACRES	A
CUBIC YARDS	Y	GALLONS PER HOUR	E	HECTARES	P
CUBIC METERS	C	LITERS PER HOUR	[illegible]		
GALLONS PER DAY	U				

EXAMPLE FOR COMPLETING ITEM III (shown in line numbers X-1 and X-2 below). A facility has two storage tanks, one tank can hold 1,200 gallons and another can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C DUP

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	2. UNIT OF MEASURE (enter code)
X-1	S02	600	G
X-2	T03	20	T
1	S01	2500000	G
2	~~S01~~	~~[illegible]~~	

0.40

Continued from the front.

III. PROCESSES *(continued)*

C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES *(code "T04")*. FOR EACH PROCESS ENTERED HE[illegible] INCLUDE DESIGN CAPACITY.

DEC 3 11 58 AM '80
ENVI[illegible] [illegible]TION
[illegible]ENCY
NEW YORK, N.Y. 10007

IV. DESCRIPTION OF HAZARDOUS WASTES

A. **EPA HAZARDOUS WASTE NUMBER** – Enter the four–digit number from 40 CFR, Subpart D [illegible] handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four–digit number(s) from 40 CFR, Subpart C that describes the charac[illegible]tics and/or the toxic contaminants of those hazardous wastes.

B. **ESTIMATED ANNUAL QUANTITY** – For each listed waste entered in column A estimate the quantity of that waste that will be handled on an an[illegible] basis. For each characteristic or toxic contaminant entered in column A estimate the total annual [illegible] of all the non–listed [illegible] which possess that characteristic or contaminant.

C. **UNIT OF MEASURE** – For each quantity entered in column B enter the unit of measure code. [illegible] codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	[illegible]
POUNDS	P	KILOGRAMS	[illegible]
TONS	T	METRIC TONS	[illegible]

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking i[illegible] account the appropriate density or specific gravity of the waste.

D. **PROCESSES**

1. PROCESS CODES:

For listed hazardous waste: For each listed hazardous waste entered in column A select the code(s) from the list of process [illegible] contained in Item [illegible] to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non–listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, [illegible] contained in Item III to indicate all the processes that will be used to store, [illegible]

Note: Four spaces are provided for entering process codes. If more are needed: (1) [illegible] the first three [illegible] described above, [illegible] extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code(s).

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER – Hazardous wastes that can be described more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B,C, and D [illegible] quantity of the waste and describing all the processes to be used to [illegible] total ann[illegible]
2. In column A of the next line enter the other EPA Hazardous Waste Number that can [illegible] "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number [illegible]

EXAMPLE FOR COMPLETING ITEM IV *(shown in line number [illegible])*

[illegible] per year of chrome shavings from leather tanning and finishing operation [illegible] are corrosive only and there will be an estimated 200 pounds per year of each waste [illegible] 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be [illegible]

LINE NO.	A. EPA HAZARD. WASTE NO. *(enter code)*	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE *(enter code)*	[illegible]
X-[illegible]	[illegible]	900	[illegible]	[illegible]
X-2	D002	400	P	T0[illegible]
[illegible]	[illegible]001	100	[illegible]	[illegible]
X-4	D002			

Included with above

Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S800

EPA I.D. NUMBER (enter from page 1): W N J 0 0 6 7 4 8 4 9 2 3 2 1

FOR OFFICIAL USE ONLY: W DUP 3 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT (enter code)	D. PROCESS CODES (enter)	E. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	K069	20,000000	P	S01	
2	D002	10,000000	P	S01	
3	D000	20,000000	P	S01	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					

Continued from the front.

IV. DESCRIPTION OF HAZARDOUS WASTE (continued)

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

NEW YORK, N.Y. 10007

F6: A/55 F6: A/56

EPA I.D. NO. (enter from page 1)

F N J D 0 6 7 4 8 4 9 2 3 T/A C 3 6

V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility (see instructions for more detail).

VI. PHOTOGRAPHS

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas (see instructions for more detail).

VII. FACILITY GEOGRAPHIC LOCATION

LATITUDE (degrees, minutes, & seconds)	LONGITUDE (degrees, minutes, & seconds)
40 30 46 0	074 15 34 0

VIII. FACILITY OWNER

☐ A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator listed in Section VIII on Form 1, complete the following:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. (area code)
E M.C. CANFIELD SONS	201-688-5

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE
F 1000 BRIGHTON	G UNION	NJ	

IX. OWNER CERTIFICATION

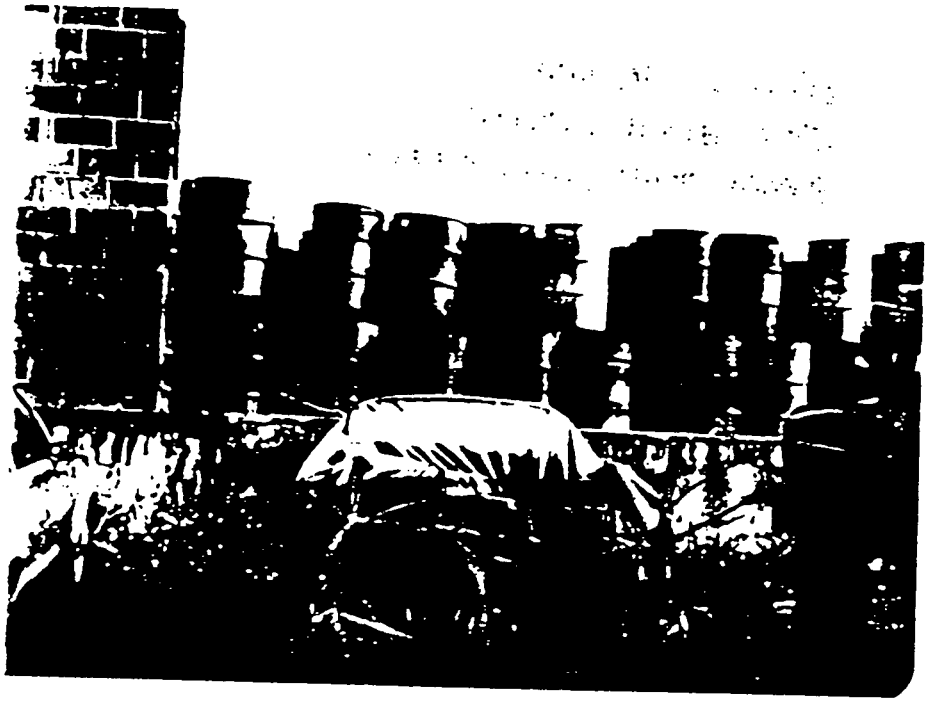
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME (print or type)	B. SIGNATURE	C. DATE SIGNED
ROBERT M. SILVERMAN	[signature]	11/18/80

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

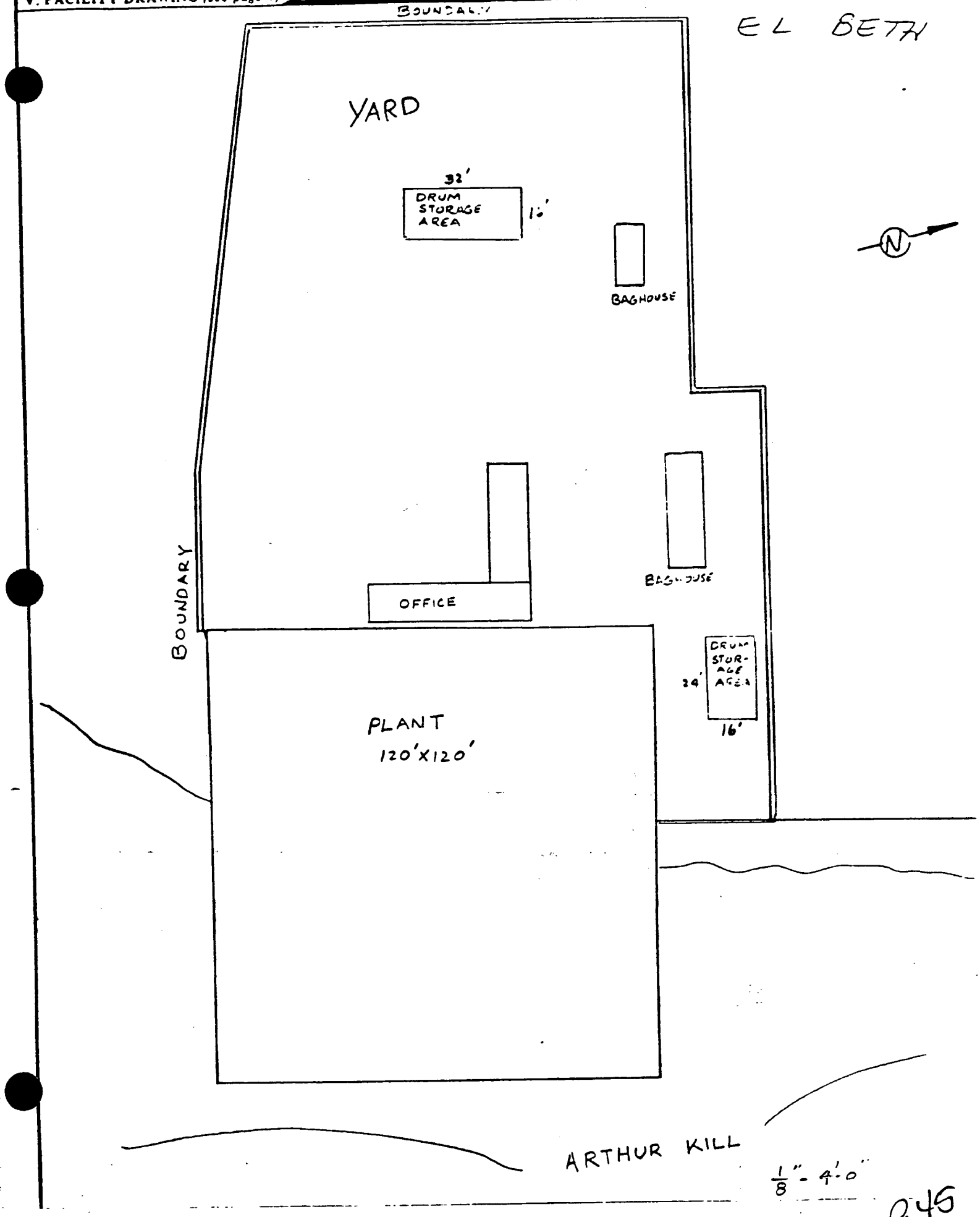
A. NAME (print or type)	B. SIGNATURE	C. DATE SIGNED
RICHARD STEINBERG	[signature]	11/18/80



Continued from page 4. NJD067484423

Form Approved OMB No. 158-S80004

V. FACILITY DRAWING *(see page 4)*



REFERENCE NO. 3

Received 1-11-85
From: R. Silverman

E. L. BETH LIMITED

P.O. Box 1769
Union, NJ 07083
201-688-9011

~~500 HIGH STREET~~
~~PERTH AMBOY, NJ 08861~~
~~(201) 826-0800~~

CABLE ADDRESS: BETHMETAL, PERTH AMBOY
TELEX No. 844535

March 14, 1983

Mr. Frank Coolick, Chief
Bureau of Hazardous Waste
Engineering
32 E. Hanover Street
Trenton, NJ 08625

SUBJECT: Annual Report

REF: NJD067484923
500 High Street, Perth Amboy, NJ 08861

Dear Mr. Coolick:

Please delist the above facility.

This plant has been closed since May 1981. There has been no activity since then and there is no storage of hazardous waste at this location.

Sincerely,

E. L. BETH LIMITED

Robert M. Silverman
Vice President

RMS/fh

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REFERENCE NO. 4

12-03

NJDEP INSPECTION FORM

Report Prepared for:

Generator ☒
Transporter ☐
HWM (TSD) facility ☒

} see comments

Facility Information

Name: E.L. Beth Ltd.

Address: 500 High Street
Perth Amboy, N.J. 08861

Lot: _____ Block: _____

County: Middlesex

Phone: 201-688-5050 (Silverman's Office)

EPA ID#: NJD067484923

Date of Inspection: 1-16-85

Participating Personnel

State or EPA personnel: L. Zaninelli - N.J.D.E.P.

Facility personnel: Robert Silverman - Vice President
Robert McIntyre - Plant Ma
of Edison site

Report Prepared by Name: L. Zaninelli

Region: Central

Telephone #: 609-292-5560

Reviewed by: [signature]

Date of Review: 1/17/85

FACILITY NAME: E.L. Beth Ltd.

ADDRESS: 500 High St.
Perth Amboy, N.J. - 08861

COUNTY: Middlesex

EPA ID #: NJD067484923

TIME IN: 0930hars

TIME OUT: 0955hars

DATE OF INSPECTION: 1-16-85

PHOTOS TAKEN ☒ YES ☐ NO

If yes, how many? 5

SAMPLES TAKEN ☐ YES ☒ NO NUMBER OF SAMPLES _____

NJDEP ID # _____

MANIFESTS REVIEWED ☐ YES ☒ NO

Number of manifests in compliance _____

Number of manifests not in compliance _____

List manifest document numbers of those manifests not in compliance.

Summary of Findings

Facility Description and Operations

E.L. Beth Ltd. has not been in operation since 5/81. According to Mr Robert Silverman, Vice President, a fire occurred on 5/15/81 collapsing the building and destroying the site. At that time, they were just starting up operations at another E.L. Beth Ltd. site located at 321 Meadow Road in Edison which is registered with the State as a generator and TSD with an EPA ID# NJD980594022. All salvagable items from the Perth Amboy site were taken to the Edison site.

The E.L. Beth site located in Perth Amboy was purchased by Mr. Silverman in 1978. According to same, the only waste generated was baghouse dust from processes, and TSD status pertained to >90 day drum storage. I questioned him as to any waste stored on-site at the time of the fire, and its' disposition. He stated that he was unsure if any waste (baghouse dust) was on-site at

Summary of Findings

Facility Description and Operations

that time per se, but if there was, it would have been taken to the Edison site. I informed him that if any waste had been taken to the Edison site, he would be in violation of N.J.A.C. 7:26-7.5(c)1 - transporting waste without being permitted to do so. He also indicated that DEP-DSM representative, Edwin Liew - of the Hazardous Site Mitigation Administration, had been on-site on various occasions and site approval was given in regard to cleaning up the area after the fire. It must be noted that the site is located adjacent to the Dune Marine site, which is located due south of the EL Beth Ltd property. I questioned Mr Silverman on any manifests generated by EL Beth, and he indicated that the trailer which housed all of this information was destroyed by the fire. I was also informed that the State was informed of closure and request to delist as a generator and TSD facility. (see attached letter sent to Dum Engineering

Summary of Findings

Facility Description and Operations

representative Frank Coolick dated 3/14/83). A tour of the site was then conducted. (see attached map)

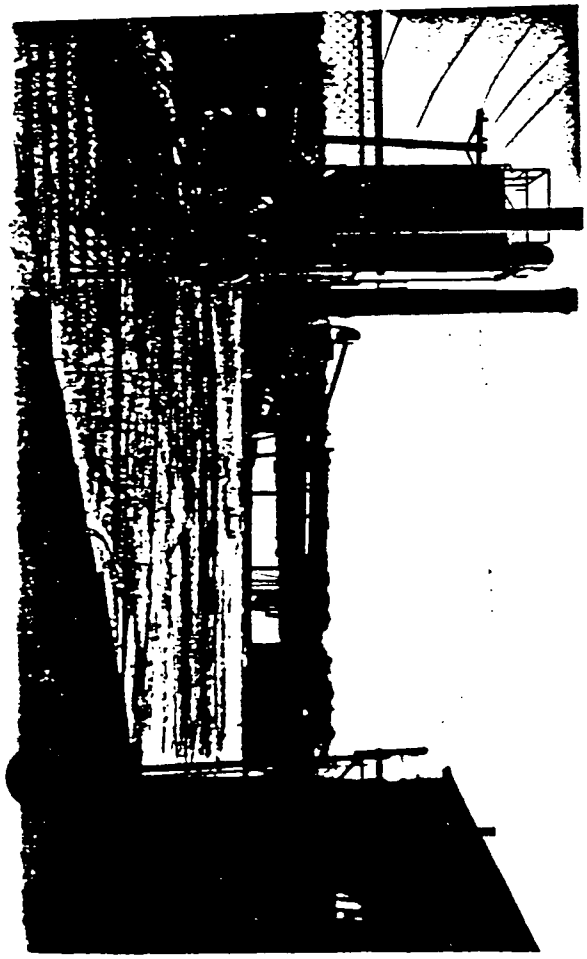
The entire site is situated on concrete. Located on the north side of the property near the fence is what appears to be some remaining process equipment (dust collector), and to the south of the main entrance, the remains of a shed (partial brick) and a sloping concrete platform. Due East located by the Arthur Kill River, is a smoke-stack, and the remains of a process building (structure) with some cardboard refuse (boxes/rubb) observed. No apparent waste could be observed, and the site basically looked barren.

While operating E.L. Roth Ltd. conducted a foundry operation for secondary metals consisting of the manufacturing of sodder and casting metals as well as tin-lead alloys. Metals are received in various forms from brokers and companies.

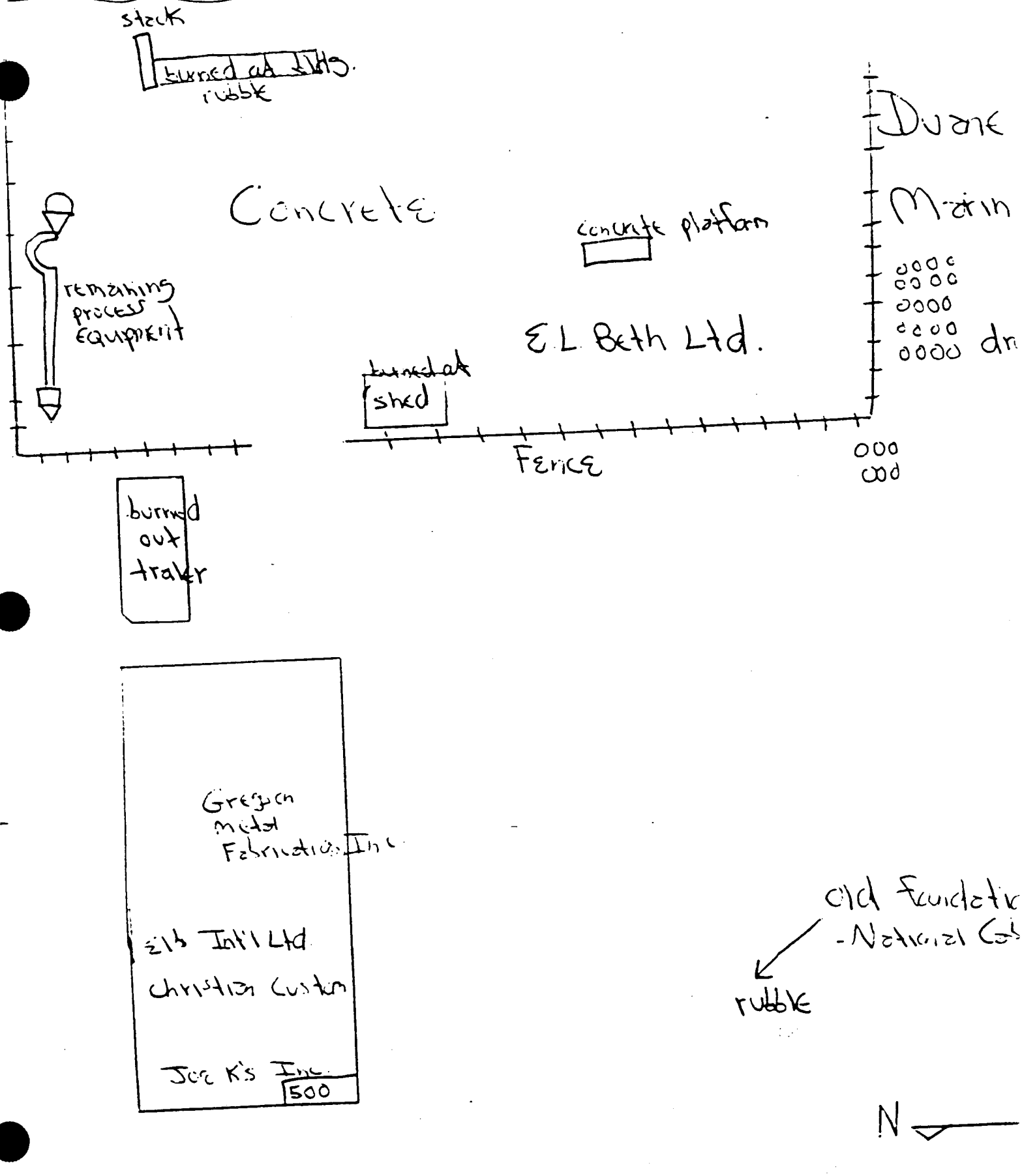
Summary of Findings

Facility Description and Operations

Raw materials are then placed into Kettles. The Kettles are hooded and all particulates are accumulated and fed into a baghouse system (3) baghouses. The solder and emission control dust are then stored in bags and put into drums. From the Kettles melted material is alloyed and assayed and cast into various solid forms as per customer specifications (bars, ingots, pigs, saws, and bags). Product was then sold to various customers such as General Motors, U.S Motors, and Delco.



Arthur Fill River



High Street

REFERENCE NO. 5

TO: File thru Fred Sickels

FROM: Chris Zainelli

DATE: 1-17-85

SUBJECT: Phone Conversations -

1-11-85 - Contacted Dum-Huston section and spoke with Fred Scazzetti to see if any manifest records could be found on E.L. Beth. Nothing could be found after 11/19/80, and prior to that time, the manifest # is needed to get information from micro-film.

1-16-85 - Contacted Edwin Lieu - HSMA. He stated that he had been on the E.L. Beth site on several occassions due to his interest in the Dura Marine site. E.L. Beth site had cleaned up satisfactorily after the fire (scrap metal, etc.) and he does not recall seeing any waste on-sit

1-16-85 Contacted Bill Sharples - Dum - Engineering He requested that my report be sent to him in order to debrief the company

REFERENCE NO. 6

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
32 E. Hanover St., CN 028, Trenton, N.J. 08625

DR. MARWAN M. SADAT, P.E.
DIRECTOR

LINO F. PEREIRA, P.E.
DEPUTY DIRECTOR

Mr. Robert Silverman
E.L. Beth Limited
P.O Box 1769
Union, New Jersey 07083

14 FEB 1985

RE: E.L. Beth
500 High Street
Perth Amboy
NJD 067 484 923

Dear Mr. Silverman:

The Department has completed a file review of the above referenced facility. The Bureau has found adequate information to determine the facility's operating status under N.J.A.C. 7:26-1 et seq., The New Jersey Hazardous Waste Management Regulations.

The facility filed with the USEPA in August of 1980 for on-site generated hazardous waste storage in containers/drums (S01) at 2,500 gallons capacity. According to your March 14, 1983 letter, the facility closed in May of 1981. A facility site visit conducted by inspector L. Zaninelli, NJDEP, Central Field Office on January 16, 1985, revealed the site destroyed due to a fire.

Based upon the aforementioned events, the Department has reached the following conclusions regarding hazardous waste activity at the site:

(1) Hazardous waste site operations terminated on 5/18/81 due to a fire which destroyed the facility.

(2) No present or future hazardous waste activity occurs or will occur at this site.

Assuming the aforementioned conclusions are correct and complete, E.L. Beth's TSD facility as identified by the following USEPA identification number:

NJD 067 484 923

is excluded from applicable TSD facility regulations under N.J.A.C. 7:26-1 et seq.

This written acknowledgement of the exclusion of E.L. Beth from the New Jersey Department of Environmental Protection's list of existing hazardous waste TSD facilities is based expressly on the review of the aforementioned correspondence. This letter makes no claim as to the extent and physical conditions of the actual hazardous waste activities occurring at the site mentioned above.

The issuance of this delisting letter by the Department does not indicate, or imply, and should not be construed as a waiver of any requirements pursuant to the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq., and regulations promulgated thereunder concerning the New Jersey Pollutant Discharge Elimination System, N.J.A.C. 7:14-1 et seq. If your facility is in any of the regulated categories identified in the above cited regulations, you are hereby directed to apply for any and all permits necessary within ninety (90) days to the Bureau of Ground Water Discharge Permits, CN 029, Trenton, New Jersey 08625. Applications may be obtained by calling (609) 292-0424.

E.L. Beth's hazardous waste facility above is no longer included in DEP's list of "existing facilities" (see N.J.A.C. 7:26-1.4 and 12.3)and therefore does not need to conform with the interim operating requirements of N.J.A.C. 7:26-9 et seq., for "existing facilities". To operate a hazardous waste facility without prior approval from the DEP is a violation of the Solid Waste Management Act N.J.S.A. 13:1E-1 et seq.

If you have any questions on these matters, please contact Mr. William Sharples of my staff at (609) 984-4062.

Very truly yours,

Frank Coolick, Chief
Bureau of Hazardous Waste Engineering

EP6:lk
cc: A. Chang, USEPA, Region II
L. Zaninelli, CFO, Yardville

FEB 15 12 54 PM '85

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REFERENCE NO. 7

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT
HAZARDOUS WASTE INSPECTION REPORT

DWM-029

HAZARDOUS WASTE MANAGEMENT FACILITY INSPECTION REPORT

FACILITY INFORMATION

FACILITY NAME: E.L. Beth LTD.

FILE NUMBER: 12-16-28

VHT FACILITY FILE NUMBER:

PERMIT #:

REGION: C

INSPECTION DATE: 6/4/90

INCIDENT/CASE NUMBER:

INSPECTION TYPE: TSD RCRA

RESPONSIBLE AGENCY CODE:

INSPECTOR'S NAME: Pete Taylor

INSPECTOR'S AGENCY: NJDEP

INSPECTOR'S BUREAU: DHWM BCE

EPA ID NUMBER: NJD 067484923

ADDRESS: 500 High Street
Perth Amboy

LOT: BLOCK:

COUNTY: Middlesex

FACILITY PERSONNEL:

TELEPHONE #: 201-688-5050

OTHER STATE/EPA PERSONNEL: 2

REPORT PREPARED BY: Pete Taylor

REVIEWED BY: [illegible]

DATE OF REVIEW: 6/8/90

TIME IN: _____

TIME OUT: _____

PHOTOS TAKEN (__) YES (✓) NO IF YES, HOW MANY? _____

SAMPLE TAKEN (__) YES (✓) NO NO. OF SAMPLES _____

NJDEP SAMPLE ID#: _____

MANIFESTS REVIEWED (__) YES (✓) NO

Number of manifests in compliance _____

Number of manifests not in compliance _____

List manifest document numbers of those manifests not in compliance.

This Facility has been closed since 1985

GENERAL CHECKLIST

		YES	NO	N/A
GENERAL				
7:26-7.4(a)1	Does the Generator have an EPA ID number?	✓		
HAZARDOUS WASTE DETERMINATION				
7:26-8.5(a)	Did the generator test its waste to determine whether it is hazardous?	✗	✓	
7:26-8.5(b)	Did the generator determine the hazardous characteristics based upon knowledge of process?	✓		
	Is the waste hazardous?	✓		
7:26-8.5(d)	Were test results, waste analysis, or other determinations made in accordance with this section kept for three years from the date that the waste was last sent to an on-site or off-site TSF?	✓		
MANIFESTS				
7:26-7.4(a)4	Does each manifest have the following information? Please circle the elements missing and obtain a copy of the incomplete manifests. (List those manifests that are deficient on G-1).			
7:26-7.4(a)4i	The generator's name, address and phone number.			
7:26-7.4(a)4ii	The generator's EPA ID number.			
7:26-7.4(a)4iii	The hauler(s) name, address phone number and NJ registration.			
7:26-7.4(a)4iv	The hauler(s) EPA ID number.			
7:26-7.4(a)4v	The name, address and phone number of the designated TSD facility.			
7:26-7.4(a)4vi	The TSF's EPA ID number.			
7:26-7.4(a)4v	The name, address and phone number of the designated TSD facility.			
7:26-7.4(a)4vii	The name, type and quantity of hazardous waste being shipped, including such particulars as may be required regarding same?			
7:26-7.4(a)4viii	Special handling instructions and any other information required on the form to be shipped by generator?			

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		YES	NO	N/A
7:26-7.4(3)	Did the generator describe all N.O.S. wastes in Section J?			
7:26-7.4(a)1x	When shipping hazardous waste to a waste reuse facility does the generator enter the waste reuse facility I.D. # in the section G of the Uniform Manifest?			
7:26-7.4(a)5	Before allowing the manifested waste to leave the generator's property, did the generator:			
7:26-7.4(a)5i	Sign the manifest certification by hand?			
7:26-7.4(a)5ii	Obtain the handwritten signature of the initial transporter and date of acceptance on the manifest?			
7:26-7.4(a)5iii	Retain one copy and forward one copy to the state of origin and one copy to the state of destination?			
7:26-7.4(a)5iv	Provide the required numbers of copies for: generator, each hauler, owner/operator of the designated facility, as well as one copy returned to the generator by the facility owner/operator?			
7:26-7.4(a)5v	Give the remaining copies of the manifest form to the hauler?			
7.26-7.4(f)	Has the generator maintained facility records for three (3) years? (Manifest(s), exception report(s) and waste analysis)			
7:26-7.4(h)1	Has the generator received signed copies of portion B (from the TSD facility) of all manifests for waste shipped off site more than 35 days ago?			
7:26-7.4(h)1	If not: Did the generator contact the hauler and/or the owner or operator of the TSDF and the NJDEP at (609) 292-8341 to inform the NJDEP of the situation?			
7:26-7.4(h)2	Have exception reports been submitted to the Department covering any of these shipments made more than 45 days ago?			

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7:26-9.3

Accumulation Time

How is waste accumulated on site?

(✓) Containers
(__) Tanks (greater than 90 days)
(complete HWMF (TSD) Facility Checklist)
(__) Tanks (less than 90 days)
(__) Above ground
(__) Below ground
(__) Surface impoundments
(complete HWMF (TSD) Facility Checklist)
(__) Piles (complete HWMF checklist)

		YES	NO	N/A
7:26-9.3(a)1	Is waste accumulated for more than 90 days? when stored	✓		

STOP HERE IF THE HAZARDOUS WASTE MANAGEMENT FACILITY (TSF) CHECKLIST IS FILLED OUT.

No waste on site since 1980

HAZARDOUS WASTE FACILITY STANDARDS

MANIFESTS

		YES	NO	N/A
7:26-7.4(a)4	Does each manifest have the following information? Please circle the elements missing and obtain a copy of the incomplete manifests. (List those manifests that are deficient on G-1).			
7:26-7.4(a)4i	The generator's name, address and phone number.	___	___	___
7:26-7.4(a)4ii	The generator's EPA ID number.	___	___	___
7:26-7.4(a)4iii	The hauler(s) name, address phone number and NJ registration.	___	___	___
7:26-7.4(a)4iv	The hauler(s) EPA ID number.	___	___	___
7:26-7.4(a)4v	The name, address and phone number of the designated TSD facility.	___	___	___
7:26-7.4(a)4vi	The TSF's EPA ID number.	___	___	___
7:26-7.4(a)4v	The name, address and phone number of the designated TSD facility.	___	___	___
7:26-7.4(a)4vii	The name, type and quantity of hazardous waste being shipped, including such particulars as may be required regarding same?	___	___	___
7:26-7.4(a)4viii	Special handling instructions and any other information required on the form to be shipped by generator?	___	___	___

		YES	NO	N/A
7:26-7.4(3)	Did the generator describe all N.O.S. wastes in Section J?			
7:26-7.4(a)ix	When shipping hazardous waste to a waste reuse facility does the generator enter the waste reuse facility I.D. # in the section G of the Uniform Manifest?			
7:26-7.4(a)5	Before allowing the manifested waste to leave the generator's property, did the generator:			
7:26-7.4(a)5i	Sign the manifest certification by hand?			
7:26-7.4(a)5ii	Obtain the handwritten signature of the initial transporter and date of acceptance on the manifest?			
7:26-7.4(a)5iii	Retain one copy and forward one copy to the state of origin and one copy to the state of destination?			
7:26-7.4(a)5iv	Provide the required numbers of copies for: generator, each hauler, owner/operator of the designated facility, as well as one copy returned to the generator by the facility owner/operator?			
7:26-7.4(a)5v	Give the remaining copies of the manifest form to the hauler?			
7.26-7.4(f)	Has the generator maintained facility records for three (3) years? (Manifest(s), exception report(s) and waste analysis)			
7:26-7.4(h)1	Has the generator received signed copies of portion B (from the TSD facility) of all manifests for waste shipped off site more than 35 days ago?			
7:26-7.4(h)1	If not: Did the generator contact the hauler and/or the owner or operator of the TSDF and the NJDEP at (609) 292-8341 to inform the NJDEP of the situation?			
7:26-7.4(h)2	Have exception reports been submitted to the Department covering any of these shipments made more than 45 days ago?			

Comment delisted 2/14/85

		YES	NO	N/A
7:26-9.4(b)	Waste Analysis			
7:26-9.4(b)1i	Is there a detailed chemical and physical analysis of a representative sample of the waste(s) or each waste? (At a minimum, this analysis most contain all the information necessary for proper treatment storage or disposal of the waste).			
7:26-9.4(b)1iii	Does the character of the waste handled at the facility change from day to day, week to week, etc., thus requiring frequent testing? Check only one:			
	Waste characteristics vary: ___			
	All waste(s) are basically the same: ___			
	Company treats all waste(s) as hazardous: ___			
7:26-9.4(b)2	Is there a written waste analysis plan at the facility?			
	Does it contain:			
7:26-9.4(2)i	Parameters for which each hazardous waste stream will be analyzed including constituents listed in NJAC 7:26-8.16 and the rational for the selection of these parameters?			
7:26-9.4(b)2ii	The test methods which will be used to test for these parameters?			
7:26-9.4(b)2iii	The sampling method which will be used to obtain a representative sample of the waste to be analyzed?			
7:26-9.4(b)2iv	The frequency with which the initial analysis of the waste will be reviewed or repeated to ensure that the analysis is accurate and up-to-date?			
7:26-9.4(b)2v	For off-site facilities, the waste analysis that hazardous waste generators have agreed to supply?			
7:26-9.4(b)2vii	Procedures which will be used to identify changes in waste stream characteristics?			
	Does hazardous waste come to this facility from an outside source? (e.g., another generator).			
	If yes, list the name(s) of generators.			

Records Burned

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		YES	NO	N/A
7:26-9.4(b)4	If waste comes from an outside source, are there procedures in the waste analysis plan to insure that waste received conforms to the accompanying manifest?			
	Does the plan describe:			
7:26-9.4(b)4i	The procedures which will be used to determine the identity of each shipment of waste managed at the facility?			
7:26-9.4(b)4ii	The sampling method which will be used to obtain a representative sample of the waste to be identified, if the identification method includes sampling?			
7:26-9.4(c)1	Did the facility accept hazardous waste which it is not authorized to handle?			
7:26-9.4(i)	Are all records and results of waste analysis performed pursuant to NJAC 7:26-9.4(b) and 9.4(e) as applicable written in the operating log?			
7:7:26-9.4(h)	Security Facility Closed			
	Does the facility have: Delisted			
7:26-9.4(h)1i	A 24 hour surveillance system which continuously monitors and controls entry onto the active portion of the facility?			
7:26-9.4(h)1ii	An artificial or natural barrier, which completely surrounds the active portion of the facility; and a means to control entry, at all times, through the gates or other entrances to the active portion of the facility?			
7:26-9.4(h)3	Are there "Danger-Unauthorized Personnel Keep Out" signs posted at each entrance to the facility?			
	If no, explain what measures are taken for security.			

		YES	NO	N/A
7:26-9.4(f)	General Inspection Requirements			
7:26-9.4(f)1	Does the owner or operator inspect the facility for malfunctions and deterioration, operator errors and discharges which may be causing, or may lead to:			
7:26-9.4(f)1i	Discharge of hazardous waste constituents to the environment?			
7:26-9.4(f)1ii	A threat to human health?			
7:26-9.4(f)3	Has the owner or operator developed, and does the owner or operator follow a written schedule for inspecting monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment that are utilized for the prevention, detection or response to environmental or human health?			
7:26-9.4(f)3i	Did the owner or operator submit the written inspection schedule to the department?			
	If yes, when was it submitted?			
7:26-9.4(f)3iii	Is the written inspection schedule kept at the facility?			
7:26-9.4(f)3iv	Does the schedule identify the types of problems to be looked for during the inspection?			
7:26-9.4(f)3v	Does the schedule include the frequency of inspection, based upon the rate of possible deterioration of the equipment and the probability of an environmental, or human health incident if the deterioration or malfunctions or any operator error goes undetected between inspections?			
7:26-9.4(f)5	Is there evidence that problems reported in the inspection log have not been remedied?			
7:26-9.4(f)6	Does the owner/operator record inspections in a log?			

		YES	NO	N/A
7:26-9.4(f)6	Are these records kept for at least three (3) years from the date of inspection?			
7:26-9.4(f)6	Does the records include the date, and time of the inspection, the name of the inspector, a notation of the observations made, and the date and nature of any repairs or other remedial action?			
7:26-9.4(g)	Personnel Training Have facility personnel successfully completed a program of classroom instruction or on-the-job training within six months of having been employed?			
7:26-9.4(g)2	Is the program directed by a person trained in hazardous waste management procedures and does it include instruction which teaches facility personnel hazardous waste management procedures (including contingency plan implementation) relevant to the positions in which they are employed?			
7:26-9.4(g)5	If yes, have facility personnel taken part in an annual review of training?			
	Is there written documentation of the following:			
7:26-9.4(g)6i	Job title for each position at the facility related to hazardous waste management, and the name of the employee filling each job?			
7:26-9.4(g)6ii	A written job description for each position related to hazardous waste management?			
7:26-9.4(g)6iii	A written description of the type and amount of both introductory and continuing training given to personnel in jobs related to hazardous waste management?			
7:26-9.4(g)6iv	Documentation of actual training or experience received by personnel?			

Facility closed over 3 yrs
Records burned

		YES	NO	N/A
7:26-9.8(e)1i	A description of how and when the facility will be partially closed (if applicable) and ultimately closed?			
7:26-9.8(e)1ii	The maximum extent of the operation which will be open during the life of the facility?			
7:26-9.8(e)2	An estimate of the maximum inventory of wastes in storage or in treatment at any given time during the life of the facility?			
7:26-9.8(e)3	A description of the steps needed to decontamination facility equipment during closure?			
7:26-9.8(e)4	A schedule for final closure including the anticipated date when the wastes will no longer be received, the date when completion of final closure is anticipated, and intervening milestone dates which will allow tracking of the progress of closure?			
	Post Closure Plan Not needed			
7:26-9.9(g)	Does the facility have a written post-closure plan kept at the facility?			
	If yes, does the plan:			
7:26-9.9(i)	Identify the activities which will be carried on after closure and the frequency of these activities?			
7:26-9.9(i)1	Include a description of the planned ground water monitoring activities and frequencies at which they will be performed?			
7:26-9.9(i)2	Include a description of the planned maintenance activities, and frequency at which they will be performed, to insure the following:			
7:26-9.9(i)2i	The integrity of the cap and final cover or other containment structures where applicable?			
7:26-9.9(i)2ii	Describe the function of the facility monitoring equipment?			

		YES	NO	N/A
7:26-9.9(i)3	Include the name, address and phone number of a person or office to contact about the disposal facility during the post-closure period?			
	Does the owner/operator have a written estimate of the cost of post-closure for the facility?			
	If yes, what is it?			

Please circle all appropriate activities and answer questions in appropriate sections all activities circled.

Storage	Treatment	Disposal
Container	Tank	Landfill
Tank, Above Ground	Surface Impoundments	
Tank, Below Ground	Incineration	Surface Impoundments
Surface Impoundments	Thermal Treatment	Other _____
Waste Piles		
Other _____	Chemical, Physical and Biological Treatment	
Other _____		

7:26-9.4(d) **Containers** Prior on site since 1980

What type of containers are used for storage? Describe the size, type, quantity and nature of wastes (e.g., 12 fifty-five gallon drums of waste acetone).

7:26-9.4(d)11 Do the containers appear to be o sturdy leakproof construction of adequate wall thickness, weld, hinge and seam strength, and of sufficient material strength to withstand side and bottom shock, while filled, without impairment of the container's ability to contain hazardous waste?

If no, explain.

Inspector: Taylor
Address: Twin Rivers Prof Bld, East Windsor NJ
Telephone No: 609-426-0700

RCRA LAND DISPOSAL RESTRICTION
GENERATOR CHECKLIST

I. HANDLER IDENTIFICATION

A. Handler Name: E L Beth LTD.
B. Street (or other identifie: 500 State St
C. City: Perth amboy
D. State: N.J.
E. Zip Code:
F. County Name: Middlesex
G. Nature of Business; Identification of Operations: SIC Code(s): Foundry 5051
H. EPA ID #: NJD 067484923
I. Handler Contact (Name and Phone Number): Robert Silverman 201-688-5050

II. GENERATOR COMPLIANCE

A. Waste Identification

1. F-Solvents

a. Does the handler generate the following wastes?

(i) F001, F002, F004, or F005 ___Yes ___No

(ii) F003 ___Yes ___No

If an F003 wastestream (listed solely for ignitability) has been mixed with a non-restricted solid or hazardous waste, does the resultant mixture exhibit the ignitability characteristic? ___Yes ___No

b. Source of the above: Form 8700-12 ___; Part A ___; Part B ___; Biennial/Annual Reports ___ other (specify) ___

Appendix A is intended to assist the inspector and enforcement official in determining whether the facility is generating F-solvent wastes, if such wastes were not identified by the facility previously. If you are concerned that F-solvent wastes may be misclassified or mislabeled, turn to Appendix A-1. To assist in identfying potentially

Comments

This facility has been closed and delisted since 2/14/85. ~~Prior~~ They have not produced any wastes since 1980. Prior to 1980 They produced a bag house waste which was classified as hazardous

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SUMMARY OF FINDINGS

FACILITY DESCRIPTION AND OPERATIONS

EL Beth was a foundry operation which manufactured solder, casting metals, and lead alloys.

This site is situated at 500 State Street, Perth Amboy. The site borders the Arthur Kill.

This facility has not been in operation since 1981, at which time it was completely destroyed by fire. This fire destroyed all hazardous waste manifests as well as other company records.

On 1/16/85 Linda Zaninelli, NJDEP-DHWM/BCE, conducted a RCRA inspection at this facility. At that time the company had applied for closure. This closure was granted, and the company was delisted by the NJDEP - DHWM, Bureau of Hazardous Waste Engineering on 2/14/85.

DESCRIBE THE ACTIVITIES THAT RESULT IN THE GENERATION OF HAZARDOUS WASTE.

No waste has been generated by this facility since 11/19/80. Prior to that time baghouse dust was the only waste generated at this site.

IDENTIFY THE HAZARDOUS WASTE LOCATED ON SITE, AND ESTIMATE THE APPROXIMATE QUANTITIES OF EACH (IDENTIFY WASTE CODES).

None.

CMEL FORM

COMPANY DATA

EPA ID NUMBER: NJD067484923
FACILITY NAME: EL BETA LTD
FY/QUARTER: ___/___
CONTACT: R. SILVERMAN
FACILITY PHONE: (201) 688 5050 FACILITY STREET: 500 E STATE
COUNTY/MUNIC. CODE: 12-16
FACILITY CITY: PERTH AMBOY FACILITY STATE: NJ FACILITY ZIP: _____
CORPORATE NAME: GANT FIELD METAL GROUP
CORPORATE STREET: PO BOX 3100 CORPORATE CITY: UNION
CORPORATE STATE: NJ CORPORATE ZIP: 07083 CORPORATE PHONE: (201) 688-5050
CORPORATE CONTACT: R SILVERMAN FILE NUMBER: 12-14-28 REGION CODE: C

INITIAL INSPECTION [✓]

INITIAL INSPECTION DATE: 6/4/90 MANDATORY: (Y/N) DATE NOV ISSUED: _____
DATE VIOLATIONS REFERRED: _____ AGENCY REFERRED TO: _____ LAND BAN: (Y/N)
INCIDENT CASE NUMBER: _____ SCHEDULED COMPLIANCE DATE: _____
SITE VISIT? (Y/N) FEE: (Y/N) DATE COMPLIANCE ATTAINED: _____
INSPECTOR/REVIEWER: TAYLOR DATE ASSIGNED: 4/1/90 DATE REVIEWED: 6/9/90
REGULATORY STATUS: 03
EVALUATION TYPE CODE: 01
GRANT CODE: 03

FOLLOWUP INSPECTION [ ]

FOLLOWUP INSPECTION DATE: _____ SITE VISIT: (Y/N)
INSPECTOR/REVIEWER: _____ DATE REPORT REVIEWED: _____
EVALUATION TYPE CODE: _____
GRANT CODE: _____

CMEL GRID FOR
[✓] INITIAL [ ] FOLLOWUP

CLASS OF VIOLATION	GW	CLO	$$$	PTB	SCH	MNF	LDB	OTH
I*						O		O
I						O		O
II						O		O

(ENTER Z, X, O, H OR C IN THE APPROPRIATE BOX.)

Z=UNDETERMINED OR UNDER INVESTIGATION
X=VIOLATION
O=NO VIOLATION
H=HIGH PRIORITY VIOLATOR
C=FACILITY NOT IN COMPLIANCE WITH CORRECTIVE ACTION COMPLIANCE SCHEDULE IN AN ORDER OR PERMIT

AREAS OF EVALUATION:
GW=GROUND WATER
CLO=CLOSURE
$$$=FINANCIAL RESPONSIBILITY
PTB=PART B
SCH=COMPLIANCE SCHEDULE
MNF=MANIFEST
LDB=LAND BAN
OTH=OTHER

COMMENTS: _____

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
CENTRAL BUREAU OF FIELD OPERATIONS
DAILY ACTIVITY/MILEAGE LOG

NAME: Taylor ID #: 2572 DATE: 6/4/90

DEPARTED: 7:20 ARRIVED: 8:30
ODOM. IN: 28857 ODOM. OUT: 28903
DEPARTED: 950

SITE NAME: Burlington County Tra... St-Jo...
MUNICIPALITY: ~~Fo~~ Florence
COUNTY: Burlington
INCIDENT#/PAC #: 90-05-31-1022

HAZARDOUS WASTE INSPECTIONS

RCRA GRANT ACTIVITIES
[ ] GENERATOR
[ ] LDF-CEI
[ ] TSF'S (TSD'S)
[ ] PERMITTED FACILITY
[ ] COMMERCIAL FACILITY
[ ] SAMPLING
[ ] COMPLIANCE INSPECTION
[ ] TRANSPORTER AUDIT
[ ] FIELD NOV ISSUED
[ ] WITH LAND BAN

FEE BASED INSPECTIONS
[ ] MAJOR FACILITY (WEEKLY)
[ ] NON-MAJOR FACILITY
[ ] GENERATOR
[ ] TRANSPORTER
[ ] TSD
[ ] FIELD NOV ISSUED
[ ] COMPLIANCE INSPECTION
[ ] SAMPLING EPISODE

SUMMONS PROGRAM
[ ] SUMMONS ISSUED
[ ] COURT APPEARANCE

SPILL/HW INVESTIGATIONS & pesticides case
[✓] INITIAL INVEST.
[ ] FOLLOWUP INVEST.
[ ] SAMPLING
[ ] CLEANUP MONITORING
[ ] CRIM. JUSTICE INV.
[ ] ABANDONED DRUMS
[ ] POTABLE WATER
[ ] GROUND WATER
[ ] SURFACE WATER
[ ] RP KNOWN
[ ] RP UNKNOWN

[ ] LUST
[ ] LAST
CHECK APPLICA
[ ] PETRO.PR
[ ] HOMEOWNE
[ ] MEETING
[ ] OTHER
[ ] FIELD NO ISSUED
[ ] CLEANUP F FUND
[ ] SPILL FU

RP COST $ [illegible]

FINDINGS:

No Further
Action
Required

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REFERENCE NO. 8

Field Book

7482' 2

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Projects (continued)

Na

Ac

Ph

Th
sp
a

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JO30 (1)

EL Beth Ltd

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14, 15	OFF-Site Reconnaissance March 4, 1992
16, 17	Photo Log - On-Site Reconnaissance March 4, 1992
17	Photo Log - Off-Site Reconnaissance March 4, 1992

Claire Barnick March 4, 1992 [signature] 3/04/92

J030

(2) EL Beth Ltd March 4, 1992

OVA serial #(EPA #) 729633. Background reading: <0.2 ppm
HNU: EPA Serial # 729622. Background reading: 0 ppm
monitor-4, EPA Serial # 734665. Background: <1 cpm.

Camera for prints: EPA# 734745
Camera for slides: EPA# 734743

Claire Bauvis March 4, 1992
K. Campbell 03/04/92

J030
March 4, 1992 (3)

EL Beth Ltd
Perth Amboy, New Jersey
Wednesday, March 4, 1992
ON-Site Reconnaissance

HNUS Personnel:
Claire Bauvis - Site Manager
Nick Kides - Surveillance Support [illegible] 3/4/92
Barry Vroeginday - Site Safety officer [illegible] 3/4/92
(The above personnel have read and understand the site work plan and safety plan). 08 3/4/92

Arrive at property at 0930. Met Mr. Jack Silverman, Robert Silverman and Carol Surgens. We looked over tax map, clarifying where on block property lines. Now we're entering site.
Weather: Sunny, hazy, cool, about 40°F, calm breeze from the east-northeast
0937 Holding tailgate meeting.
Barry's reviewing site hazards, potential contaminants and ppe.
1010 Instrument setup, background readings, suiting up completed. I'm briefly going over recon with Barry, Nick.

Claire Bauvis March 4, 1992 K. Campbell 03/04/92

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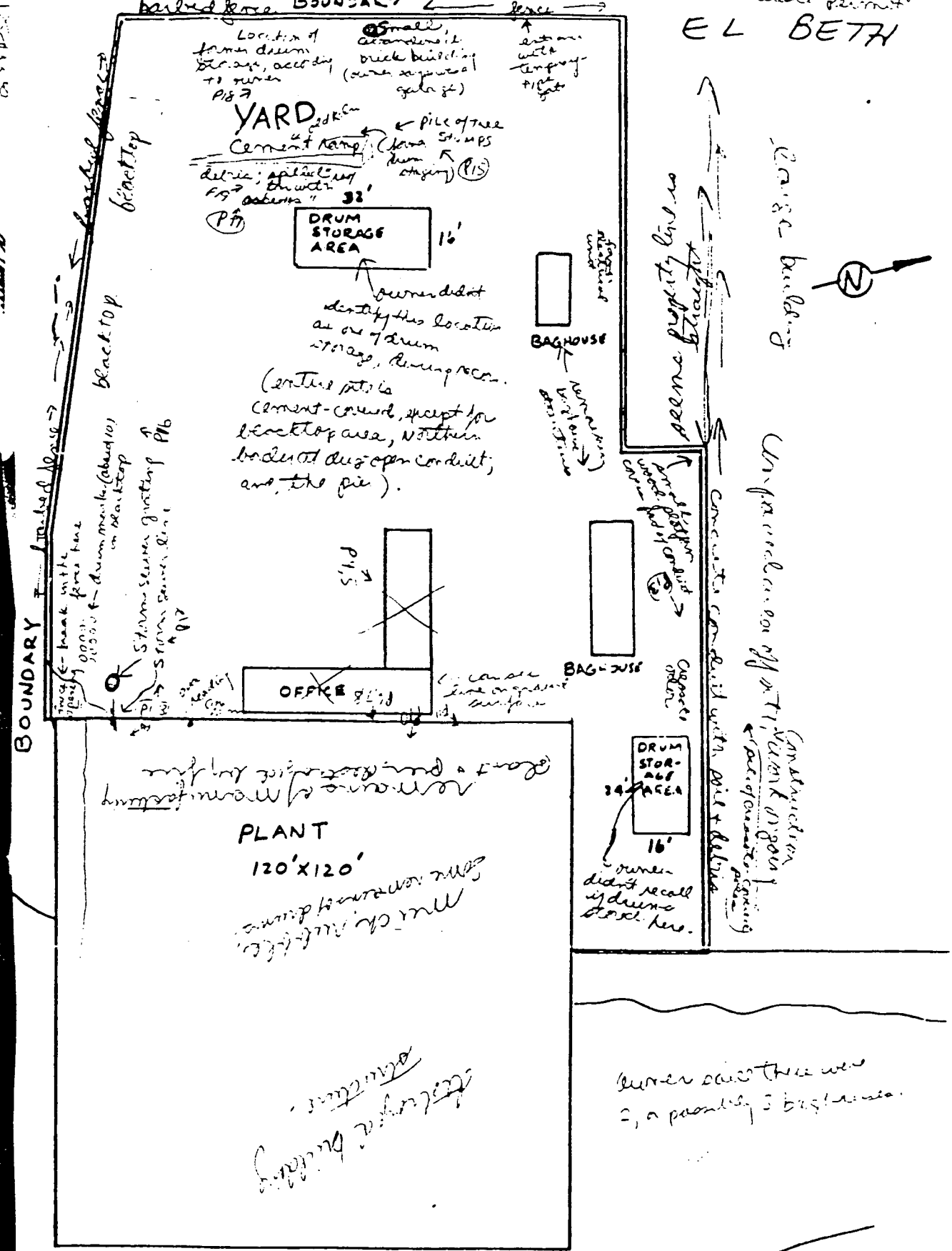
VING (see page 4)

REVISION 0 (case analysis of application for Hazardous Waste Permit)

EL BETH



owner said there were 2, or possibly 3 baghouses.

ARTHUR KILL

1/8" = 4'-0"

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EL Beth Ltd

J030
March 4, 1992 (5)

1014 hrs Mr. Bob & Jack S. (their company purchased existing facility late 1977 (at about late 1977). (They are relating site history to me). In operation 1978 - 1981 as subsidiary of parent company M.C. Canfield.
Property is in their names as individuals now.
Company 3/4/92 owned by M.C. Canfield & then Mr Silverman (Jack & Bob Silverman) remained as property owners.
Co. made solder, casting metals.
Used Virgin metals, refined & factory secondary metals.
Some of their raw material was by-product from their material suppliers. They recycled, reused here.
This reused material was ammonium chloride, that came with scrap solder, he said.
Mr. Silverman said: ——
—— Property has been paved as long as they've been owners. Drum storage was at W edge of property next to garage for raw materials.
Mr. Bob Silverman said the baghouse dust was recycled.
[illegible] March 4, 1992 [illegible] 03/[illegible]

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J030

(6)

EL Beth Ltd March 4, 1992

owner said that drums of waste were very heavy could be about 2000 lb each.

Claire Barrys March 4, 1992

K. Campbell 03/09/92

J030

EL Beth Ltd March 4, 1992 (7)

posts of the drum storage area by the former garage can be seen (I do not see all four)

Much waste volume - "there may not be removal documentation because waste reused."

Ms Surgens said there was no DEP cleanup requirement after the fire - "back then less requirements," she said.

(according to on site talk with owners attorney) 3/4/92

SE part of site, Storm sewer grating; small (~6'X12') asphalt area with ~ten drum marks. (blacktop)

fence in this area is broken, open, by pier.

1038 hrs

Barry & Nick are checkg storm sewer, within grating

Barry detected 0.6 ppm with OVA, after stone dropped into storm sewer.

Grafitti present on burned building, Ms Jack Silverman noted kids did the grafitti.

1043 were at edge of concrete looking at burned remains of building. An Above-ground tank had heating oil, Ms. Surgens said.

Claire Barrys March 4, 1992

K. Campbell 03/09/92

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(8) J030 EL Beth Ltd

J030

EL Beth Ltd March 4 1992 (9)

1045 - Photos P1 through P5, and S1 through S5 - panoramic view of property, taken from SE corner of paved part of property (land portion of site)

Barry has OVA reading of 0.6 ppm at edge of concrete (not soil there) by ~~by~~ group of cast iron conduits (perhaps sewer) (possibly storm sewer line) There is no response on HNV

1048 Photos P6 through P8 - Panoramic view facing pier of burned building at pier.

1050 Closer view South edge of burned pier (Photos P9, S9)

1051 Photo P10, S10, of burned plant at pier facing S-SE.

Barry has spike readings on OVA up to 0.8 ppm at hole at concrete - soil (pier) interface

Claire Barry March 4, 1992 [signature] 03/04/92

[signature] 03/04/92

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(10) J030 El Beth Ltd March 4, 1992

0.8 to 1 ppm on OVA at 1100 hrs at NE corner of land area of site. (wind from NE also) by creosote logs

Claire Barnes March 4, 1992 K. Campbell 03/04/92

J030 El Beth Ltd March 4, 1992 (11)

1055 photo P11-S11 of location where Barry had 0.8 ppm OVA reading. Photo facing E ~~SE~~ 3/27/92

1058 photo P12, S12 photograph of location of storm sewer asphalt where drum marks noted, facing SE.

1100 walking along N ~~W~~ 3/4/92 site border at NE corner of land area, strong odor (creosote); there are creosote covered large logs right at adjacent property, about 20 feet away.

1105 photo of conduit & adjacent lot, facing ~~SE~~ NE 3/27/92. P13, S13

1110 Photo # P14, S14, remaining baghouse equipment

1112 Photo # — P15, S15 facing West, debris (tree) and site border, ramp & gauge.

1115 Photo # P16, S16 facing S SE

Claire Barnes March 4, 1992 K. Campbell 03/09/92

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(12) J030

EL Beth Ltd March 4, 1992

~1120 hrs - by debris at ramp (former drum shipping area) is an overturned bucket; Nick read label - roofing tar with asbestos. Also, is can, about 1 gallon size - label reads (partly) "another pentanone product". I'm not approaching it to read further, as it seems is uncapped. Owner is holding the cass now. (I indicated he should have a glove on).

By baghouse area (it's a large metal structure) seems compass isn't working properly. Note to check compass reading against map.

Claire Bourque March 4, 1992

K. Campbell 03/04/92

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J030

EL Beth Ltd, March 4, 1992 (13)

Site border, & blacktop area (~20' in from fence)

1117 hrs

P17, S17 ramp formerly for drum storage.

1119 P18, S18 former drum storage area, and, garage, facing W.

small bucket, tar and asbestos = roofing tar with asbestos" (Nick read & related to me).

photo of bucket 1120 hrs P19, S19.

They believe there were no transformers. electricity came from street, they said.

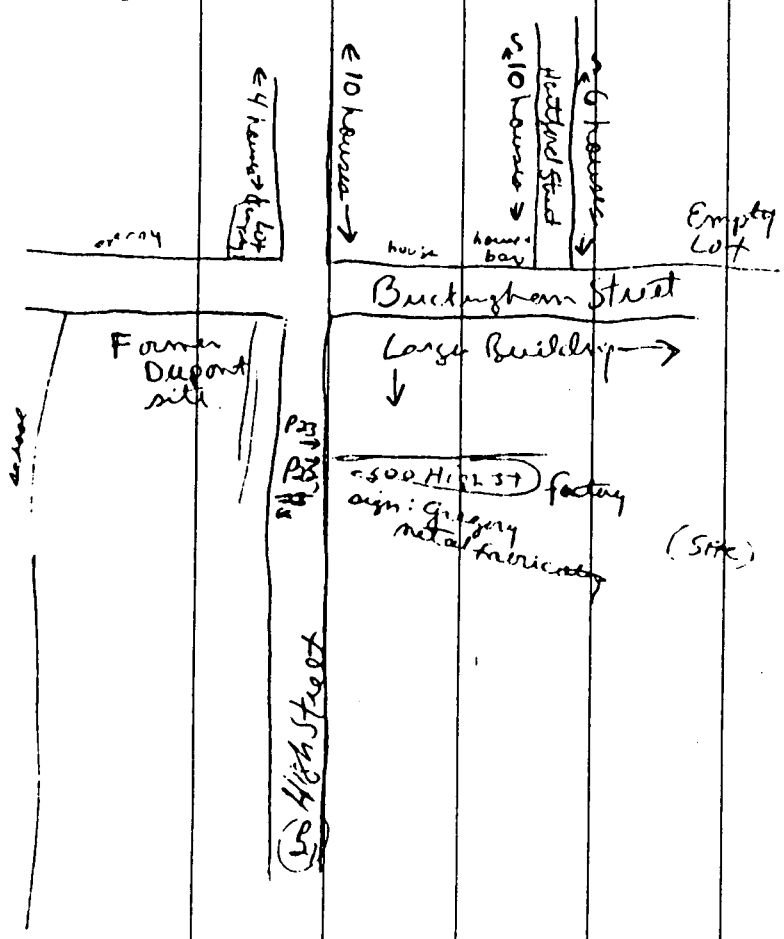
1125 Photo P20, S20 part of baghouse & some elec equipment. electrical equipment is 3/4/92

Note: brick shed ("garage") by entrance seems to have debris. I did not inquire if anything is now stored in it. No readings were taken at shed.

1135 Leaving site.

Claire Bourque March 4, 1992 K. Campbell 03/04/92

(14) J030
EL Beth Ltd March 4, 1992
offsite recon.



Claire Barnes March 4, 1992
K. Campbell 03/04/92

J030
EL Beth Ltd March 4, 1992 (15)
Offsite recon.

Drive along area near site to note if there are houses, and if schools, etc present.

1149: Photo of ~~Lot~~ Block 238, lots (industrial) adjacent to site. Taken from High Street.

1150: Photo of property entrance, 500 High Street

1151 Photo at property entrance with sign, "500 High Street"

Claire Barnes March 4, 1992
K. Campbell 03/04/92

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J030

(16) El Beth Ltd March 4, 1992

Photograph Log - ON-SITE Reconnaissance

Time	Description	Photo#
1045	Panoramic view of site taken from SE corner of land portion of property; facing W to NE.	P1-P5+ S1-S5
1048	Panoramic view of burned building, pier.	P6-P8+ S6-S8
1050	Closer view, south edge of burned pier	P9, S9
1051	Burned manufacturing plant, facing S-SE.	P10, S10
1055	Location of 0.8 ppm OVA reading. facing E-SE	P11, S11
1058	Location of storm sewer and, blacktop with drum marks. facing SE	P12, S12
1105	Conduit and adjacent lot	P13 S13
1110	Remaining baghouse equipment	P14, S14
1112	facing west; pile of tree debris; former drum ramp; "garage"	P15, S15
1115	facing S-SE	P16, S16

Claire Baum March 5, 1992
K. Campbell 03/04/92

J030

El Beth Ltd entered March 5, 1992 (17)

Photograph Log - ON-site reconnaissance, continued:

Time	Description	Photo#
1117	former ramp for drum handling	P17, S17
1119	facing west former drum storage area, and, -garage'.	P18, S18
1120	Photo of overturned bucket of roofing tar with asbestos	P19, S19
1125	Photo of part of baghouse, and, some electrical equipment	P20, S20

Photos taken off-site 3/4/92

Time	Description	Photo#
1149	Photo of Block 238, with lots adjacent to site; taken from High Street.	P21, S21
1150.	Property entrance	P22, S22
1151	Property entrance, showing sign.	P23, S23

Claire Baum March 5, 1992
K. Campbell 03/04/92

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REFERENCE NO. 9

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NUS CORPORATION
SUPERFUND DIVISION

PROJECT NOTES

TO: E L Beth Ltd file

DATE: March 27, 1992

FROM: Claire Barnes

COPIES: —

SUBJECT: Waste Quantity Reported for the E L Beth site.

REFERENCE: noted below

Through discussion with Hanna Majcejko of U.S. EPA, Permits Administration Branch, the correct waste quantity figures for the E L Beth Ltd. Hazardous Waste Permit Application dated November 18, 1980 have been determined. The figures that appear in the file copy are 1000 times greater than the values entered by the applicant; this is because in the past, EPA added the additional zeroes to the form for the purpose of filling in a field, in data entry. The correct values are:

Part III, process design capacity, SOL = 2500 G

Part IV, estimated annual quantity of waste:

K069, 20,000 P

D002, 10,000 P

"D000", 20,000 P

NUS 443A 58 1182

REFERENCE NO. 10

p. 95

GEOHYDROLOGY AND DIGITAL-SIMULATION MODEL OF THE FARRINGTON AQUIFER IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY

By George M. Farlekas

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations 79-106

Prepared in cooperation with
New Jersey Department of Environmental
Protection, Division of Water Resources

August 1979

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ABSTRACT

A two-dimensional digital-computer flow model was developed to simulate the Farrington aquifer in the northern part of the Coastal Plain of New Jersey. The area of detailed study includes approximately 500 square miles in Middlesex and Monmouth Counties where the aquifer provides a large part of the municipal and industrial water supply. The area modeled is much larger, extending seaward as well as northeastward into Long Island.

The aquifer consists chiefly of the Farrington Sand Member of the Raritan Formation and is composed of sand and some gravel. It thickens from a featheredge in outcrop to more than 170 feet, 11 miles to the southeast. The confining unit between the Farrington and the overlying Old Bridge Sand Member of the Magothy Formation consists primarily of the Woodbridge Clay Member of the Raritan Formation and has a maximum thickness of 244 feet.

The model simulates both water-table and artesian conditions. The confining unit overlying the Farrington aquifer is simulated as having a variable thickness and vertical hydraulic conductivity. The effect of a declining water level in the overlying Old Bridge aquifer on the Farrington aquifer is also simulated by the model.

Values used to describe the hydraulic properties of the Farrington aquifer are: a hydraulic conductivity of 105 feet per day, a storage coefficient of 1.6×10^{-4} for artesian conditions, and a specific yield of 0.25 for water-table conditions. Values for the overlying confining unit are: a vertical hydraulic conductivity ranging from 4.2×10^{-7} to 1.0×10^{-10} feet per second and a specific storage of 4×10^{-5} feet^{-1}.

Aquifer simulation for the 15-year period, 1959-73, was used to calibrate the model. The model was calibrated by comparing the observed potentiometric surface of November 1973 with the simulated potentiometric surface. In addition, hydrographs for selected wells were compared with model results. Ground-water withdrawals for 1959 and 1973 were 12.1 and 28.5 million gallons per day, respectively.

Potentiometric surfaces for 1985 and 2000 were computed based on a linear projection of ground-water withdrawals (39.5 and 56.9 million gallons per day in 1985 and 2000, respectively) of the period 1959 through 1973. These surfaces are deeper than that of November, 1973, and the cone of depression is wider. The potentiometric head projected by the model in the vicinity of Sayreville will be more than 150 feet below mean sea level by 2000; the head in this area was 70 feet below sea level in 1973.

The model calculated ground-water budgets for steady-state and transient conditions for the entire modeled area and for several rectangular subareas. Ground-water flow into the modeled Farrington aquifer under steady-state conditions before

ground-water development was 16 cubic feet per second for the entire area. Recharge in the outcrop area and vertical leakage from the Old Bridge was 8 cubic feet per second each. Approximately 75 percent of the discharge occurred as seepage into surface-water bodies in and near the outcrop and as lateral flow southwestward into Burlington County near the outcrop area. The remaining 25 percent occurred southeast of the outcrop as vertical leakage into the overlying Old Bridge aquifer and as lateral flow to the south into Ocean and Burlington Counties.

A transient water budget for 1973 was calculated for a subarea consisting mainly of Middlesex County. The model indicates that 48 percent (14.3 cubic feet per second) of the total inflow to the subarea was through its boundaries. Other sources of water include direct recharge within the subarea (5.4 cubic feet per second), vertical leakage (mainly from the Old Bridge) within the subarea (2.6 cubic feet per second), and water released from storage (3.4 cubic feet per second). Discharge from the subarea consisted mainly of withdrawals (26.5 cubic feet per second). It also included vertical leakage to the Old Bridge and discharge to surface-water bodies simulated by constant-head nodes (3.2 cubic feet per second).

INTRODUCTION

Purpose and Scope

The purpose of this study is to simulate the hydrology of the Farrington aquifer using a computer-simulation model so that the effects of alternative withdrawal schemes can be evaluated quantitatively. The primary study area consists of the northern part of the New Jersey Coastal Plain. The area modeled is much larger, extending seaward and also to the northeast into Long Island. This report discusses the geohydrology of the Farrington aquifer, the simulation model, and the effects of projected withdrawals from the Farrington aquifer. Saltwater intrusion, one of the limiting factors of future development of the aquifer, had not been investigated during this study. This study by the U.S. Geological Survey was done in cooperation with the Division of Water Resources of the New Jersey Department of Environmental Protection.

Location and Extent

The primary area of study consists of approximately 500 mi^2, including parts of Middlesex, Monmouth, and Mercer Counties (fig. 1). The modeled area is much larger, incorporating additional areas of New York and New Jersey. To the northeast, the model extends into Long Island. The southeastern boundary of the model is approximately 60 mi offshore. The southwestern boundary extends to the southwestern limit of Monmouth County. The total area simulated by the model is approximately 7,500 mi^2.

Previous Investigations

The geology and ground-water resources of the Farrington aquifer in the northern part of the Coastal Plain of New Jersey have been studied for many years. Barksdale (1937) discussed the geology and hydrology of the Farrington Sand in Middlesex County. Barksdale and others (1943) completed an investigation of the ground-water resources of Middlesex County, with special emphasis on the coastal plain. Appel (1962) reported on saltwater encroachment into the Farrington and Old Bridge aquifers in the Sayreville area, Middlesex County. Hasan, Kasabach, and Malone (1969) discussed the Old Bridge aquifer in the Sayreville area of Middlesex County. Reports on the ground-water resources of several counties in the northern part of the New Jersey Coastal Plain include: Jablonski (1968) on Monmouth County, Anderson and Appel (1969) on Ocean County, and Vecchioli and Palmer (1962) and Widmer ~~(1965~~) on Mercer County. Wilson and others (1972) reported on the water resources of the Upper Millstone River basin, with emphasis on the water-table aquifer. The Potomac-Raritan-Magothy aquifer system in the New Jersey Coastal Plain was described by Gill and Farlekas (1976).

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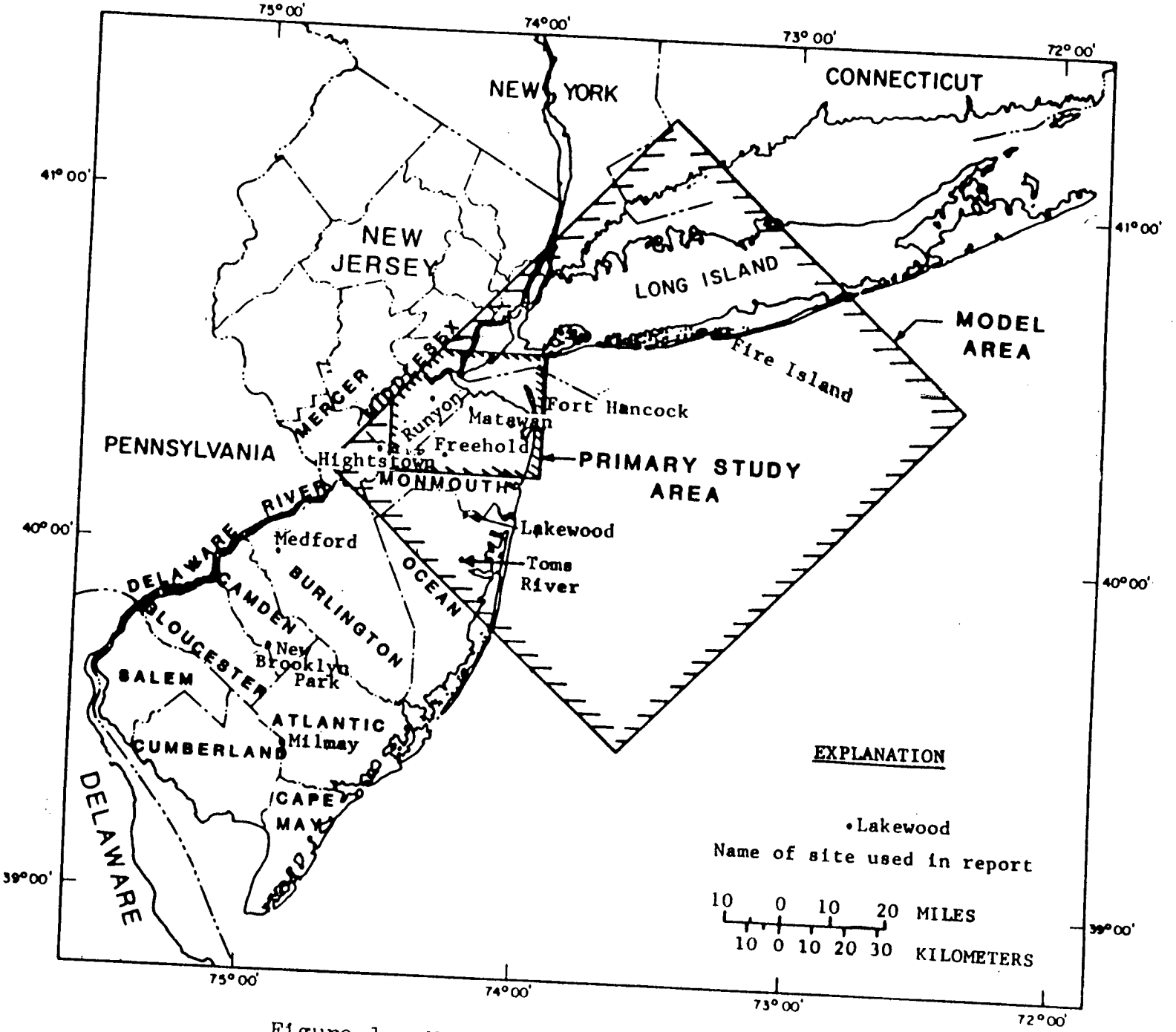

Figure 1.--Map showing area of investigation

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Recent investigations of the geology of the northern part of the Coastal Plain of New Jersey include a report by Owens, Minard, and Sohl (1968) on the Cretaceous deltas and a report by Owens and Sohl (1969) on the Cretaceous-Tertiary shelf and deltaic paleoenvironments. A recent paper by Perry and others (1975) presents a survey of the stratigraphy of the Atlantic Coastal Margin and includes detailed stratigraphic sections of the northern part of the New Jersey Coastal Plain.

Acknowledgments

The assistance of state government officials and private individuals is gratefully acknowledged for furnishing well information and permitting access to wells. Special thanks are extended to the Duhernal Water System officials for providing hydrologic data from their files. Gerard P. Lennon and Flavian Stellerine, both formerly of the U.S. Geological Survey, provided valuable assistance with computer programming.

GEOHYDROLOGY

Potomac-Raritan-Magothy Aquifer System

The northern part of the Atlantic Coastal Plain of New Jersey is underlain by unconsolidated silt, clay, sand, and gravel deposited under fluvial, fluvial-deltaic, and marine conditions. The sediments range in age from Early Cretaceous to Holocene and lie unconformably on a pre-Cretaceous bedrock consisting mainly of sedimentary and igneous rocks of Triassic age and older crystalline rocks. The unconsolidated sediments crop out in northeast-southwest directions and thicken downdip to the southeast. Their thickness ranges from a featheredge in Middlesex County to about 1,700 ft in Monmouth County (Gill and Farlekas, 1976). The present study is concerned with the lower part of this sedimentary sequence.

The most productive source of ground water in the northern part of the New Jersey Coastal Plain is the Potomac-Raritan-Magothy aquifer system, which is made up of the Potomac Group and the Raritan and Magothy Formations of Cretaceous age. This wedge-shaped aquifer system, consisting of quartz sand with some gravel, silt, and clay, thickens from a featheredge at its outcrop in Middlesex County to a maximum of about 600 ft in Monmouth County (Gill and Farlekas, 1976). Overlying the Potomac-Raritan-Magothy aquifer system is a confining unit consisting of the Cretaceous Merchantville Formation and the Woodbury Clay. It is the most extensive confining unit in the New Jersey Coastal Plain and ranges in thickness from a featheredge in Middlesex County to a maximum of approximately 300 ft in Monmouth County. Structure contour maps of the top of the Merchantville Formation, the Magothy Formation, and the pre-Cretaceous bedrock in New Jersey appear in Gill and Farlekas (1976).

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The Potomac-Raritan-Magothy aquifer system in the northern part of the New Jersey Coastal Plain contains two major aquifers; the Farrington aquifer, consisting mainly of the Farrington Sand Member of the Raritan Formation, and the Old Bridge aquifer, consisting mainly of the Old Bridge Sand Member of the Magothy Formation. The Old Bridge Sand Member was originally placed in the upper part of the Raritan Formation. However, Wolfe and Pakiser (1971, p. 41) designated the unit as the basal member of the younger Magothy Formation. An analysis of geophysical and water-level data indicate that the Farrington and the Old Bridge function as separate aquifers in Middlesex County, and each can be traced downdip into Monmouth County.

The Woodbridge Clay Member of the Raritan Formation, an extensive confining unit that separates the Farrington Sand Member from the overlying Old Bridge Sand Member, can also be traced downdip from the outcrop area in Raritan Bay to the shore area in Monmouth County. This interpretation is supported by a recently published cross section along the Atlantic Coast (Perry and others, 1975, p. 1542). The stratigraphic section shown in Table 1 is modified from Perry and others (1975, p. 1539) and shows the correlation of part of the Cretaceous section in the northern part of the Coastal Plain of New Jersey (Middlesex and Monmouth Counties) with sediments on Long Island.

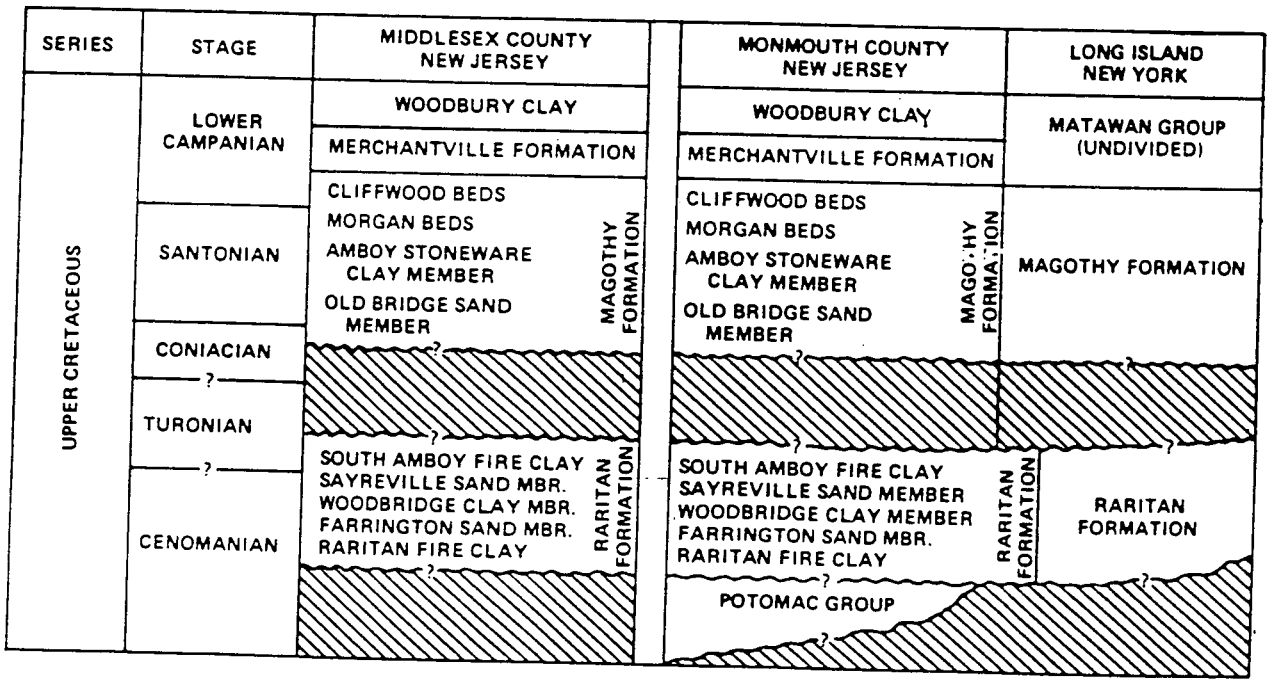

Table 1.--Correlation of stratigraphic units in Middlesex and Monmouth Counties, New Jersey and Long Island, New York (Modified from Perry and others, 1975).

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Lower Confining Unit

The lower confining unit in Middlesex County, as defined in this report, consists mainly of a layer of clay and the underlying consolidated rocks. Southeast of the Monmouth-Middlesex County line, the lower confining unit is defined as the first layer of clay thicker than 20 ft beneath the Farrington aquifer.

In Middlesex County, the upper part of the lower confining unit is the Raritan fire clay (Barksdale and others, 1943). This clay lies between the Farrington Sand Member and bedrock in much of Middlesex County. Near the Farrington outcrop, the Raritan fire clay ranges in thickness from 0 to 35 ft, and the thickness increases downdip (Barksdale and others, 1943, p. 140). Well data near Spotswood, Old Bridge, Runyon, Parlin, and South Amboy indicate a thickness of up to 86 ft for the Raritan fire clay.

The lower part of the confining unit in Middlesex County consists of rocks of Triassic age and pre-Triassic crystalline rocks. An analysis of drillers' logs indicates that Triassic rocks extend beneath the northwestern edge of the coastal plain southward for approximately 5 mi. Farther southeast, the bedrock is composed of pre-Triassic crystalline rocks. The thickness of the Triassic and crystalline rocks is not known.

Within the Triassic sequence is a thick diabase sill, which is exposed north of the study area along the Hudson River, where it forms the Palisades. The same diabase sill occurs on Staten Island, N.Y., in Middlesex County, N.J., and farther west. The sill is a continuous unit within the study area and is overlain by post-Triassic sediments (Barksdale and others, 1943, p. 15). The hydrologic significance of this sill will be discussed in the section on aquifer characteristics.

The lower confining unit southeast of the Middlesex-Monmouth County line is defined as the first confining layer of clay below the Farrington aquifer thicker than 20 ft. Only a few wells or test holes completely penetrate the Farrington in this area. Consequently, data on the sediments between the Farrington and bedrock are scant. Geophysical logs of a test hole just north of Freehold Borough suggest the presence of at least 60 ft of silt and clay below the principal aquifer. Southeast of the Middlesex-Monmouth County line, geophysical logs indicate a thickness of up to 200 ft for the lower confining unit.

Farrington Aquifer

Geohydrology

The Farrington aquifer in the northern Coastal Plain of New Jersey consists primarily of the Farrington Sand Member of the Raritan Formation. At or near its outcrop, the aquifer includes the Farrington Sand Member and overlying sand and gravel beds. In Middlesex County southeast of the outcrop, the aquifer consists solely of the Farrington Sand Member. Southeast of the Middlesex-Monmouth County line, the aquifer, as defined in this report, consists of the Farrington Sand and the underlying uppermost sand layers of the Potomac Group, which are hydraulically connected to the Farrington.

In Middlesex County, the Farrington Sand Member has been described as coarse to fine sand with lignite and pyrite. Locally, it contains clay beds (Barksdale and others, 1943, p. 104-105). In Middlesex County, its thickness ranges from 0 to 129 ft. Near South River, Sayreville, and Old Bridge the thickness of the Farrington ranges from 44 to 104 ft. It is either thin or missing above the Triassic diabase sill between the Borough of South River and Perth Amboy City due to erosion or a lack of deposition during Cretaceous time (Barksdale and others, 1943, p. 106). The sand was deposited in a subaerial deltaic environment near the outcrop area and in a marine environment downdip along the coast (Perry and others, 1975, p. 1543). North of the Raritan River, the northwesterly part of the Farrington Sand Member in Middlesex County is overlain by a unit consisting of sand and, in places, clayey sediments (Barksdale and others, 1943, p. 19 and p. 58). Farther north in Middlesex County, the northwesterly part of the Farrington is overlain by glacial deposits of considerable thickness (Barksdale, 1937, p. 6). Information on the Farrington at the New Jersey-New York State line beneath Arthur Kill is not available. On Staten Island, the northwesterly part of the Farrington is overlain by glacial deposits consisting of ground moraine and terminal moraine and some glacial outwash (Perlmutter and Arrow, 1953, plate 2).

Near the Raritan River, the Farrington Sand Member is overlain by Pleistocene or Holocene deposits consisting of highly permeable sand and gravel. In some places, the overlying deposits are dense and nearly impermeable. In places, the ancestral Raritan River eroded through the Farrington, disrupting its continuity. The Farrington has been replaced with relatively impermeable river mud. This mud, where present, restricts the hydraulic connection between the part of the Farrington north of the Raritan River with the part south of the river (Barksdale, 1937, p. 3-6).

Along the Washington Canal, the overlying confining unit (Woodbridge Clay Member), together with all or part of the Farrington Sand Member, has been eroded. Here, Holocene sand and

gravel were deposited directly on the Farrington and the Triassic bedrock, thus increasing the thickness of the aquifer (Barksdale, 1937, p. 6-9).

South of the Raritan River, the northwesterly part of the Raritan and Magothy Formations are covered by surficial deposits of fine to very coarse sand and local basal beds of gravel (Owens and Minard, 1975). Near Hightstown, the surficial deposits reach a thickness of 94 ft. Where the surficial deposits are in direct contact with the underlying Farrington Sand Member, the thickness and effective recharge area of the Farrington is increased. Wilson and others (1972, p. 27) state that west of the New Jersey Turnpike in the Upper Millstone River basin, where the surficial deposits overlie Cretaceous sediments, the entire section acts essentially as a single water-table aquifer.

Southeast of the Middlesex-Monmouth County line, few wells penetrate the Farrington Sand Member and, consequently, data are sparse. However, geophysical data at Lakewood, Freehold, Toms River, and Sandy Hook, and palynological analyses of cores from wells at Fort Dix, Matawan, Sandy Hook, and Toms River (Perry and others, 1975, p. 1542; Sirkin, written commun., 1971) indicate that the Farrington is separated from the underlying sands of the Potomac Group by a relatively thin confining unit. The unit may be equivalent to the Raritan fire clay. At Sandy Hook and Toms River, this confining unit is only 10 to 20 ft thick (Perry and others, 1975, p. 1542). The thinness of this confining unit strongly suggests that the Farrington and some Potomac sands act as a single aquifer in Monmouth and Ocean Counties in the study area. For this reason, in the area southeast of the Middlesex-Monmouth County line, the Farrington aquifer, as defined in this report, includes the uppermost Potomac sand unit.

The top of the Farrington aquifer strikes in a northeast-southwest direction and dips to the southeast 45 to 60 ft/mi. A structure contour map of the top of the aquifer constructed primarily from geophysical logs is shown in figure 2. The altitude of the top of the aquifer near the Middlesex-Monmouth County line is approximately 400 ft below mean sea level. Near Freehold, the top is approximately 700 ft below mean sea level.

A thickness map of the Farrington aquifer, constructed from geophysical logs and geologists' and drillers' logs, is shown in figure 3. More than 50 geophysical logs were used, most of which were obtained from wells within 6 mi of the outcrop area. The aquifer, is thickest, about 170 ft, in Marlboro Township, Monmouth County (fig. 3).

p. 106 (11

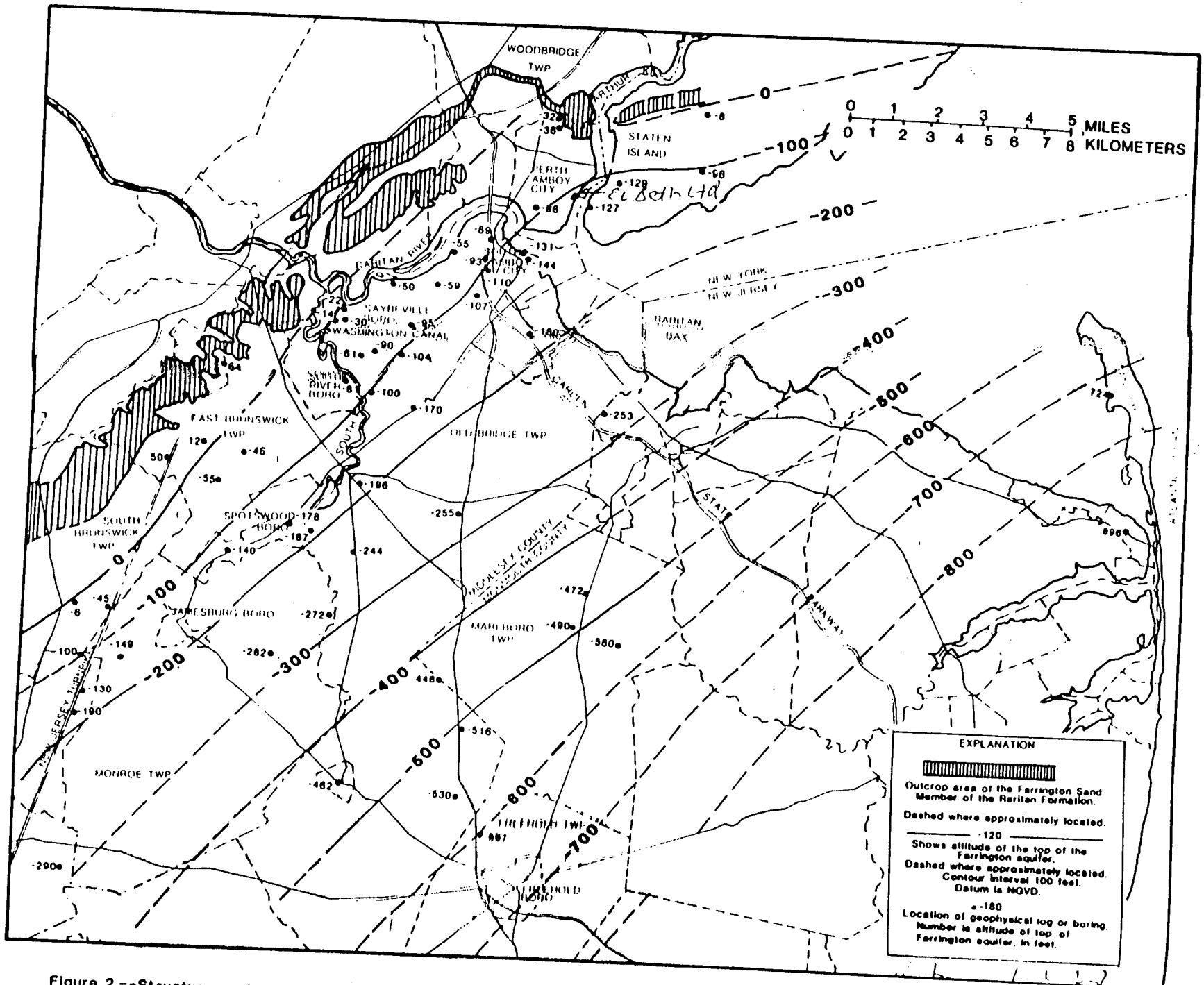

Figure 2.--Structure contour of the top of the Fa

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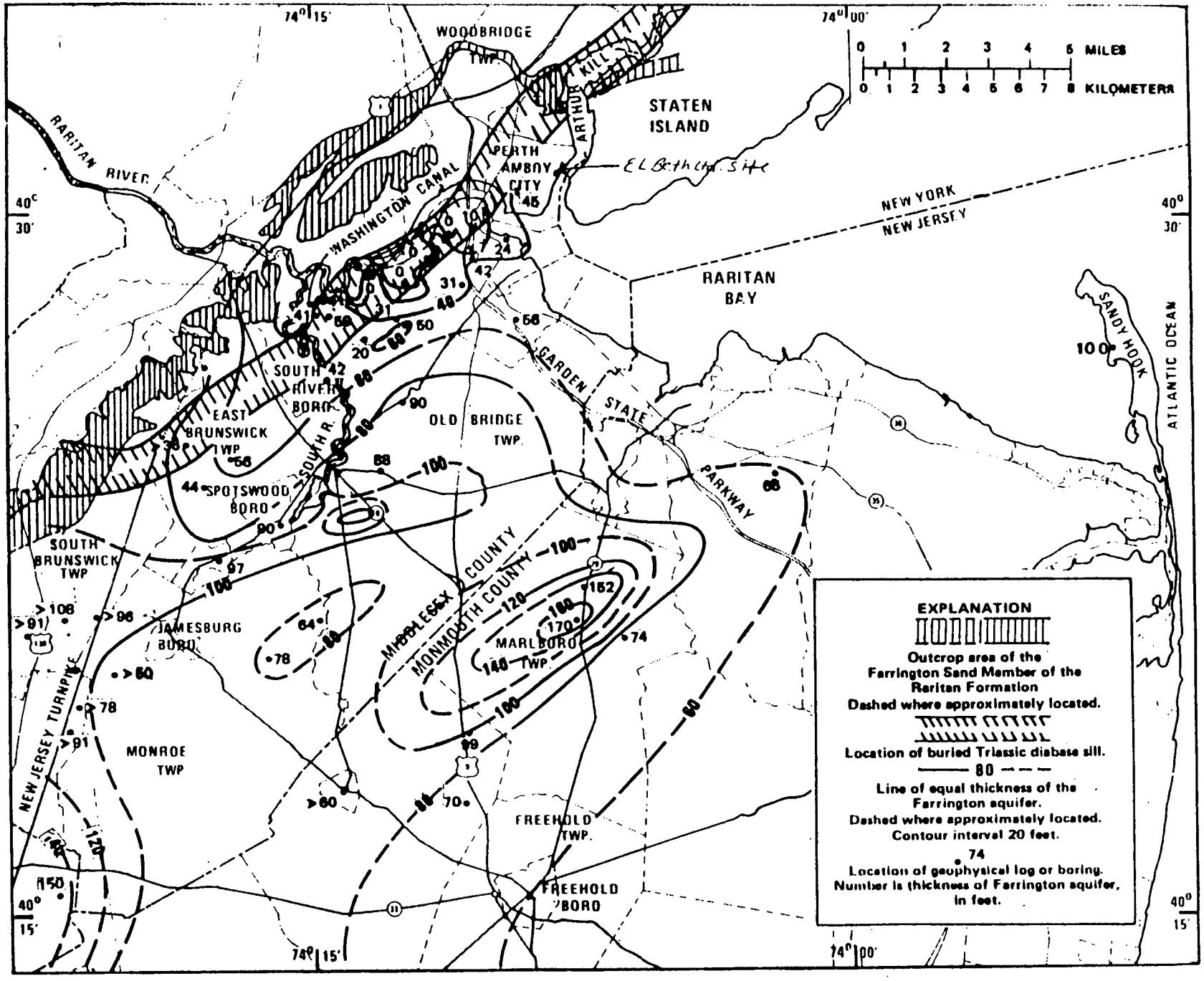

Figure 3.--Thickness of the Farrington aquifer.

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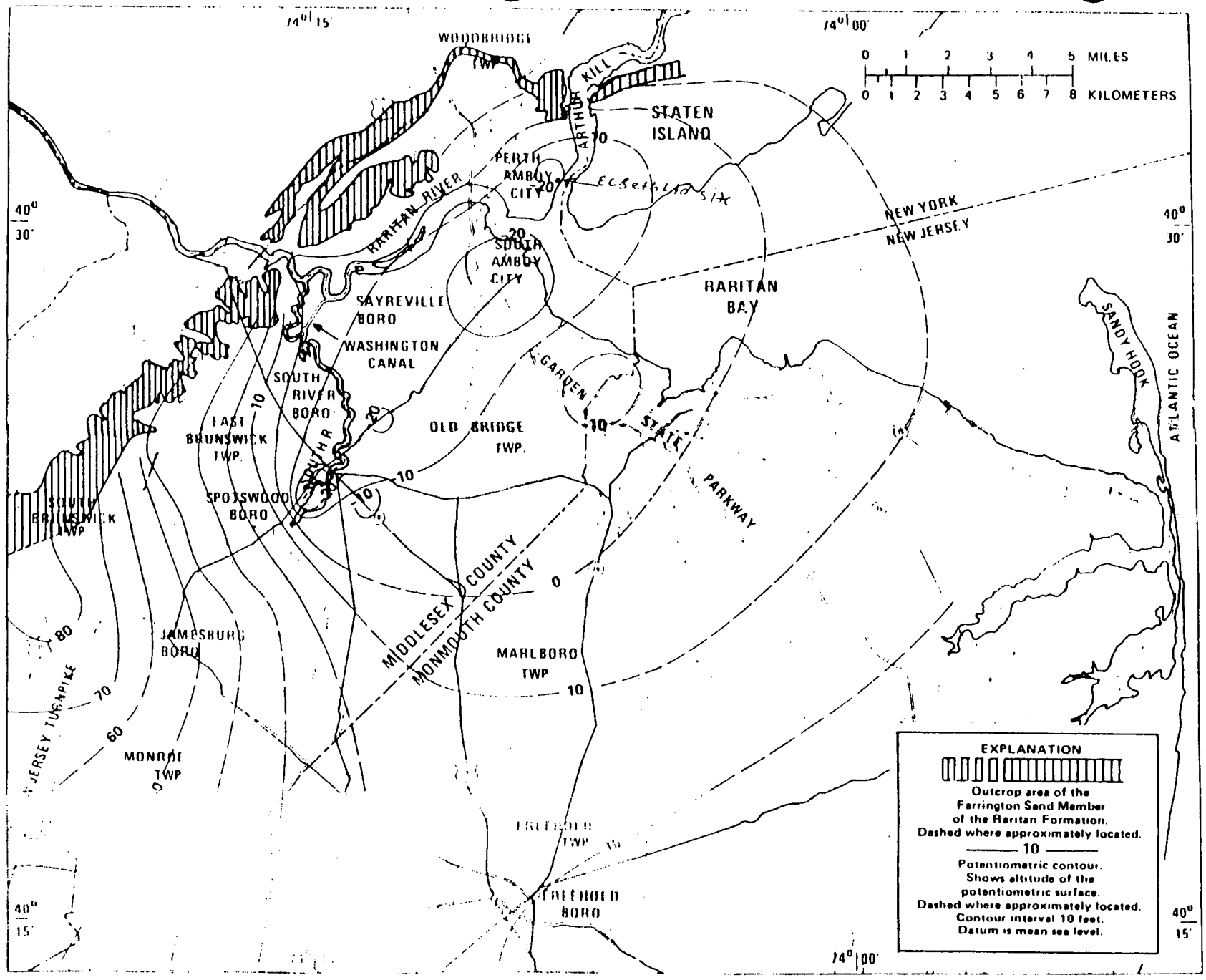

Figure 5. Generalized potentiometric surface of the Farrington aquifer, 1959.

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a discharge to a recharge area prior to 1959. Ground-water flow in 1959 was from the canal to Perth Amboy's Runyon well field (fig. 5).

Water-level measurements made in November 1973 at more than 180 wells were used to construct a 1973 potentiometric surface for the Farrington aquifer. The map (fig. 6) shows a deeper and more extensive cone of depression with the lowest point in excess of 70 ft below mean sea level in the Sayreville area. The gradient from the Washington Canal to Perth Amboy's Runyon well field increased 10 ft/mi between 1959 and November 1973. Water levels in the major recharge area of South Brunswick Township area did not change significantly from 1959 to November 1973.

Withdrawals

Withdrawals from the Farrington aquifer south of the Raritan River began at Perth Amboy's Runyon well field in 1897. By 1914 total withdrawals from the Farrington aquifer in Middlesex County "did not exceed one or two million gallons daily" (Barksdale and others, 1943, p. 107). Annual withdrawal data presented by Barksdale and others (1943, p. 108) for the period 1929-42 are shown in figure 7 together with withdrawals for the period 1959-73. The peak withdrawal of 12 Mgal/d (18 ft^3/s) for the period of 1929-42 occurred in 1936. The lowest withdrawal rate of 7 Mgal/d (11 ft^3/s) for the period occurred in 1942.

Ground-water withdrawals from the Farrington aquifer for the period 1959-73 are presented in figure 8. The total withdrawal shown includes irrigation, public supply, and industrial use. Irrigation withdrawals did not exceed 0.3 Mgal/d (0.5 ft^3/s) and, therefore, are not shown in figure 8. Total withdrawal increased 113 percent, from 12.1 Mgal/d (18.7 ft^3/s) in 1959 to 25.8 Mgal/d (1.4 ft^3/s) in 1973. Public supply and industrial withdrawals during the period 1959-65 were approximately equal and each increased at an average annual rate of 0.2 Mgal/d (0.3 ft^3/s). However, during the period 1966-73, yearly industrial withdrawals were virtually unchanged; while, public-supply withdrawals increased from 9.0 Mgal/d (13.9 ft^3/s) to 18.4 Mgal/d (28.5 ft^3/s), an average annual rate of increase of 1.2 Mgal/d (1.9 ft^3/s). Much of the increase in public-supply withdrawals from 1966 to 1973 occurred southeast of the Old Bridge-Sayreville area.

Upper Confining Unit

The upper confining unit for the Farrington aquifer as defined in this report consists mainly of the Woodbridge Clay Member of the Raritan Formation. The upper confining unit also includes the clayey segment of the overlying Sayreville Sand Member and the South Amboy Fire Clay Member, both of the Raritan Formation, when these units are in direct contact with the Woodbridge. This confining unit is quite extensive and has been traced into Monmouth County on the basis of geophysical logs and palynological data. A thickness map of the confining unit, based

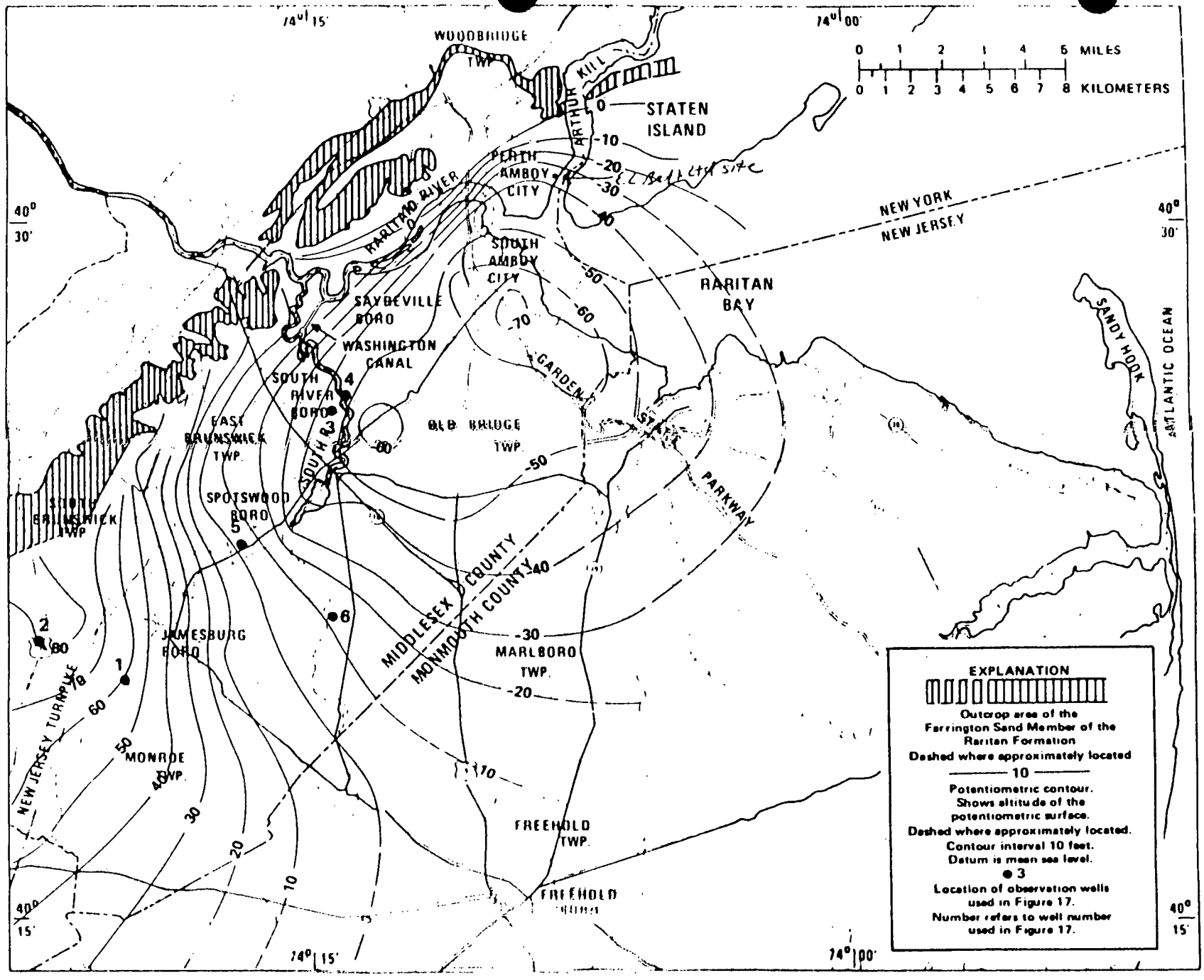

Figure 6. Potentiometric surface of the Farrington aquifer, November 1973.

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on geophysical and drillers' logs, is shown in figure 9. Although variable in thickness, the unit is generally greater than 100 ft thick southeast of the outcrop of the Old Bridge Sand Member. The unit has a maximum thickness of 244 ft.

The Woodbridge Clay Member is a thin to thick-bedded sequence of micaceous silts and clays (Owens and Sohl, 1969, p. 239). The basal part of the Woodbridge "contains beds of compact, tough, and highly refractory fire-clay" (Barksdale and others, 1943, p. 103). This fire-clay has been mined in the vicinity of Sayreville. Also, near Sayreville, the Woodbridge contains lignite, pyrite, and nodular masses of impure siderite (Barksdale and others, 1943, p. 103). To the southwest, the clay content in the Woodbridge decreases, while the sand and gravel content increases. The hydrological significance of this change in lithology will be discussed in a later section of this report.

The Woodbridge ranges in thickness from 50 to 90 ft near the outcrop area (Barksdale and others, 1943, p. 103). Farther downdip, the thickness is 190 ft at Fort Hancock and 120 ft at Toms River (Perry and others, 1975, p. 1542). Perry and others (1975, p. 1543) state that the Woodbridge is "probably estuarine to shallow water marine in origin." Siderite nodules found near Sayreville in the upper part of the Woodbridge contained marine fossils suggesting a marine depositional environment for at least part of Raritan time (Barksdale and others, 1943, p. 103). Dinosaur footprints have also been found in the upper part of the Woodbridge (Barksdale and others, 1943, p. 103-104).

The Woodbridge Clay Member is widespread throughout the Raritan Bay area (Owens and Sohl, 1969, p. 239) and has been traced from Long Island to southern New Jersey on the basis of recent palynological studies. Pollen characterizing the Woodbridge has been found in clays cropping out along the North Shore of Long Island (Sirkin, 1974, p. 440) and in clay pits near Sayreville in Middlesex County (Wolfe and Pakiser, 1971, p. B38-39). Core samples obtained from well sites at Matawan, Monmouth County, and at Fort Dix and Medford, Burlington County, have yielded this same pollen zonation (Sirkin, written commun., 1971). These sites are located 10-15 mi downdip from the outcrop area. Farther downdip, the same zonation has been found in cores collected at Fire Island State Park, Long Island; Fort Hancock, Monmouth County; and Toms River, Ocean County (Perry and others, 1975, p. 1540) as well as from cores obtained at New Brooklyn Park, Camden County, and at Milmay, Cumberland County (Sirkin, written commun., 1971).

Overlying the Woodbridge Clay Member at some locations is the Sayreville Sand Member of the Raritan Formation. The sand consists of fine to medium sand with an average thickness of 35-40 ft (Barksdale and others, 1943, p. 101-102). Locally, it is thin and clayey. Because of its irregular occurrence and its clay content, the Sayreville sand is not a significant water-producing unit.

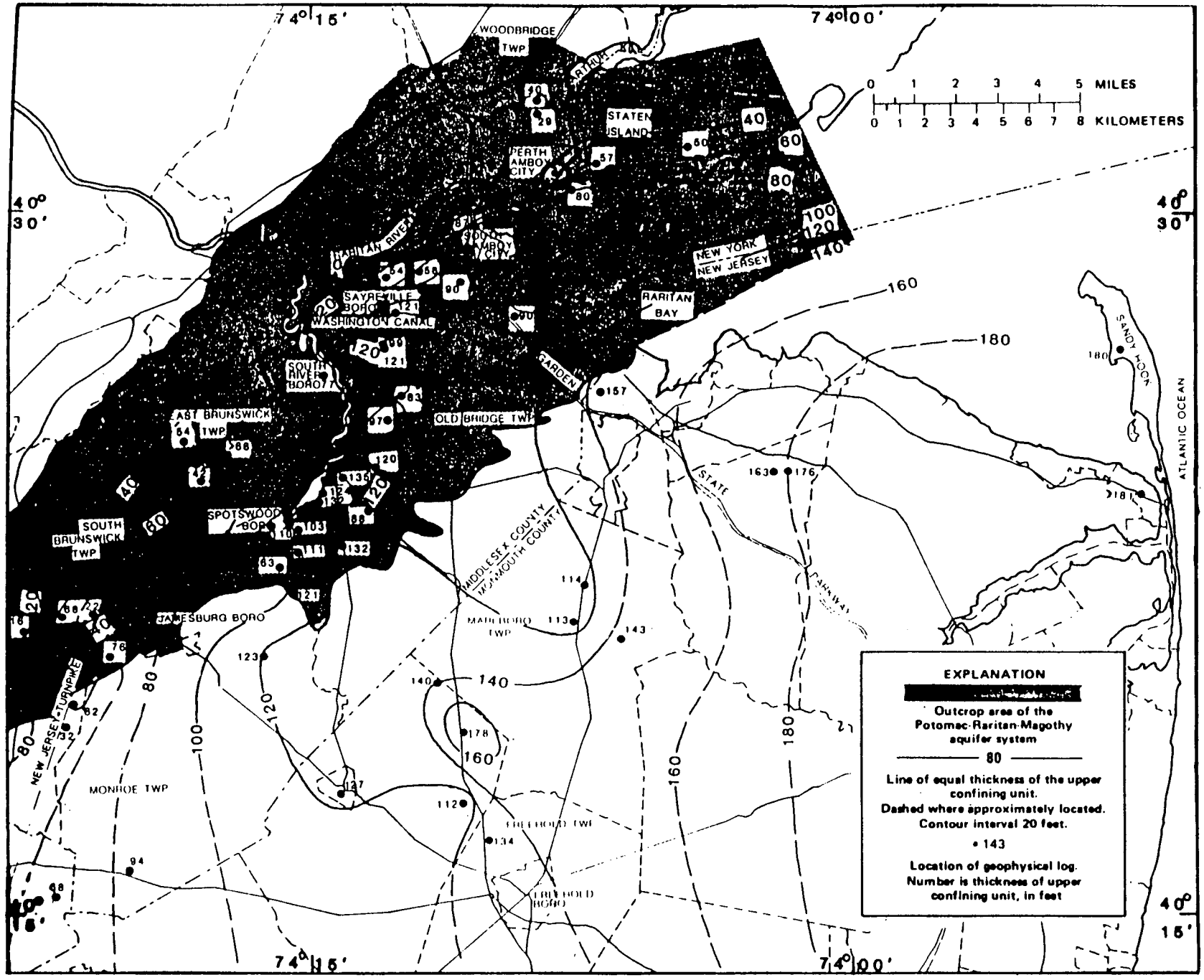

Figure 9.--Thickness of the upper confining unit.

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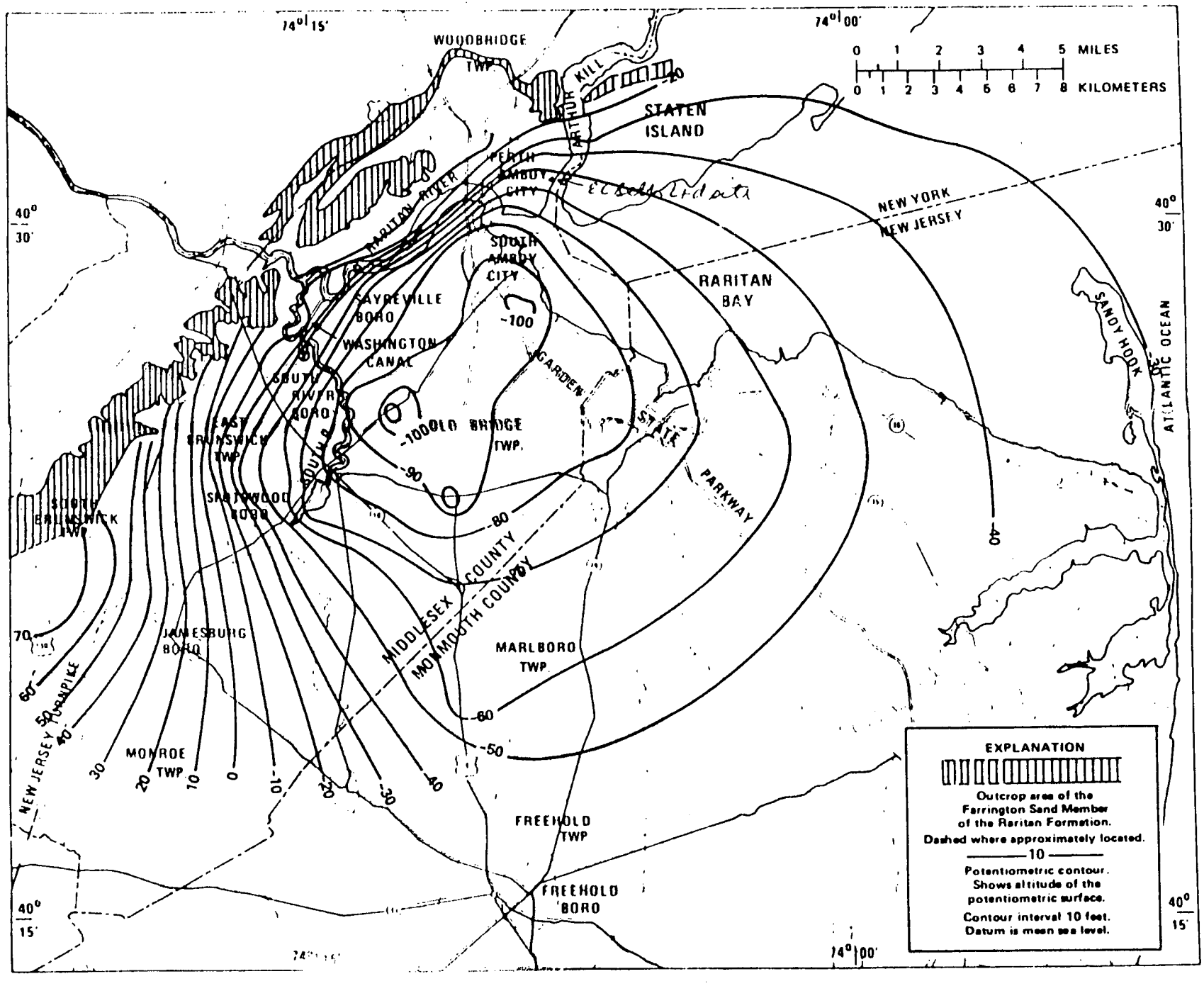

Figure 20. Simulated potentiometric surface of the Farrington aquifer, 1985

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(4.3 ft^3/s), infiltration from surface-water bodies (2.6 ft^3/s, and water released from storage (3.4 ft^3/s). All of these occurred within the subarea.

Discharge from the subarea for the last time step of 1973 was largely by withdrawals through wells. The total withdrawal rate through wells was 26.5 ft^3/s. Combined discharge through vertical leakage to the Old Bridge and to surface-water bodies was approximately 3.2 ft^3/s. The difference between inflow, water released from storage, and outflow is 0.3 ft^3/s, about 1 percent of outflow, which is probably due to calculation errors inherent in the computer.

A budget analysis of the subarea under transient conditions for the year 2000 produced a similar percentage of inflows and discharges. However, the values were greater than those calculated for 1973.

SUMMARY AND CONCLUSIONS

The Potomac-Raritan-Magothy aquifer system consisting of sand, silt, clay, and gravel of Cretaceous age is the most productive source of ground water in the northern part of the New Jersey Coastal Plain. The Farrington and the Old Bridge aquifers are the two major aquifers within the Potomac-Raritan-Magothy system in Middlesex and Monmouth Counties.

The Farrington aquifer consists primarily of the Farrington Sand Member of the Raritan Formation and overlying surficial deposits in Middlesex County. In Monmouth County, the aquifer consists of the underlying sand unit of the Potomac Group. The aquifer ranges in thickness from a featheredge at its outcrop to more than 170 ft in Marlboro Township, Monmouth County. The mean specific capacity of 99 wells, mostly in Middlesex County, is 20.4 (gal/min)/ft of drawdown. The mean specific capacity per ft of well screen is 0.62 (gal/min)/ft per foot of screen.

Overlying the Farrington Sand Member is a confining unit of silt and clay composed mainly of the Woodbridge Clay Member of the Raritan Formation. The confining unit has a maximum thickness of 244 ft and separates the overlying Old Bridge aquifer from the Farrington aquifer.

A major cone of depression existed in the Farrington aquifer near Sayreville in 1959 and 1973. Cones of depression for the Old Bridge aquifer occurred in the Keyport area in 1959 and 1973 and in the Freehold area in 1973. Withdrawals from wells tapping the Farrington aquifer increased from 12.1 Mgal/d (18.7 ft^3/s) in 1959 to 25.8 Mgal/d (39.9 ft^3/s) in 1973. The major recharge area for both the Farrington aquifer and the Old Bridge aquifer is in South Brunswick Township in Middlesex County.

A finite-difference digital-flow model was developed to simulate water-table and artesian conditions in the Farrington

aquifer. A lateral hydraulic conductivity of 105 ft/d was used for most of the area. A uniform storage coefficient of 1.6×10^{-4} was used for artesian conditions and a uniform specific yield of 0.25 for water-table conditions. Vertical hydraulic conductivity of the upper confining unit ranged from 4.2×10^{-7} to 1.0×10^{-10} ft/s and a specific storage of 4×10^{-5} ft^{-1} was used. The model includes the effects of declining water levels in the Old Bridge aquifer. For transient conditions, the 1959 Farrington potentiometric surface was used as the starting head and the 1959 Old Bridge potentiometric surface was used as the initial head overlying the confining unit. Old Bridge heads were adjusted at each node and at every time step using the average rate of change in head for each node between 1959 and 1973.

The model was calibrated for the 15-year period, 1959-73. Yearly withdrawal rates were used to stress the aquifer. Calibration of the model was achieved by comparing the calculated potentiometric surface for the end of the 15-year period with the observed November 1973 potentiometric surface. In addition, hydrographs of selected wells were compared with model results. After calibration, steady-state conditions were simulated. The model results compared favorably with available prepumping water levels.

The potentiometric surface of the Farrington aquifer was simulated to the year 2000 by using projected withdrawals. The withdrawals were estimated by a linear projection determined from 1959-73 withdrawals. The simulated potentiometric surface for the Sayreville area is in excess of 100 ft below mean sea level by 1985 and exceeds 150 ft by 2000. The simulated potentiometric surfaces for 1985 and 2000 are somewhat similar to the 1973 surface, but the cone of depression in the vicinity of Sayreville is greater in depth and area.

A ground-water budget analysis for steady-state conditions prior to development indicates that total inflow into the Farrington aquifer was 16 ft^3/s. Recharge in the outcrop area and vertical leakage from the Old Bridge each accounted for about 8 ft^3/s each. Approximately 75 percent of the discharge occurred in or near the outcrop area. Most of this discharge was into the Raritan River, Washington Canal area, and Arthur Kill. The remaining 25 percent of the discharge occurred southeast of the outcrop as vertical leakage into the overlying Old Bridge aquifer and as lateral flow into Ocean and Burlington Counties.

The budget analysis for transient conditions (1959-2000) indicates the importance of vertical leakage (mainly from the Old Bridge) as a source of water to the Farrington aquifer. Other sources of water include recharge in the outcrop area, water released from storage, and infiltration from the Washington Canal and part of the Raritan River. The original hydraulic gradient toward the two surface-water bodies was reversed prior to 1959, thus causing the Washington Canal and part of the Raritan River to recharge the aquifer. The budget analysis also shows that

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recharge into the aquifer from these two surface-water bodies increased with time during the simulation.

A transient budget analysis for the last time step of 1973 was made for a subarea consisting mainly of Middlesex County. About 48 percent (14.3 ft^3/s) of the total inflow to the subarea was through its boundaries. Other sources included direct recharge (5.4 ft^3/s), vertical leakage, mainly from the Old Bridge, (2.6 ft^3/s), and water released from storage (3.4 ft^3/s). Withdrawals from wells (26.5 ft^3/s) were the major discharge from the subarea of the aquifer. The combined rate of discharge through vertical leakage to the Old Bridge and to surface-water bodies was approximately 3.2 ft^3/s.

Analysis for the year 2000 showed a similar percentage. However, the values were greater than those calculated for 1973.

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STATE OF NEW JERSEY

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SPECIAL REPORT 8

THE GROUND-WATER SUPPLIES OF MIDDLESEX COUNTY, NEW JERSEY

Prepared in cooperation with the United States Department of the Interior, Geological Survey

1943

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State of New Jersey
State Water Policy Commission
Howard T. Critchlow, Engineer in Charge

The Ground-Water Supplies of Middlesex County New Jersey

With Special Reference to the Part of the Coastal Plain Northeast of Jamesburg

By

Henry C. Barksdale

Meredith E. Johnson

Roger C. Baker

Edward J. Schaefer

George D. DeBuchananne

Prepared in cooperation with the United States Department of the Interior,

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LETTER OF TRANSMITTAL

Mr. George S. Burgess, Chairman
State Water Policy Commission

DEAR SIR:

I am transmitting herewith a report on ground-water supplies of Middlesex County, N. J., prepared by Henry C. Barksdale, Hydraulic Engineer, U. S. Geological Survey. The report contains the information which has been assembled on ground-water conditions in that portion of Middlesex County adjacent to Raritan Bay and extending up the valleys of Lawrence Brook and South River. It discusses the public water supplies and many of the private supplies which are derived from the ground-water horizons designated in the report as Farrington (No. 1) sand and Old Bridge (No. 3) sand. Special Report No. 7 published in 1937 was a preliminary report on the water supplies from the No. 1 sand in the vicinity of Parlin.

The report points out the danger to the water supplies in this area from salt water intrusion and emphasizes the importance of reducing the draft on the No. 1 sand in order to avoid further pollution. It warns against further development in the No. 3 sand, the safe yield of which has been reached in this area. It is important that the municipalities and other public agencies be acquainted with this situation in order that the valuable ground water resources in this area may not be ruined by overdraft.

I therefore recommend that this report on ground-water supplies of Middlesex County be published as a special report of the Commission in order that the information contained therein may be made available to the people of the State.

Respectfully submitted,

H. T. CRITCHLOW,
Engineer in Charge.

June 11, 1943.

ABSTRACT

Ground-water investigations have been carried on in parts of Middlesex County since 1923. This report is based upon detailed observations of ground-water conditions in that part of the coastal plain between Jamesburg and Perth Amboy, and upon a generalized survey of ground-water conditions in the remainder of the county. It deals primarily with the factors affecting the safe yield of the more important aquifers in the county.

Roughly the northwestern third of the county is underlain by rocks of the Newark group of Triassic age and the southeastern two-thirds by sands and clays of the coastal plain, which are of Cretaceous age and are largely unconsolidated. The rocks of the Newark group dip toward the northwest, but they are so badly fractured that the dip is of very little significance from a hydrologic standpoint. Intruded into the rocks of the Newark group is a diabase dike, that is of no importance as a water-bearing formation, but stood as a ridge on the surface upon which the Cretaceous deposits were laid down. Hence the lowest of the Cretaceous sands (the Farrington sand member of the Raritan formation) is almost divided into two parts by it. To a considerable extent this ridge has been effective in retarding the advance of salt water into this sand from the estuary of the Raritan River. The beds of the coastal plain formations dip to the southeast, and alternating layers of permeable sands and relatively impermeable clays provide a setting under which water supplies are frequently encountered under artesian conditions. Both the Cretaceous formations and the older rocks of the Newark group are overlain throughout much of the county by various Quaternary deposits. These latter deposits are relatively unimportant as water-bearing formations. Their principal importance lies in their ability to absorb water and transmit it to the underlying materials, or in a few places to prevent the absorption of water by the underlying bed.

Early developments of ground water in the county were primarily in the form of relatively shallow dug wells, and in the improvement of existing springs. Drilled wells similar to those generally in use today were not developed to any considerable extent until the end of the last century. The development of large supplies of ground water has depended to a considerable extent upon the development of well drilling methods and upon the improvement of well pumping machinery. In 1941 more than 37 million gallons of water a day was pumped from wells for industrial and municipal water supplies in Middlesex County. Of this amount about 22 million gallons a day was used exclusively for industrial purposes and the remainder for public water supplies.

The quality of water obtained from wells in Middlesex County is generally satisfactory for all ordinary purposes. It sometimes requires treatment for the removal of iron or for the reduction of hardness. In some areas the ground waters have been contaminated by sea water that has been drawn into the aquifers by heavy pumping. Where this contamination has been severe, the waters are of little value except for cooling.

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In the course of these investigations records of water levels have been obtained in a great many wells. Some of these records now cover a period of more than twenty years. Included in this group are some wells not affected by pumping that have been used as a standard for comparison with the fluctuations in the other observation wells. They have also proved valuable as indices of the amount of water naturally stored in the ground at various times. As such they are useful outside the scope of this report for the prediction of minimum stream flow and for similar purposes. At the Perth Amboy Water Works, at Runyon, a record of precipitation, temperature and evaporation has been obtained for approximately 20 years.

Of the various aquifers within the county three are of major importance. The rocks of the Newark group are the principal source of ground water in the northwestern part of the county. The Old Bridge and Farrington sands, both members of the Raritan formation, are the principal sources of water supply in the southeastern two-thirds of the county. The other aquifers are of relatively little importance either because of the limited area in which they are available or because they are not capable of yielding substantial supplies.

The Old Bridge sand is the most important aquifer within the county. It supplies more than half the total water used for industrial and public water supplies. In 1941 a total of more than 19 million gallons a day was withdrawn from this sand in Middlesex County and 2 or 3 million gallons a day was taken from wells tapping this sand outside the county, bringing the total yield to 21 or 22 million gallons daily. In 1942 the total pumpage had increased to 25 or 26 million gallons daily. Studies made of this sand indicate that natural recharge probably could not supply this large yield of water. Fortunately, however, at least two major developments include works for artificially recharging this sand. Even so, it is believed that the safe yield of this sand has been reached. The pumpage from this sand should not be increased except in instances where it is possible and desirable to recharge the sand with surface water in an amount essentially equivalent to the additional water to be taken from wells.

The Farrington sand yielded about 8.5 million gallons daily to municipal and industrial wells during 1941. The safe yield of this sand appears to have been exceeded for a considerable period in the past. Its capacity is limited not by the amount of natural recharge or by its ability to transmit water, but rather by the fact that it is exposed in numerous localities to the intrusion of salt water from surface sources. A considerable part of this sand now contains water that is contaminated by salt water. In at least three areas the water in this sand is severely contaminated. There is substantial evidence supporting the belief that the areas of contamination will expand with continued pumping from the wells tapping this sand. A few wells that drew from this sand have already been abandoned because of salt-water contamination, and it seems probable that a considerable number of others will have to be abandoned at some time in the future. After this has occurred and the total pumpage from the sand has thereby been reduced materially, it may be possible to develop some new water supplies from this sand in areas near its intake area and remote from bodies of surface water containing salt.

The rocks of the Newark group yield water to a large number of wells in the county. In localities where they are covered by permeable material they yield substantial quantities. In areas where they are not covered by such deposits

or where they are covered by impermeable materials, the yield is very low. The water that these rocks yield comes almost entirely from cracks which form a small part of their total volume so that their storage capacity is low. Substantial yields are safely obtained only in areas where the overlying material is capable of absorbing and storing considerable amounts of water and of transmitting it freely to the underlying rock.

It seems probable that no more large ground-water developments can be made within Middlesex County. Possibly some additional water may be obtained from the Newark group, but this should not be attempted without a careful study of conditions in the vicinity of any proposed development, because draft on these rocks is already heavy. Some additional water can be developed from the Englishtown sand in the southeastern corner of the county, but care should be exercised not to injure water supplies derived from this sand down the dip in Monmouth County. On the whole it seems probable that any large additional supplies of water for Middlesex County will have to come from surface water, and very possibly from sources outside the county. The appraisal of sources of surface water is, however, outside the scope of this report.

Future studies of the Old Bridge sand should be directed primarily toward ways of increasing its intake capacity by artificial recharge. Those of the Farrington sand should be concerned primarily with the salt-water instrusion in this sand. Intensive quantitative studies should be made of the Newark group in order to estimate more accurately its safe yield in different localities. Measurements should be continued at the evaporation station at Runyon and in the Morrell and other water-table wells. A few additional observation wells should be established in parts of the county where there is no effect of pumping.

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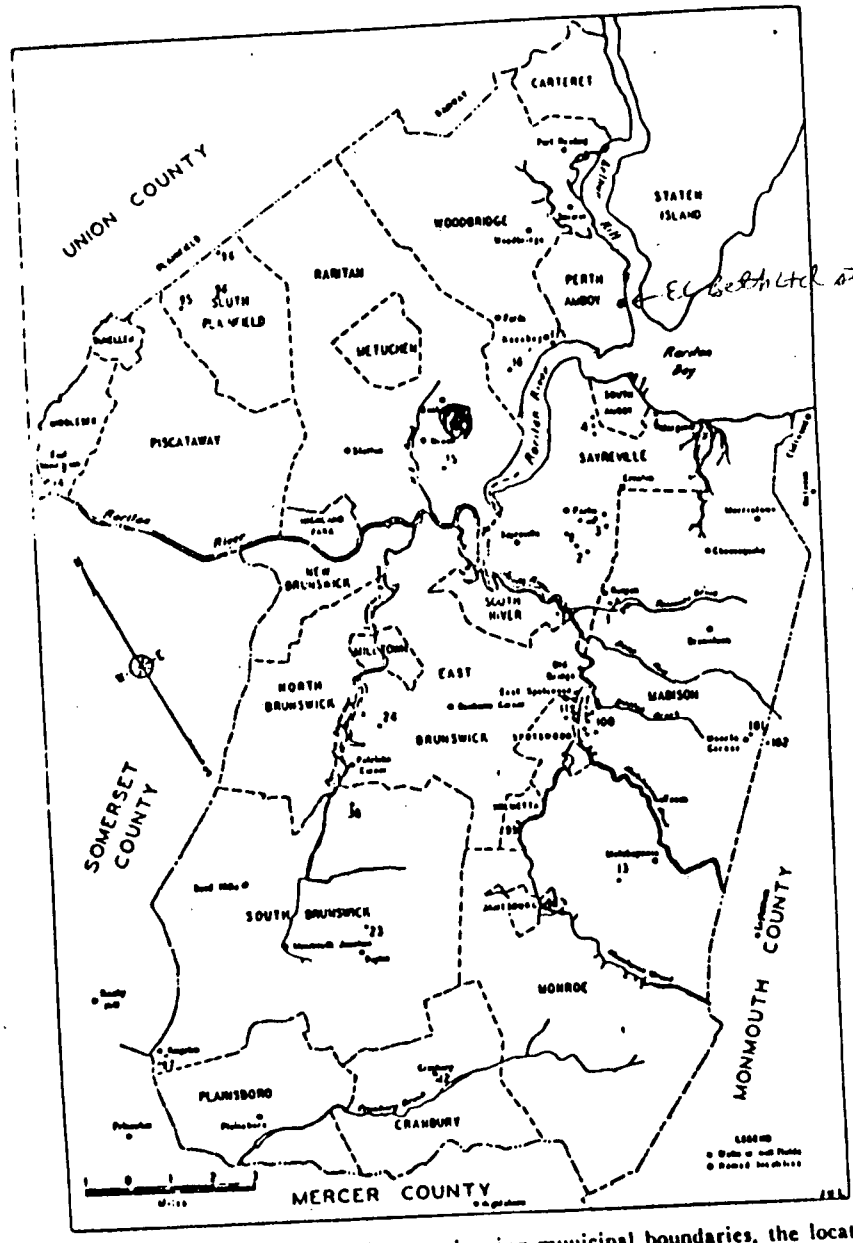

FIGURE 2.—Map of Middlesex County, showing municipal boundaries, the location of important wells or well fields, and places referred to in the text.

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KEY TO WELL NUMBERS (Figure 2)

1. Perth Amboy Water Department
2. Hercules Powder Company
3. E. I. duPont deNemours & Co.
4. National Lead Company
6. South Amboy Water Department
7. South River Water Department
11. Peter J. Schweitzer Company
12. Cranbury Water Company
13. State Home for Boys
23. Kufka test well
24. Fischer test well
38. Beecher test well
94. Elizabethtown Water Company, Piscataway well field
95. Plainfield-Union Water Company, Clinton Avenue wells
96. Middlesex Water Company well fields
97. Kingston Water Company
98. Jamesburg Water Company
99. Helmetta Water Company
100. Dubernal water supply
101. Morrell well
102. Hulsart well

Scope of report.—This report is based upon detailed observations of ground-water conditions which were begun at the Perth Amboy Water Works at Runyon in 1923, and have been gradually expanded to cover much of the industrial area along the estuary of the Raritan River, and upon a more generalized survey of ground-water conditions in the remainder of the county which has been carried out mainly during 1941 and 1942. Detailed field studies have been made of the geology and hydrology of the part of the county that lies in the coastal plain northeast of Jamesburg. It is in this area that most of the ground-water development in the county has taken place, and the major part of the report deals with the conditions there. For the remainder of the county, the report is more generalized.

The quality of the ground water of the area is discussed briefly in a section of the report devoted to that topic. Samples of water have been collected from representative wells tapping each of the more important aquifers and have been analyzed for their mineral content in the Water Resources Laboratory of the Geological Survey. The results of these analyses are included in tabular form. No attempt is made to determine the sanitary or bacteriological quality of the water as these features are usually not due to conditions inherent in the aquifer but to extraneous causes or to the treatment of the water after it has been pumped to the surface.

During the investigation on which this report is based much information on water levels and artesian pressure was collected. Many thousands of individual measurements of water level or artesian pressure were made and continuous records of water levels were obtained by means of automatic water-stage recorders at one time or another in about thirty wells. Most of these records have been published by the Geological Survey in its annual reports on water levels and artesian pressure.[1] The remaining records will be published in forthcoming

[1] Meinzer, O. E., Wenzel, L. K., and others, Water levels and artesian pressure in observation wells in the United States: U. S. Geol. Survey Water-Supply Papers 777, 817, 840, 845, 886, 906, 936, etc. (Annual volumes since 1935.)

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adjacent counties. Effective control should therefore be State-wide and the regulation of inter-state aquifers may require inter-state cooperation. Effective control should also be broadly inclusive. Restrictions applied to one class of water users and not to another would be futile as well as unfair. No diversion of ground water should be made without the prior approval of some unbiased agency empowered to safeguard this valuable natural resource against injurious overdevelopment.

OUTLINE OF GEOLOGY

Physical Divisions

Middlesex County lies within two major physiographic provinces, the Coastal Plain Province and the Piedmont Province. This division is based largely on rocks and structure projected from nearby regions, for in Middlesex County the topography would not warrant this subdivision, mainly because it has been modified by Quaternary deposits. The part of the county which is in the Coastal Plain Province is, roughly, that which lies southeast of a line from Plainsboro to Carteret. In this area the bed rock consists of unconsolidated or poorly consolidated sands and clays of Cretaceous age (see Stratigraphic Table, page 18, for geologic time-table) which dip at low angles to the southeast.

The Piedmont Province includes the area to the north and west of the Coastal Plain Province. It is underlain by relatively hard Triassic rocks, which in most regions stand up as rounded hills above the flat coastal plain. The prominences at Sand Hills are capped by outliers of the formerly more extensive Cretaceous sediments which have been protected from erosion by the numerous consolidated layers of "ironstone" (ferruginous sandstone) and the resistant Triassic diabase to the south. Farther north and east the Triassic shales have been eroded nearly as low as the Cretaceous sediments. This feature, together with the blanket of Quaternary deposits, has left little difference in the topography of the two provinces.

Geologic History

The geologic history of Middlesex County as observed from the rocks within its borders is necessarily far from complete. Much of it, however, can be read from rocks in nearby areas although other events are forever lost. References to the length of time which has elapsed since the deposition of some of the formations are of necessity approxi-

mate. They are based on age determinations from radio-active minerals and are given to indicate the slowness with which geologic processes operate, the vastness of the intervals in which there are no geologic records within the county and, to some extent, the relative age of the existing formations.

The gneiss of the Wissahickon formation, known only from well logs in Middlesex County, gives us the first chapter in the geologic history of the county. In pre-Paleozoic time, at least 600 million years ago, muddy sediments were deposited, which later were folded and metamorphosed (altered) and then intruded by highly heated molten rock. This igneous activity further metamorphosed and recrystallized the sediments so that they little resembled the original deposits.

A long period of erosion followed, during which the existing mountains and hills were reduced to a fairly level plain. This was followed by the development of a depression which extended from the Gulf of Mexico northeastward through the Appalachian belt and Canada, and which was occupied by an arm of the sea for many millions of years. The record of those years is read in the sediments which were deposited in the depression and in which we find today the fossils, or preserved remains of animals which lived and developed during that period (the Paleozoic era). Since these sediments are today found only northwest of Middlesex County, the presumption is that either this area was above sea-level during that entire period, or that such sediments as were deposited have since been entirely removed by erosion. Whichever assumption is right, the second oldest rocks which we find in Middlesex County today are the generally red-colored rocks of Triassic age, which are believed to be at least 400 million years younger than the Wissahickon formation.

The Triassic sediments in Middlesex County are believed to have been deposited in an intermontane valley in the latter part of that geologic period. During this same time there was considerable igneous activity, the most important of which was the intrusion of the thick sill of diabase known along the Hudson River as the Palisades. This sill is continuous in the Triassic rocks in Middlesex County from Carteret to Rocky Hill, but is found at the surface only from Deans to Rocky Hill. The Triassic rocks were later tilted, faulted and eroded during an interval of about 100 million years. This interval spanned all of the Jurassic period and more than half of the Cretaceous period.

In early Upper Cretaceous times the land surface in Middlesex County consisted of a plain of moderate relief sloping to the southeast at about 60 feet to the mile. The bed rock in the southern third of the

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area consisted of the Wissahickon formation and the rest consisted of Triassic rocks, above which the resistant diabase sill stood as a ridge. Then the land was submerged and Upper Cretaceous sands and clays were deposited on it in alternating layers dipping to the southeast. These sediments tended to thicken oceanward so that the older sediments dipped parallel to the underlying plain while the higher formations were more nearly horizontal. During this period there were fluctuations in the depth of water, as indicated by the alternation of shallow and deep water fossils in the Cretaceous formations. The general relationship of the various rocks in the county is shown on the geologic section in figure 3.

In the Tertiary period which followed, there were intervals of deposition and of erosion, but any sediments which may have been deposited in Middlesex County have since been removed by erosion, together with much of the older Cretaceous deposits.

In the Quaternary period, which dates from the beginning of the Ice Age and in which we are now living—a period of some 2 million years—there were four advances of great ice sheets moving from centers in Canada into the northern part of the United States, interspaced with times of partial submergence and deposition. In Middlesex County there is evidence of only the last ice sheet. This consists of the Wisconsin drift which blankets the northern third of the county. The oldest non-glacial Quaternary deposits have been entirely removed from the county. The Pensauken formation, which is much older than the Wisconsin drift, is found capping the hills and higher divides but has been removed from the larger stream valleys. The Cape May formation, which is probably slightly older than the Wisconsin drift, is found mainly in stream valleys. Since the retreat of the Wisconsin ice sheet there have been only relatively slight physiographic changes in the county.

Outline of the Stratigraphy

The areal geology of Middlesex County is shown on figures 4, 5 and 6 on pages 19, 20, and 21. The geologic formations shown thereon range from soft, unconsolidated alluvial deposits formed within the last few thousand years, to compacted rocks whose origin dates back many millions of years. The following stratigraphic table, arranged in normal sequence (i. e. youngest formation at the top) includes a still older formation (the Wissahickon) which has been penetrated by a number of deep wells within the county. Detailed descriptions of the formations are given in the section on hydrology and geology of the rock formations beginning on page 52.

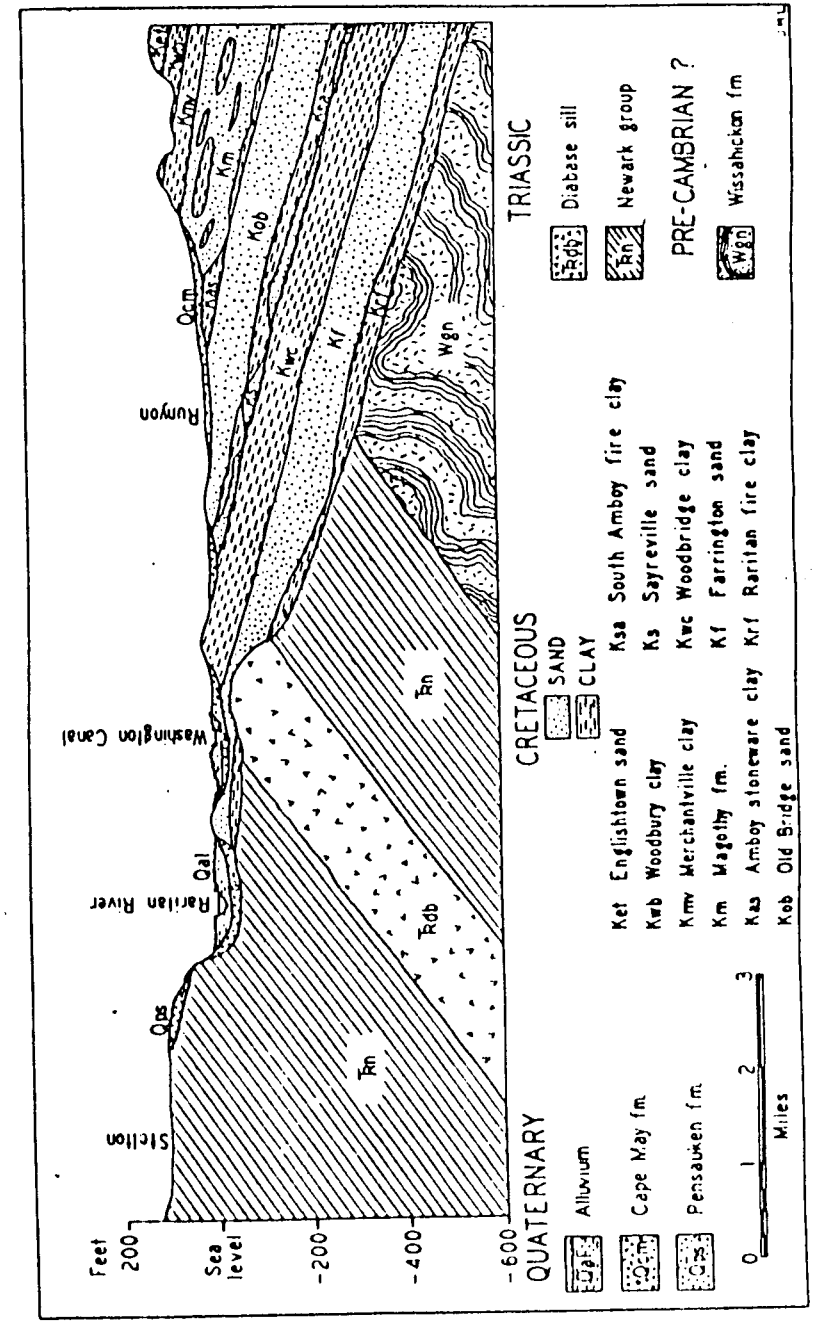

FIGURE 3.—Generalized geologic section from Stelton through Runyon to the county line.

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STRATIGRAPHIC TABLE FOR MIDDLESEX COUNTY, N. J.

Cenozoic sequence
- Quaternary system
  - Recent series
    - Alluvium
    - Eolian deposits
  - Pleistocene series
    - Wisconsin drift
    - Cape May formation
    - Pensauken formation

UNCONFORMITY

Mesozoic sequence.
- Cretaceous system
  - Upper Cretaceous series
    - Mount Laurel and Wenonah sands
    - Marshalltown formation
    - Englishtown sand
    - Woodbury clay
    - Merchantville clay
    - Magothy formation
    - Raritan formation
      - Amboy stoneware clay
      - Old Bridge sand member
      - South Amboy fire-clay
      - Sayreville sand member
      - Woodbridge clay
      - Farrington sand member
      - Raritan fire-clay

UNCONFORMITY

- Triassic system
  - Upper Triassic series (Newark group)
    - Brunswick shale
    - Lockatong formation
    - Stockton formation

UNCONFORMITY

Proterozoic sequence (?)
- Pre-Cambrian (?)
  - Wissahickon formation

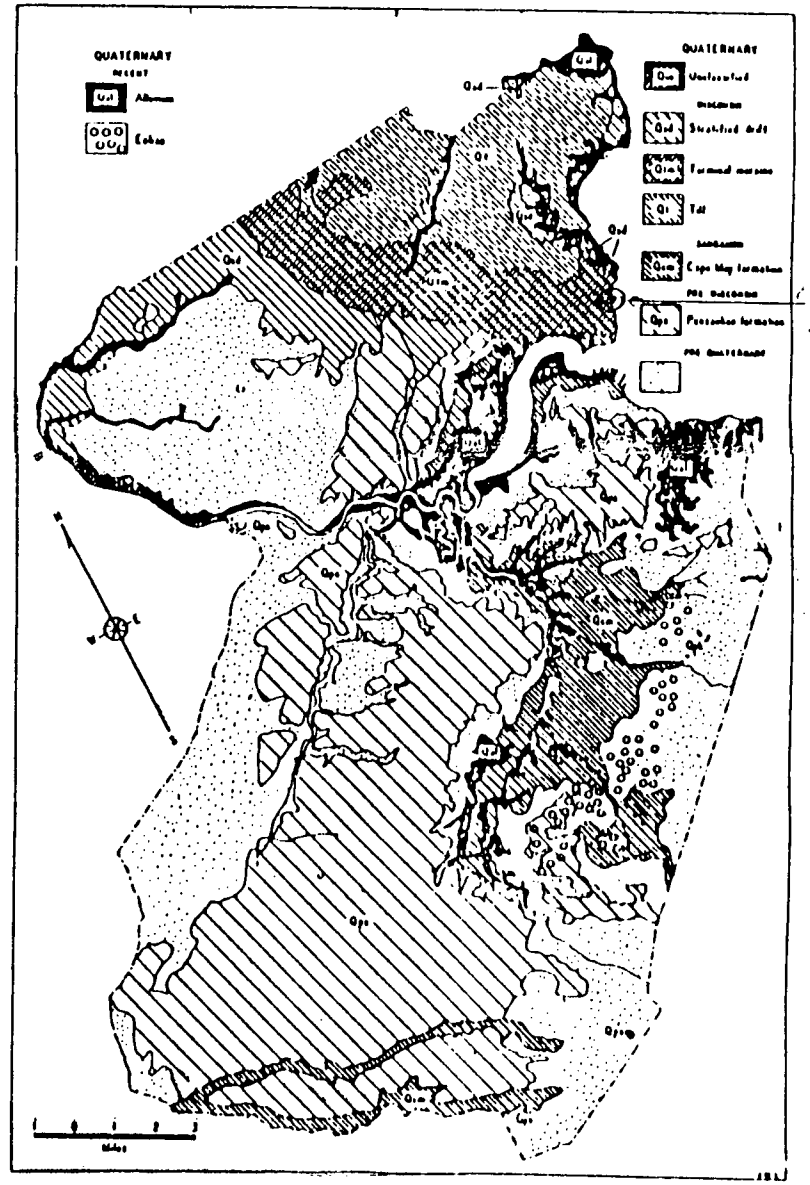

FIGURE 4.—Map of Middlesex County showing the areal distribution of the rocks of the Quaternary system. Small quantities of good water are obtained from the eolian deposits, the stratified drift, the Cape May and Pensauken formations, and the unclassified deposits.

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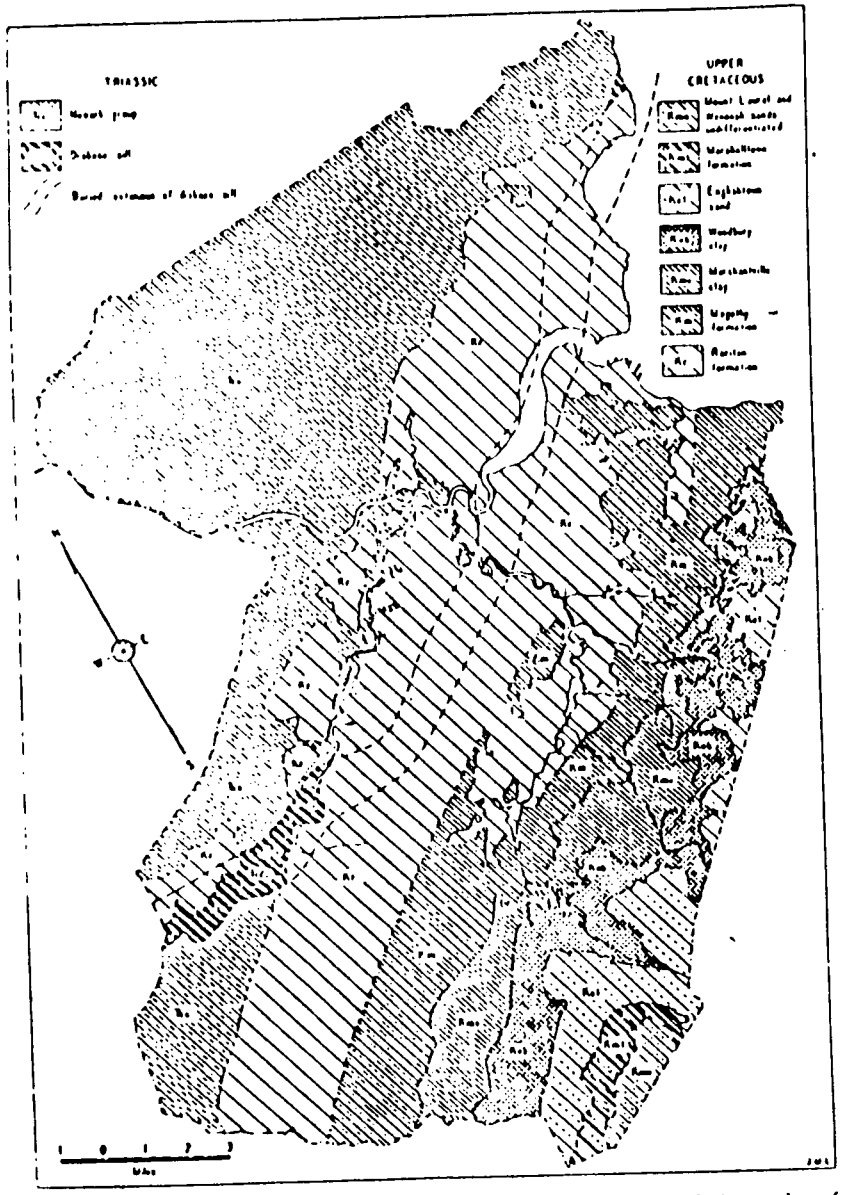

FIGURE 5.—Map of Middlesex County showing the exposures of the rocks of the Triassic and Cretaceous systems. Small quantities of good water are obtained from the Mount Laurel and Wenonah sands, the Englishtown sand and the Magothy formation within the county. Substantial quantities are derived from the Raritan formation and the rocks of the Newark group.

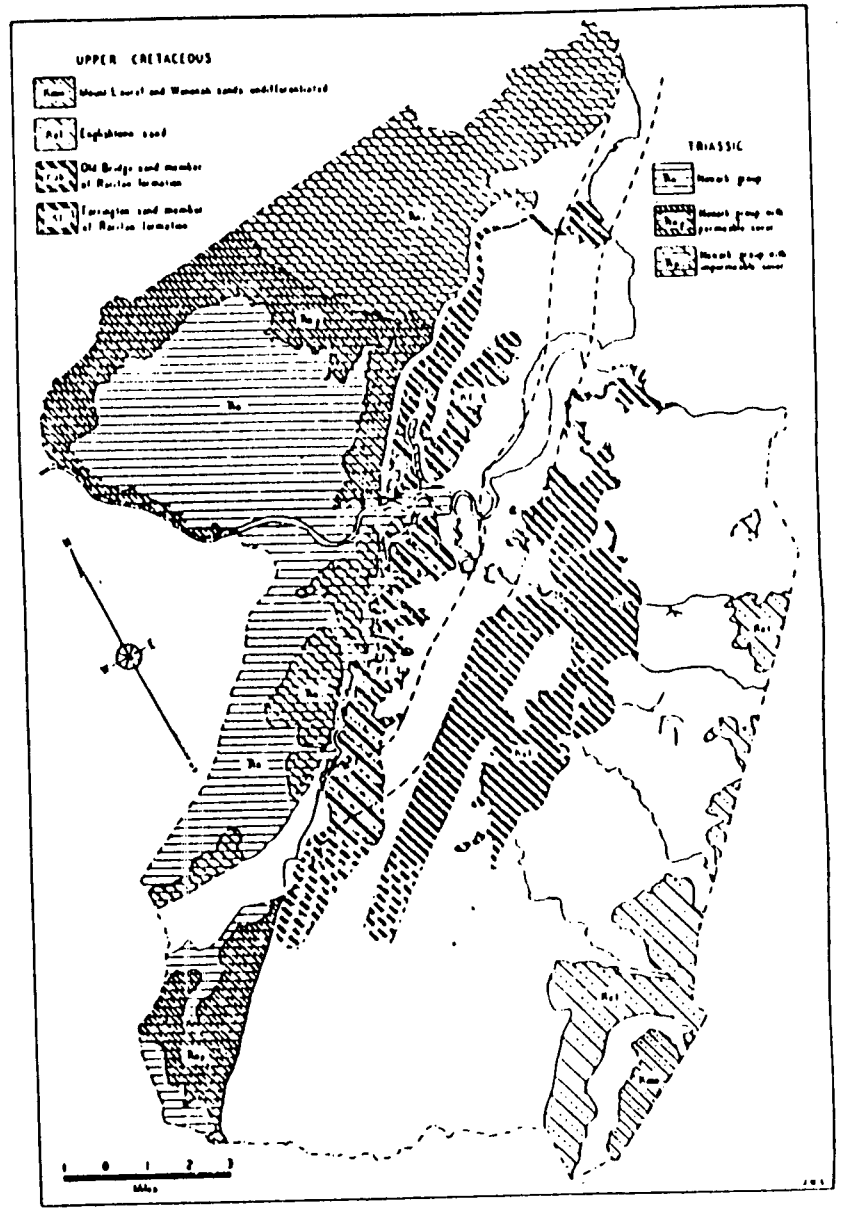

FIGURE 6.—Map of Middlesex County showing the intake areas of the important aquifers. Large quantities of good water are obtained from the Old Bridge and Farrington sand members of the Raritan formation. Small quantities are obtained from the Englishtown sand and the Mount Laurel and Wenonah sands. The rocks of the Newark group yield moderately large supplies where overlain by permeable materials, but elsewhere their yield is small.

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MAGOTHY FORMATION

2187. Browntown; 3¼ mile west of, from road cut about ¼ mile south of highway, 25 feet above base.
2190. do ; 3¼ mile west of, from same location and about 2 feet above sample 2187.
2191. Cheesequake; Perrine's pit, 8 feet above base of formation.
2198. Runyon; 1¼ miles NE of, from small sand pit about 100 yards north of highway, about 10 feet above base.
1582. Browntown; ¾ mile SE of, Dr. Ostberg's well, 160 to 165 foot depth.

OLD BRIDGE SAND MEMBER OF THE RARITAN FORMATION

2167. South River; Marcus Wright's pit, 5 feet above water level, elevation above base of formation not determined.
2168. do ; Marcus Wright's pit, 11 feet above sample 2167.
2170. do ; do , 14 feet above sample 2168.
2171. do ; do , 24 feet above sample 2170 and 6 feet below contact with Pensauken formation.
2173. Parlin; Crossman pit, 8 feet above contact with South Amboy fire clay.
2174. do ; do , 18 feet above base of sand.
2175. do ; do , 28 feet above base of sand.
2176. do ; do , 39 feet above base of sand.
2177. do ; do , 48 feet above base of sand and 5 feet below contact with Pensauken formation.
2181. Old Bridge; South River Sand Company pit, 20 feet below contact with Amboy stoneware clay.
1630. Runyon; test well A-41, 13 foot depth.
1637. do ; test well K-1, 7 foot depth.
1638. do ; test well J-4, 7 foot depth.

SAYREVILLE SAND MEMBER OF THE RARITAN FORMATION

2172. Sayreville; from pit near Raritan River, 3 feet above contact with Woodbridge clay and 4 feet below contact with South Amboy fire clay.

FARRINGTON SAND MEMBER OF THE RARITAN FORMATION

2160. South River; abandoned sand pit about 1½ miles north of town, 20 feet above Raritan fire clay.
2161. Same pit as 2160, 25 feet above Raritan fire clay.
2162. Same pit as 2160, 35 feet above Raritan fire clay.
2163. South River; about 1 mile northwest of town, 2½ feet below Woodbridge clay.
2164. Same locality as 2163, 3½ feet below Woodbridge clay (represents locally coarse streak).
2165. Milltown; from highway cut about 1 mile east of town, 1 foot above Raritan fire clay.
2166. Milltown; Marcus Wright's pit, 13½ feet above Raritan fire clay.

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The volumetric samples were collected by driving a sampling tub perpendicularly into a smooth flat surface of the aquifer. The dept to which the tube was driven was carefully measured. The materi along one side of it was then excavated without disturbing the tube o its contents. The sample was cut off flush with the end of the sample transferred to a can and sealed for shipment to the laboratory. Th known area of the sampling tube and the depth to which it is driver make possible a computation of the volume occupied by the sample i nature. The sampling apparatus and technique were devised by Mr Meinzer and are described in detail by Stearns.[11] Volumetric sample are considered more reliable than samples from wells, because there is less likelihood of collecting foreign material or of losing fine particles from the sample. Furthermore in making determinations of porosity and permeability in the laboratory an attempt is made to adjust the volume of the sample to that occupied by it in nature.

A description of the laboratory procedure used to determine the various factors shown in the table and a discussion of their significance is also given by Stearns in the same paper. The significance of the coefficient of permeability and the various laboratory and field methods of determining it are further discussed by Wenzel[12] in a paper published in 1942. A brief discussion and explanation of the various features shown in the table is given below.

The apparent specific gravity is the specific gravity of an oven-dried sample of the sand including the pore spaces. It must not be confused with the specific gravity of the mineral grains composing the sand.

Mechanical analyses of granular materials are made by separating into groups the grains of different sizes and determining what percentage by weight each group constitutes. The United States Bureau of Soils[13] has adopted the following nomenclature and arbitrary limiting diameters, in millimeters:

Fine gravel	2 to 1
Course sand	1 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.1
Very fine sand	0.1 to 0.05
Silt	0.05 to 0.005
Clay	less than 0.005

[11] Stearns, Norah Dowell, Op. cit., p. 122.
[12] Wenzel, L. K., Methods for determining permeability of water bearing materials with special reference to discharging well methods: U. S. Geol. Survey Water Supply Paper 887, 1942.
[13] Mechanical analysis of soils: U. S. Dept. Agr. Bur. Soils Bull. 4, 1896. Briggs, L. J., Martin, E. O., and Pierce, J. R., The centrifugal method of mechanical soil analysis: U. S. Dept. Agr. Bur. Soils, Bull. 24, 1904. Fletcher, C. C., and Bryan, H., Modification of the method of mechanical soil analysis: U. S. Dept. Agr. Bur. Soils, Bull. 84, 1912.

made only in the more recent complete analyses of water shown in the table. They seem to indicate, however, that all the ground waters in the county, with the possible exception of some water from the Magothy formation and possibly also some from the Newark group, contain too little fluoride to be of any significance. None of them contain enough fluoride to be harmful. Analyses of waters from other parts of New Jersey seem to confirm these conclusions.

HYDROLOGY AND GEOLOGY OF THE ROCK FORMATIONS

The geologic formations occurring in Middlesex County are discussed in the following pages in the same order that they appear in the stratigraphic table on page 18. Maps showing their areal extent are given on figures 4, 5, and 6. A brief geologic description of each formation or member listed in the table is presented. In general the reader is referred to the stratigraphic table and to the text accompanying it for the geologic age and relationship of the formations discussed in this section. Discussions of the groups into which the various formations or members fall is presented only when common features may best be described in this way. The hydrology of the various aquifers is presented in more or less detail depending upon their importance. Detailed discussions of the development and safe yield of the more important aquifers are also presented.

Cenozoic Sequence

QUATERNARY SYSTEM

Recent Series

ALLUVIUM

A preponderance of evidence indicates that since the retreat of the last glacial ice sheet, southern New Jersey has remained relatively static, with little or no movement of the land, either up or down, in relation to the level of the sea. During this period the streams have worked ceaselessly to remove the blanket of sand and gravel which had been deposited in all the larger valleys in Pleistocene time, and some of it, together with mud and organic material, has been redeposited in tidal flats and along stretches of the streams where the gradients are low. Such recently deposited material is known as alluvium and it covers [illegible] Middlesex County. It is relatively impermeable

tidal limits the deposits are small, and so far as known, everywhere less than 10 feet thick; but bordering Cheesequake Creek, the South, and the Raritan Rivers they are broad and very much thicker. In fact, test boreholes have shown that nearly two miles southwest of the mouth of Cheesequake Creek the alluvium—here a soft mud filling—is more than 50 feet thick. Of greater importance from a water-supply standpoint is the deposit of silt and mud which has accumulated in the channel of the Raritan River north and west of Sayreville and which blankets the underlying Farrington sand member of the Raritan formation and tends to prevent the contamination of that sand by salt water from the river. Test boreholes drilled prior to the construction of the Eastern New Jersey Power Company plant at Sayreville disclosed the fact that south of Crab Island the mud extends down 53 to 55 feet, within 2 feet of the underlying bedrock.

EOLIAN DEPOSITS

At present a large percentage of the southern half of Middlesex County is forested and winds have little effect in shifting the sand and soil of the region. That it was not so during some period since the deposition of the Cape May formation may be surmised from the sand dunes about one mile south of Spotswood and the rather widespread occurrence of typical Cape May material on the hilltops and higher slopes southeast of the South River between Matchaponix, Texas and Browntown. Similar material does not mantle the slopes northwest of the South River and it would therefore seem reasonable to suppose that the strong winds which accomplished this work came from the north or northwest. Because the wind-blown material is continuous with the undisturbed Cape May deposits it is impossible to separate them in mapping except on an arbitrary basis; and since elevation 40 is about the upper limit of the Cape May formation along the shore and in the valley of the South River, that elevation was made the dividing line in mapping these deposits.

In a few small areas the Eolian deposits overlie impermeable materials, and are sufficiently thick to yield satisfactory water supplies for domestic or farmstead purposes. In such places they provide the only water supplies available for such purposes without the construction of fairly deep drilled wells. Otherwise they have relatively little hydrologic importance.

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Pleistocene Series

WISCONSIN DRIFT

The Wisconsin drift was deposited by the last of four huge continental ice sheets of Pleistocene age which covered portions of northern United States. It forms a nearly continuous mantle over the underlying Triassic and Cretaceous rocks in the northeast part of the county. The southern limit reached by the Wisconsin ice sheet in Middlesex County is roughly along a curved line from Plainfield to Metuchen and the mouth of the Raritan River at Perth Amboy. The glacier advanced from the north approximately to this line, then climatic conditions became such that the rate of movement southward just equalled the rate of melting with the result that the front of the glacier oscillated back and forth along this line. The ice dropped and piled up a huge mass of debris on its margin which forms the terminal moraine and the waters from the melting glacier deposited large amounts of gravel, sand and silt to the southwest forming an outwash plain. Later, as the climate became warmer, the ice front melted back leaving a blanket of till covering all of the county northeast of the moraine. The drift is of importance from a water-supply standpoint primarily because some parts of it are permeable enough to absorb water from precipitation and transmit it readily into the underlying beds.

The *outwash plain*, found between Metuchen, Plainfield and East Bound Brook, covers an area of about 16 square miles. It consists of layers of sand and gravel which together are called stratified drift and are so mapped on figure 4 on page 19. The stratified drift is about 10 to 60 feet thick on the eastern edge near the moraine. The material becomes finer and the deposit thins to the west so that at its irregular western border it is largely sand. In general the stratified drift is quite permeable, but it is too thin and covers too small an area to be in itself an important source of water. However, it holds water which percolates into the underlying Triassic rocks and this has increased the yield of a good many wells in that formation over and above the average yield of wells drawing from uncovered Triassic shale.

The *terminal moraine* is composed of a mixture of red clay, sand, gravel and a few boulders. In most places the material is fairly impermeable and does not yield much water, but in a few localities there are beds of stratified permeable material and the yield is higher. Because these areas are small, however, large supplies are not available.

The southwestern or outer margin of the terminal moraine is fairly well defined, as its surface rises fairly abruptly 100 to 150 feet above

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the outwash plain. The moraine is from one to one and one-half miles wide, and its inner border is less well defined because it grades into the till plain to the northeast. The surface of the moraine is a series of hummocks and depressions, many of which are undrained and because of the impervious nature of the material are filled by small lakes. The thickness of the moraine is variable but ranges between 80 and 150 feet.

A *till plain* of Wisconsin age covers the area from the terminal moraine to the northeastern edge of the county. The till is similar to the morainic material and consists of unassorted and relatively impermeable red clay, sand, gravel and boulders derived largely from the underlying Triassic rocks. Its average thickness is only 20 to 30 feet with about 80 feet as a maximum. It is not an important source of ground water.

In some places the materials composing the terminal moraine and the till plain are so impermeable that they probably act as a roof over the underlying rocks and exclude from them much of the water from precipitation and from stream flow. This is indicated by the number of small ponds that have formed in depressions on these materials. On the whole it is probable that they do not increase but may decrease the amount of ground water that might otherwise be available from the underlying rocks.

CAPE MAY FORMATION

The Cape May formation is typically a pinkish-yellow, fine to medium-grained quartz sand with occasional small pebbles of quartz and ironstone, but it sometimes departs considerably from this type. For example, just north of the railroad station at Morgan, it is well exposed in a small pit where the basal portion is approximately 50% gravel, whereas the upper 5 feet of the deposit is fully 75% sand. The pebbles are chiefly quartz, but ironstone and unaltered flint were also noted. Five hundred feet north the pebbly lower portion is lacking.

In the valley of the South River and along the south shore of the Raritan River the Cape May formation is rather consistently true to type and in general forms a rather thin mantle only three to ten feet thick over the underlying Cretaceous sediments except where it fills the pre-Cape May channels of these streams. North of the Raritan River, however, there is a marked change in the composition of the Cape May. There it contains numerous partly rounded pebbles and fragments of Triassic red sandstone and shale, as well as fairly numerous lumps of Cretaceous clay

RARITAN FORMATION

The Raritan formation is composed of alternating and irregular beds of clay, sand and gravel. The sands are predominantly white or light-colored, but gray and yellow beds are not uncommon, particularly in the region west of Jamesburg, and sometimes they are colored pink or orange by small percentages of iron oxides. The clay beds range in color from white through cream and light gray to dark gray and brick red. In composition they range from dark, sandy and lignitic beds, usually containing many nodules of pyrite or marcasite, to white-burning, highly refractory clays of great value. Many of the sandy beds are relatively clean or free of clay, but all gradations occur from nearly pure quartz sand to beds containing a high percentage of clay, muscovite, limonite, feldspar or other minerals. Lignite is a fairly common constituent of both the sands and the dark impure clays.

Most of the Raritan formation is believed to have been formed in shallow, brackish water and in estuaries and lagoons rather than in the open sea. This belief is based not only upon the variable character of the formation and the lignite, but also upon fossil evidence; numerous remains of land plants having been found in an excellent state of preservation near the middle of the formation in the Woodbridge region.

Although the horizontal extent of any one bed in the Raritan formation is not very great, it is nevertheless possible to divide it into several fairly distinct and mappable units in most of Middlesex County. These units are alternating layers of sand and clay. The clays of the Raritan formation have been extensively used in the ceramic industry and have been the subject of several reports by the Geological Survey of New Jersey. In them the clays received informal names because of their economic importance. The other members, composed dominantly of sand, were not given names but received numbers. In this report, where attention is focused on the sand members, it is proposed to give these members names. Thus, the units in the Raritan formation are from top to bottom:

Amboy stoneware clay
Old Bridge sand member (No. 3 sand of previous reports)
South Amboy fire-clay
Savreville sand member (No. 2 sand of previous reports)
Woodbridge clay
Farrington sand member (No. 1 sand of previous reports)
Raritan fire-clay

A description of these units follows.

AMBOY STONEWARE CLAY

The Amboy stoneware clay varies in color from a light gray through darker grays to a nearly black clay with considerable carbonaceous material. Rarely it has a red mottled appearance. In some places it consists of a gray, more or less sandy clay resting on the white Old Bridge sand, but in other places the gray clay is underlain by as much as 10 feet of black carbonaceous clay. In turn the gray clay may be overlain with as much as 15 feet of black sandy clay. The black clay is lignitic and very similar to black clay in the Magothy formation, except that as a rule the black lignitic clays of the Magothy contain small rounded grains of amber. These are not common in the Raritan formation.

The Amboy stoneware clay was deposited on an uneven surface and was partly eroded before the deposition of the overlying Magothy formation. Its thickness ranges from 0 to 30 feet. Where present it forms an impermeable layer between the Magothy formation and the Old Bridge sand member of the Raritan formation.

OLD BRIDGE SAND MEMBER

GEOLOGY

The most productive aquifer in Middlesex County is the Old Bridge sand, a member of the Raritan formation. This sand has not been identified in outcrop very far south of Jamesburg, or anywhere north of the Raritan River or the Raritan Bay. It crops out or is exposed beneath permeable Pleistocene deposits in an irregular band that extends from the Raritan Bay near South Amboy to and probably beyond Jamesburg. Along this band which is shown on figure 6 and which has an area of about 25 square miles, the sand is exposed to the direct infiltration of meteoric waters. As is the case with the major coastal plain formations it dips gently to the southeast and has been identified in wells several miles from its outcrop in that direction.

The Old Bridge sand is the No. 3 sand member of previous reports containing descriptions of the Raritan formation. The name Old Bridge was selected because the sand crops out at several places in and near that village. One of the best exposures is at the pit of the South River Sand Company about half a mile northeast of Old Bridge. Furthermore, Old Bridge is the center of the greatest ground water develop-

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North of the Raritan River, the Sayreville sand consists of layers of fine, white, micaceous sand, cross-bedded fine to coarse-grained white sand, with or without layers of white clay, and beds of arkosic sand. The general thickness is about 35 to 40 feet. The beds are so variable that there is no order of stratigraphic sequence over more than a small area. The lenses of arkosic sand, which may be as much as 12 feet thick were once used in the manufacture of fire brick near Perth Amboy.

Though a conspicuous member of the Raritan formation in the vicinity of Woodbridge and Perth Amboy, the Sayreville sand is thin or lacking in the vicinity of Runyon. In the prominent hill half a mile southwest of the southern approach to the Victory Bridge over the Raritan River it is a fine to coarse-grained white sand, arkosic towards the base, and about 40 feet thick. A mile to the southwest it is markedly cross-bedded, contains thick beds of ironstone and is only 15 feet thick. In a good exposure in Sayreville, due south of Crab Island, it is only 6 to 7 feet thick; and though the sand is fairly coarse, it contains lumps and thin lenses of white clay. Just 1,400 feet farther southwest, in the large pit of the Sayre & Fisher Brick Company, the sand is lacking and the South Amboy fire-clay can be seen directly overlying the laminated clays of the upper part of the Woodbridge clay. This same relationship can be observed in the pit of the New Jersey Clay Products Company, one and a quarter miles to the south-southwest. This "pinching out" of the Sayreville sand is the chief reason why not one well southeast of the Camden and Amboy Railroad is yielding water from this stratum. Carefully kept logs of wells and test boreholes show that even though it is sometimes present in the Runyon area, it is thin and clayey and not therefore an important aquifer.

No important water supplies have been developed from the Sayreville sand. In fact, not a single well is known to draw its water entirely from it and it was, therefore, impossible to obtain a sample of water for analysis. However, the South Amboy fire-clay which separates the Sayreville sand from the overlying Old Bridge sand, is irregular and sometimes absent so that in one or two wells there has apparently been no separation between these two sands, and at least one well probably draws water from both the Old Bridge and the Sayreville sands.

One sample of sand was collected from this member for analysis in the Water Resources Laboratory during the present investigation. The analysis in the table on page 42 indicates that the sample contained a considerable amount of clay and other fine materials. Its porosity was

44 percent, and its moisture equivalent was 12 percent. It would appear, therefore, that the specific yield of the sand is only about 32 percent and that its ability to store water is not as great as most of the other sands in the county. Analyses of two other samples from this sand are reported by Stearns,[22] and they indicate a probable specific yield of about 39 percent, which is more in line with the other sands in the area. The analysis on page — shows that the coefficient of permeability of the recent sample from the Sayreville sand was only 30, indicating that water would move through it very slowly under ordinary conditions. The two samples reported by Stearns indicate an average coefficient of permeability of about 500 which again is more in line with the other sands in this area. Samples of this sand subsequently obtained from wells, although not analyzed in the laboratory, appeared to contain a smaller percentage of fine or clayey material than the sample sent to the laboratory. A recent examination of this sand where exposed in another pit tends to confirm this conclusion. It seems probable, therefore, that the capacity of the Sayreville sand to store and transmit water is fairly high in some places. Nevertheless its thinness and lack of continuity make it most unlikely that any substantial water supply can ever be developed from it.

WOODBRIDGE CLAY

The Woodbridge clay underlies the Sayreville sand and ranges from 50 to 90 feet in thickness where uneroded. The upper portion consists of well stratified, dark-gray clays containing a sufficient amount of fine-grained sand to make an ideal material for the manufacture of common brick, and it is widely used for that purpose. The middle portion of the member commonly consists of gray clay, though sandy clays or clayey sands may occur. Both the upper and middle portions of the Woodbridge clay are extensively used in the manufacture of hollow tile. The basal portion of the member contains beds of compact, tough, and highly refractory fire-clay which are white, light-gray or brick red in color.

Nodular masses of impure siderite are common in the upper portion of the Woodbridge clay near Sayreville and the South River and when present they aid in its identification. These nodules contain marine fossils thus showing that marine conditions probably prevailed for at least a part of Raritan time. The upper part of the clay also contains lignite and pyrite. Dinosaur footprints have been found in the Wood-

[22] Stearns, Norah Dowell, Laboratory tests on physical properties of water-bearing materials; U. S. Geol. Surv. Water Supply Paper 596-P, 1927, pp. 166-167, Samples 71 and 72.

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bridge clay and these, together with the lignite, indicate that a marine environment may not have existed throughout all of Woodbridge time.

Quite apart from its economic importance as a source of clay, this thick and widespread unit in the Raritan formation is of great hydrologic importance because it forms an impervious cover over the prolific Farrington sand. It limits the intake area of that sand to the area of its outcrop and farther down the dip, confines the water in the sand so that it occurs under artesian conditions.

FARRINGTON SAND MEMBER

A report describing the water supplies of the Farrington sand or No. 1 sand of previous reports dealing with the Raritan formation, was published in 1937.[24] The description of the sand and of the water supplies from it in this report are, therefore, somewhat abbreviated and emphasis is placed upon new data collected since the preparation of the earlier report. This sand occurs both north and south of the Raritan River and probably across the Arthur Kill on Staten Island. Not much water is pumped from its intake area, but it is tapped by wells in many places down the dip from the intake area where the water is encountered under artesian pressure.

Geology

The Farrington sand lies beneath the Woodbridge clay. As indicated on figure 6 on page 21, it crops out in a conspicuous band nearly a mile wide along the southeast edge of Farrington Lake where several sand pits give a good opportunity to examine it. A large amount of water enters the sand in this area which makes it very important from a hydrologic standpoint. For the above reasons, this member is called the Farrington sand in this report.

The upper part of the Farrington sand is generally medium to fine-grained. The lower portion, 10 feet to 20 feet thick, is a coarse, arkosic, light-gray or light-yellow sand usually containing a considerable sprinkling of small pebbles. The arkosic material, as seen in outcrop, is always partly kaolinized, the white kernels of the partly decomposed feldspar standing out sharply in contrast with the gray and yellow colors of the sand and gravel. The latter is composed chiefly of well rounded quartz pebbles, but also contains numerous pebbles of flint ranging in diameter from a quarter of an inch to a maximum of two

[24] Lutholde, Henry C., Water Supplies from the No. 1 Sand in the Vicinity of Parlin, New Jersey, Special Report 7.

inches. Occasionally the gravelly beds contain rather numerous small chunks of red or white clay, quite obviously derived from the underlying Raritan fire-clay and evidently redeposited close to their source. Lenses of clay, usually only a few feet thick, also occur within the limits of this member and thin clay seams are fairly common.

As recorded in well logs, the sand is often divided by clay lenses into two or more parts, but since the static levels of the water from all parts of the member are about the same for any one location, the dividing clay beds are evidently of very local extent. The following log was compiled from samples obtained from a test well drilled for the Borough of Sayreville about a mile and a quarter northwest of the Runyon pumping station.

Partial log of test well at Sayreville, New Jersey

Sample depth	*Description*	*Formation*
118–120	Clean, fine to coarse-grained, light gray sand with a little lignite and pyrite.	
120–137	Clean, coarse-grained sand and small gravel (including unweathered flint). Some grains cemented by pyrite. A little fine-grained sand and some lignite at 132 feet.	Farrington sand member of the Raritan formation.
137–163	Light gray clay with a little sand.	
163–180	Coarse gray sand and small pebbles.	
180–198	Coarse, light gray sand and gravel.	

It will be noted that the full thickness of the member is 80 feet. Half a mile southwest at the pumping station of the Borough of South River, the reported thickness in a deep well was only 44 feet; but at the Anheuser-Busch plant half a mile southwest of Old Bridge it is 78 feet 8 inches thick, at the Peter J. Schweitzer Company plant in East Spotswood it is 56 feet thick, at Runyon it is 91 feet thick and near Parlin it ranges from 50 to 104 feet thick. It is known to be continuous to the southwest at least as far as Jamesburg as it was found (83 to 129 feet thick) in the wells at the New Jersey State Home for Boys two and a quarter miles to the east-southeast and in a test borehole 0.85 mile east of Dayton and 3 miles west-northwest of Jamesburg. The Farrington sand dips to the southeast at the rate of about 55 feet per mile.

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Northeast of Parlin the member thins, the sand becomes finer grained and sometimes quite clayey, and in South Amboy wells drilled to this horizon have been only moderately successful. In the district between Parlin and Jamesburg, however, the Farrington sand is one of the best aquifers in the State. Wells of large diameter and modern construction have yielded as much as two million gallons daily, and nearly all of them are rated in excess of half a million gallons daily.

The Farrington sand is thin or lacking above the buried trap ridge between the Borough of South River and Perth Amboy as shown in figure 3 on page 17. A great many wells have been drilled in this area, but those over the trap ridge with the exception of a few within a mile or so northeast of the Borough of South River have not been as successful as wells to the northwest or southwest. Hydrologically this is important because the thinning of the Farrington sand on the ridge tends to prevent the movement of salt water from the intake under the Raritan River to the centers of pumpage to the southeast.

Physical Properties

The results of laboratory tests on seven samples of this sand taken at different exposures along its outcrop are given in the table on page 42. The coefficient of permeability of the sand as determined by these tests ranges from 210 to 3,500, and a weighted average would probably be between 1,200 and 1,500. Pumping tests at the Perth Amboy Water Works gave figures for the coefficient of permeability which were in this same order of magnitude. The specific yield of the sand, as indicated by the average difference between its porosity and its moisture equivalent, is about 32 percent. With a specific yield of 32 percent, a block of the Farrington sand one foot thick and one square mile in area, would be capable of storing about 67 million gallons of available water.

Quality of Water

The uncontaminated water from the Farrington sand is exceptionally good for most purposes. Its quality varies slightly from place to place, but the total solids are usually less than 40 parts per million. The hardness is usually less than 15 parts per million. The only feature of this water that is sometimes objectionable is its iron content, which ranges from 2 to 6 parts per million in some localities.

The chloride content of the water from the Farrington sand is normally only 2 to 4 parts per million, but the sand has been contaminated by the intrusion of sea water in several places in the county.

Where this has occurred, the water has become highly mineralized and unfit for any ordinary use except cooling. Samples collected from wells in the contaminated areas have been found to contain from 10 to 7,675 parts per million of chloride. The other minerals contained in sea water, notably the hardness-forming minerals, calcium and magnesium, have, of course, increased in proportion to the increase in chlorides so that the water rapidly becomes less desirable, even before the concentration of salts renders it useless. The degree and extent of the contamination has tended to increase with continued pumping. The area, extent, and probable significance of the very serious problem created by the salt-water intrusion into this sand is discussed on pages 115 to 139.

Development and Pumpage

The first water supply developed from the Farrington sand south of the Raritan River was at the Perth Amboy Water Works at Runyon where a well tapping it was drilled in 1897. About the same time industrial wells drawing from this sand were drilled in the city of Perth Amboy. For several years after 1897 the Farrington sand at Runyon was the principal source of water supply for the city of Perth Amboy. Later this supply was augmented by pumping from the Old Bridge sand, and water from both sands was used. In Middlesex County the water from the Farrington sand is now used almost exclusively for industrial purposes.

Before the beginning of the World War of 1914, only a few industrial plants in Perth Amboy, South Amboy, and Sayreville were using water from the Farrington sand. The total pumpage from the sand within the county probably did not exceed one or two million gallons daily at that time. The favorable location of the region for export trade produced a sudden increase in industrial activity during the war and a corresponding increase in the use of water from the Farrington sand. Unfortunately there are practically no records of pumpage during these years, but from the information available about the capacity of the wells then in use it seems probable that the total rate of pumpage from the sand within the county did not exceed 7 million gallons daily.

Many of the industrial plants established in this area during the war were adapted to peace-time operations and continued or increased their use of water. New industries were attracted to the area and the pumpage increased still more. A table showing withdrawals from the Farrington sand for the years 1929 through 1935 was included in a

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earlier report on this sand.[24] This table has been revised and extended through 1942 and is given as table 8 below. It covers the period 1929 through 1942, and gives separately the pumpage from the sand by the Perth Amboy Water Works and by the wells of the Duhernal companies, as well as a summary of other pumpage both north and south of the Raritan River.

TABLE 8.—QUANTITY OF WATER PUMPED FROM THE FARRINGTON SAND MEMBER OF THE RARITAN FORMATION IN MIDDLESEX COUNTY, NEW JERSEY, 1929-1942

Year	North of Raritan River	Duhernal Companies	Perth Amboy Water Dept.	Other Pumpage South of Raritan	Total
	In thousands of gallons daily				
1929	2,080	6,202	92	203	8,577
[illegible]	[illegible]	5,964	877	309	9,120
[illegible]	1,583	5,053	1,173	342	8,151
[illegible]	[illegible]	4,352	2,198	398	7,188
[illegible]	[illegible]	5,542	787	377	7,227
[illegible]	[illegible]	6,570	135	369	8,389
[illegible]	[illegible]	8,129	585	407	10,452
[illegible]	1,579	9,094	655	408	12,036
1937	2,066	8,434	650	404	11,554
1938	1,874	5,495	0	408	7,777
1939	1,895	6,358	546	424	9,223
1940	1,975	4,785	301	402	7,463
1941	1,922	4,828	772	996	8,588
1942	1,875	4,015	620	556	7,066

The pumpage from the Farrington sand reached a peak in 1936 when it amounted to slightly over 12 million gallons a day. Approximately 9 million gallons a day of this amount was pumped by the industries in Sayreville Township. Intrusion of salt water into this sand at the Washington Canal caused the development of the Duhernal well field which derives its supply from the Old Bridge sand and made possible a substantial reduction in the pumpage from the Farrington sand by these industries. In 1942 the pumpage was only 4 million gallons a day, a drop of 5 million gallons a day from 1936. The decrease would probably have been even greater had it not been for the increased industrial activity due to the present war.

Pumpage from the Farrington sand by the Perth Amboy Water Department at Runyon during the period 1929-1942, inclusive, has varied from an average rate of 92,000 gallons a day in 1929 to a maximum rate of 2,198,000 gallons a day in 1932. Only one large capacity well tapping the Farrington sand is used. It is now pumped only to supplement the supply from the wells tapping the Old Bridge sand when the yield of those wells is low due to drought or when the demand for water is exceptionally great.

[24] Parker, H. C., Op. Cit., Special Report 7, p. 14.

Consumption of water from the Farrington sand north of the Raritan River has varied between 1,200,000 gallons a day and 2,100,000 gallons a day since 1929. This water has been used entirely by industries in Woodbridge and Raritan Townships and in the City of Perth Amboy. Until recently a great deal of the pumpage in this area was concentrated in and near Perth Amboy. Because of contamination of the sand by salt water, however, most of the industries within the city now obtain water from the Perth Amboy Water Department. The total pumpage from the Farrington sand north of the Raritan River has not varied greatly, however, because increases in Woodbridge and Raritan Townships have offset the reductions in Perth Amboy.

Factors Affecting Safe Yield

In general, there are three factors that may limit the safe yield of an artesian aquifer such as the Farrington sand: its available recharge, its capacity to transmit water from the intake area to the well fields, and the possibility that some form of contamination may be induced or accelerated by the pumping. The true safe yield of the sand is that rate of pumping which does not exceed any of these three factors. Whichever factor permits the smallest quantity of water to be removed from the sand is the limiting factor and determines the safe yield.

Available Recharge

The recharge in the intake area of the Farrington sand was estimated in the previous report to be about 950,000 gallons daily per square mile, or 20 inches of the water from precipitation each year. The intake area of the sand as far as it has been defined is about 17 square miles, as is shown in figure 6 on page 21, and the recharge in this area is accordingly estimated to be about 16 million gallons daily. The sand is separated into two parts by the estuary of the Raritan River and by the underlying trap ridge. Recharge occurring north of the Raritan River is believed not to be available to wells south of the river and vice versa. The intake area north of the river is approximately 6.8 square miles, and its recharge is estimated to be about 6.5 million gallons daily. The intake area south of the river, so far as it has been defined, is about 10.2 square miles, and its recharge is estimated to be about 9.7 million gallons daily. The area at its southeastern end shown by shading in figure 6, is not very well defined, because [illegible] depth of the overlying Quaternary deposits. The sand probably extends still farther south, because it is [illegible]

down well of the Cranbury Water Company. Any additional intake area in this direction, however, is so far from the present centers of pumping that it would probably not supply any appreciable amount of water to them.

Artificial Recharge. The natural intake capacity of the Farrington sand could, no doubt, be increased by artificial recharge. However, there has as yet been no attempt to recharge this sand artificially. The easiest and most obvious method of inducing artificial recharge would be the location of ponds on some of the smaller streams that cross its intake area, both north and south of the Raritan River.

Another possible means of recharging the sand would be to introduce water into it through wells. This method is expensive, however, and the techniques involved have not been developed to an extent that makes it thoroughly reliable. In order to successfully recharge the sand through wells, the water used should be absolutely free from any material that would be deposited in the sand outside the recharge well and thus reduce its capacity. If surface water were used for this purpose, it should be filtered and preferably sterilized as well to prevent the clogging of the sand by solid particles or by the growth of micro-organisms. Recharge wells may, of course, be redeveloped from time to time to restore their capacity, but it is difficult to maintain the original capacity of such a well even with the best of care, especially if the recharge water is not carefully prepared. Recharge of the Farrington sand through wells might be considered in the vicinity of Parlin and South Amboy, in order to retard the advance of salt water and possibly force it out of the sand. Elsewhere in the county it is not believed to be economically justifiable.

If the fullest possible use were made of all opportunities for artificially recharging the Farrington sand, it might be possible to increase its total recharge by several million gallons daily. It must be borne in mind, however, that the surface water diverted into this sand would not be available for use elsewhere. For example, the principal streams south of the Raritan River that flow across its intake area discharge into Lawrence Brook, which is being used by the city of New Brunswick as a source of public water supply.

Capacity to Transmit Water

The capacity of the Farrington sand to transmit water from the intake areas to the various wells as indicated by the coefficient of permeability of the samples analyzed in the laboratory is relatively high. It

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appears improbable that this factor would limit the safe yield of the sand. For the purposes of estimating, the average coefficient of permeability may be assumed to be 1,350, and 80 feet may be used as the average thickness of the sand. In June, 1936, when the rate of pumping from the Farrington sand in the Parlin area was near its maximum (9.4 million gallons a day), water levels in the vicinity of Parlin, as determined from the duPont and Hercules observation wells averaged about 57 feet below sea level. At the same time the water level in the intake area of the sand, as determined from the Fischer well, was about 60 feet above sea level, making a total difference in head of 117 feet between the intake area and the area of pumping. The average distance from the intake area to the approximate center of pumping at Parlin is about 5 miles. The average gradient was, therefore, about 23.4 feet per mile. With this hydraulic gradient the sand would transmit 1,350 x 80 x 23.4 or about 2.5 million gallons a day for each mile of its width. South of the Raritan River the width of the aquifer is at least 10 miles so that it might transmit 25 million gallons daily under the assumed conditions. In the immediate vicinity of the individual pumped wells, where the gradients are much steeper, the rate of flow was, of course, much greater.

The capacity of the sand to transmit water may also be judged by a study of the effect of pumping different quantities of water upon the head of the water in the sand at various points. The relation between pumpage from the Farrington sand and the water levels in various observation wells tapping this sand is shown on figure 11 on page 112. The location of all the wells on this diagram except the Fischer well are shown on figure 12. The location of the Fischer well is shown on figure 2, on page 6, because it is outside the limits of figure 12.

This diagram shows the pumpage by months and the fluctuations of water level in several observation wells tapping this sand. The pumpage is subdivided to show the amount taken from the wells of the Duhernal companies and the amount taken from the well at the Perth Amboy Water Works. Water level fluctuations are shown in five wells. Two of these are at Parlin: an observation well at the duPont plant, and an observation well at the plant of the Hercules Powder Company. The other three are an old deep well at Runyon, a test well at the site of the proposed Sayreville Water Works, and the Fischer well, which is an observation well in the intake area of the sand several miles from any center of pumping.

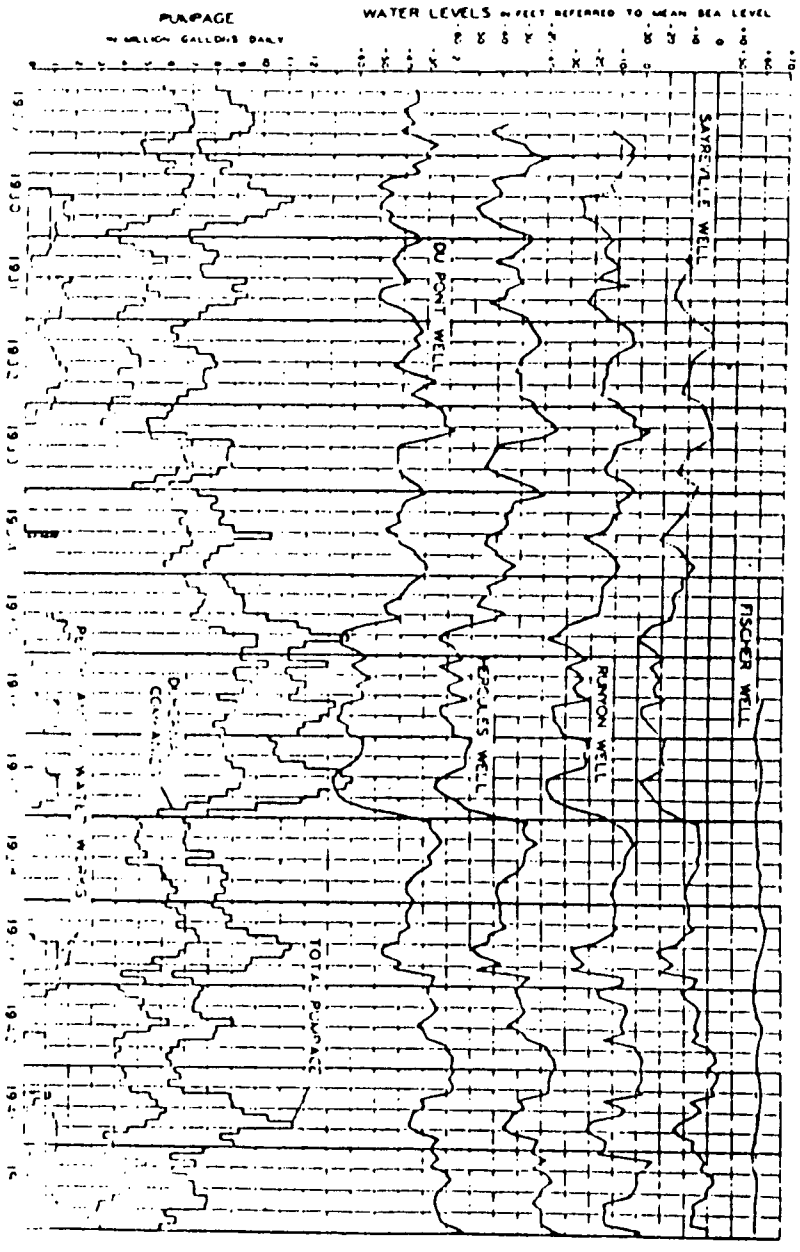

FIGURE 11.—Diagram showing the relation between water levels and pumpage in the Farrington sand member of the Raritan formation, 1929 to 1942. For locations of wells see Figs. 2 and 12.

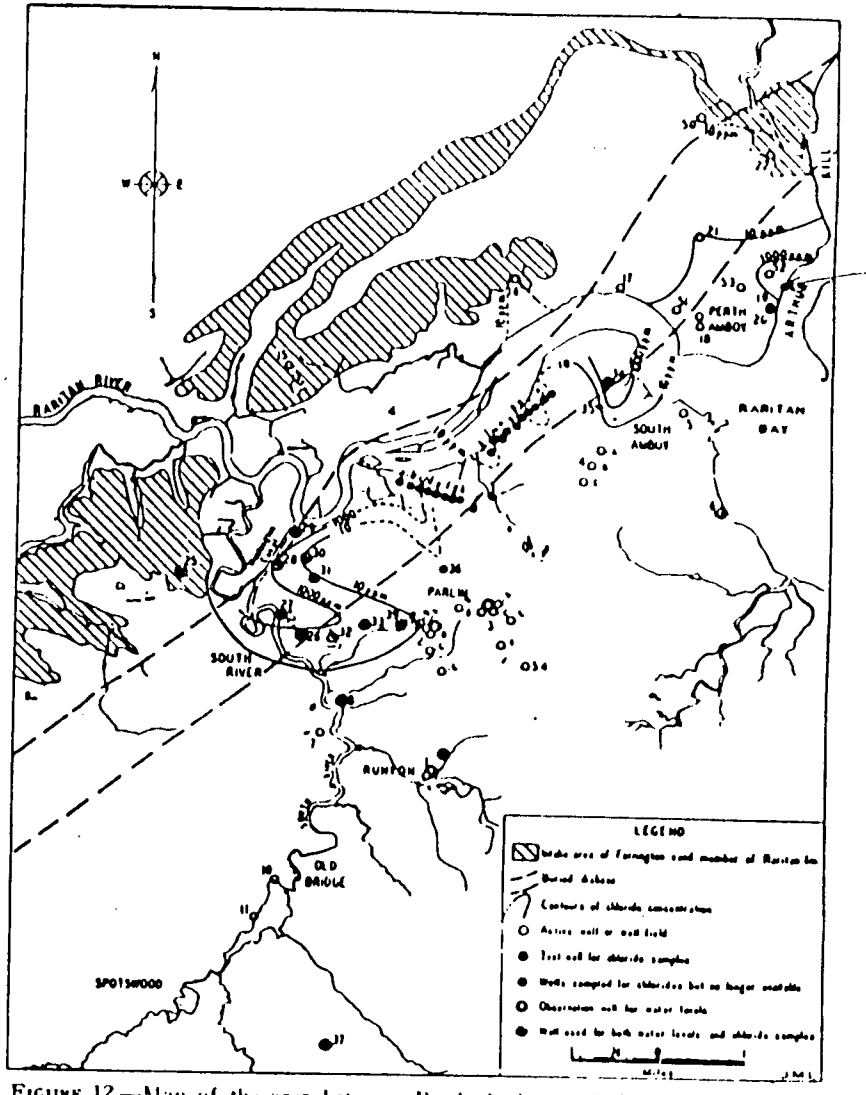

FIGURE 12.—Map of the area between Perth Amboy and Spotswood showing the location of wells tapping the Farrington sand, the intake area of this sand, and the approximate extent of the salt-water intrusion into this sand

KEY TO WELL NUMBERS

1. Perth Amboy Water Department
2. Hercules Powder Company (5 wells)
3. E. I. duPont deNemours & Company (6 wells)
4. National Lead Company (3 wells)
5. Jersey Central Power & Light Company (2 wells)
6. South Amboy Water Department (3 wells not used)
7. South River Water Department (2 wells)
8. Sayreville [illegible]
17. Carborundum Company (2 wells)
18. Raritan Copper Works (2 wells)
19. Roessler & Hasslacher Chemical Company
20. General Cable Company
21. Puritan Dairy
22. Bona Fide Mills
25. National Fireproofing Comp[illegible]
26. Furman observation well
27 to 37 (inclusive) and 19 (Other [illegible] wells.

It will be noted that the pumpage from the wells of the three Duhernal companies accounts for the major part of the total pumpage. In recent years the well at the Perth Amboy Water Works has been operated only when it has not been possible to obtain enough water from the Old Bridge sand. In general, the fluctuations of the water level in the various wells, except the Fischer well, correspond with the total rate of pumping. The pumpage north of the Raritan River is fairly constant and does not affect appreciably the trend of the line for total pumpage. The observation wells are all south of the river.

The fluctuations of the Fischer well are believed to be due entirely to variations in precipitation and to other natural causes. It will be noted that the Runyon well fluctuates more widely in response to the pumpage at the Perth Amboy Water Works than do the other wells, and that the Hercules and duPont wells are more responsive to changes in the Duhernal pumpage than are the other wells. The pumpage was higher and the water levels were lower during 1935, 1936 and 1937 than at any other time in the period shown. This is due partly to increased demand from most of the wells tapping the sand, and partly to the fact that the wells at the plant of the National Lead Company were put into operation during 1935. The decrease in pumpage in 1938 was due to conservation measures at the plants of the three Duhernal companies, and to the fact that the summer of 1938 was relatively wet and it was not necessary to operate the deep well at the Perth Amboy Water Works. In 1939 the new Duhernal supply south of Old Bridge was put into operation and the decreased pumpage since that time has been due largely to the fact that a considerable portion of the water used by the Duhernal companies has been taken from this source.

In general, the effect on the water levels in the wells of a given rate of pumpage was about the same both before and after the three years of excessively high pumping. There have, of course, been some changes due to the fact that the construction of the National Lead Company wells in 1935 and the use of the Schweitzer well in 1941 and 1942 have changed the distribution of the pumpage in the area somewhat, but on the whole comparable rates of pumpage in the early 1930's and in the early 1940's have produced comparable water levels in the wells. There is no indication from this diagram that the rates at which the water has been pumped from the Farrington sand have produced any excessive drawdowns in the observation wells. If the rate of pumping had been greater than the capacity of the sand to transmit water from the intake area, a progressive lowering of the water level would have occurred. Even in 1935, 1936 and 1937, when the rate of pumping was about 13 million gallons daily for several months and approached

14 million gallons daily for a few months, the lowering of the water level does not appear to have been out of proportion to the rate of pumping. It may be concluded, therefore, from the study of this diagram, that the capacity of the Farrington sand to transmit water is greater than any rate at which it has been pumped up to the present time.

Salt-Water Intrusion

The factor that appears most likely to limit the safe yield of the Farrington sand, at least in the area within a few miles of the Raritan River, the South River, and the Arthur Kill, appears to be the danger of salt-water intrusion. In fact salt water has already entered the sand both north and south of the Raritan River and advanced for some distance. A considerable number of wells have been more or less severely contaminated.

The areas in which salt-water contamination of the Farrington sand has occurred, a part of the intake area of the sand, and the locations of most of the wells tapping it within the county are shown on figure 12 on page 113. An attempt has been made to indicate the degree of contamination by means of contours enclosing areas in which the salinity of the water is believed to be 10 parts per million or more, and 1,000 parts per million or more. Solid contours are used to indicate fairly well-defined areas of contamination while those less well-defined are indicated by dashed contours. It will be noted that the two largest areas in which contamination has occurred are in the city of Perth Amboy and in the area between the Washington Canal and the well fields at Parlin. Apparently, however, tongues of salt water are reaching out toward the active wells from a number of other points along the tidal streams.

North of Raritan River. A majority of the wells in Perth Amboy and along the north shore of the Raritan River have been contaminated by salt water, apparently drawn in from the river or from the Arthur Kill. In this area it appears probable that most of the wells within a mile or two of these bodies of salt water will ultimately be contaminated by salt water. They may have to be abandoned except as sources of water for cooling or similar purposes.

In most places north of the Raritan River the sand is not as thick as it is south of the river. Nevertheless, very substantial quantities of water have been withdrawn from it in the past, especially in the city of Perth Amboy. Some wells in the city have already been abandoned because of salt water contamination and it is probable that others may soon have to be abandoned. The chloride contents of the water from most of these wells are given in table 9 on page 116. [illegible]

been collected from some of the wells in three different years and the table shows the changes that have occurred from time to time. Apparently the only hope for the continued withdrawal of any substantial quantity of fresh water from the Farrington sand north of the Raritan River lies in the construction of relatively shallow wells near the intake area and as far as possible from the streams that contain salt water.

South of Raritan River. As indicated on figure 12 on page 113, salt water is believed to be advancing into the Farrington sand in several localities south of the Raritan River. The largest of these is an area lying between the Washington Canal, the South River, and the well fields at Parlin. This area has been studied in considerable detail, and the intensity and extent of the contamination is fairly well known. Another area that is fairly well delimited is just north of South Amboy. Three other probable areas of salt-water contamination extend from points along the Raritan River toward the well fields at Parlin and South Amboy. These areas have not been defined with the same degree of certainty as the other two, but the available records suggest they may exist.

The Farrington sand south of the Raritan River is protected from the salt water in the river and in the material beneath it by the buried trap ridge that underlies both the river and a strip of land south of it. This buried ridge is a part of the diabase dike that forms the Palisades along the Hudson River, and rises to the surface again to the southwest. In east of Middlesex County it is buried beneath the younger Cretaceous deposits. In pre-Cretaceous times the diabase dike stood as a ridge on the land surface. In the area between Perth Amboy and the town of South River it stood so high that the Farrington sand was not deposited on top of it, except perhaps in some gaps or low places. Numerous test wells have been drilled through the materials overlying the buried ridge and the great majority of them have gone directly from the Woodbridge clay, which overlies the Farrington sand, into the diabase. Unfortunately, however, the ridge was not high enough to furnish much, if any, protection to the Farrington sand in the vicinity of the Washington Canal and the salt water has easy access to the sand in this area. It seems probable, however, that in the other areas of salt-water contamination referred to above, the salt water is advancing across the trap ridge through relatively shallow gaps that do not permit a large flow.

The investigations that preceded the earlier report on the Farrington sand[26] in this area brought out the fact that it is possible for salt water

[26] Parks, H. C., Op. Cit., Special Report 7.

to enter the sand in the vicinity of the Washington Canal and probably in the meanders of the South River that extend near the intake area of the sand. It was pointed out that the deepening of the Washington Canal in 1929 provided a ready means of access, whereby the salt water could enter the Farrington sand, and that the heavy rate of pumping at Parlin and elsewhere in the area might have reduced the fresh water head near the canal to such an extent that the intrusion of salt water was possible.

In 1937 and 1938 a series of test wells (Nos. 27, 28, 29, 30, 32, and 33 on figure 12) were drilled, and the analysis of water from them showed that salt water had advanced into the sand in the direction of Parlin to an alarming extent. Chlorides ranging as high as 6,581 parts per million were found in samples from test well 29, and as high as 2,670 in samples from test well 27. Chlorides of almost 300 parts per million were found in samples from test well 32, and test well 33 yielded water containing about 20 parts per million of chloride. All the wells at Parlin were then yielding water containing only 2 to 4 parts per million. The test wells were sampled periodically in order to ascertain what fluctuations of the chloride content might occur and how fast the salt water might be advancing toward the well fields. The chloride contents of these samples are given in table 10 on page 124. The conditions in this area were discussed in a paper published in 1940.[28] They are discussed herein in somewhat more detail in the light of more recent information.

Salinity of Surface Waters

It is probable that the water in the Raritan Bay is usually only a little less salt than normal sea water. Samples of water from the Raritan River estuary opposite Perth Amboy, collected by the New Jersey State Board of Health, were found to contain as much as 19,000 parts per million of chlorides. Up the Raritan River and its branches the chlorides decrease as more and more fresh water is mixed with the water from the bay. In times of flood the larger volume of fresh water entering the estuary of the river forces the salt water out toward the bay, but the continual movement of the tides brings the salt water back into the tidal reaches of these streams as soon as the floods subside. In times of very low flow the salt water probably advances almost to the head of tide in the Raritan River at New Brunswick and, as already noted, appreciably increased chlorides have been

[28] Barksdale, H. C., The Contamination of Ground Water by Salt Water at Parlin, New Jersey. Trans. Am. Geophysical Union, 1940.

REFERENCE NO. 12

Trube

MIDDLESEX COUNTY 208 AREA-WIDE

WASTE TREATMENT MANAGEMENT PLANNING

TASK 8 - GROUND-WATER ANALYSIS

A. DESCRIPTION OF GROUND-WATER SYSTEM
B. GROUND-WATER POLLUTION SOURCES

prepared by

Geraghty & Miller, Inc.
Consulting Ground-Water Geologists and Hydrologists
44 Sintsink Drive East
Port Washington, New York 11050

November 1976

This report was prepared under a subcontract of the Middlesex 208 Joint Venture in cooperation with the Middlesex County Planning Board. The work was supported by funds provided to the Middlesex County Board of Chosen Freeholders by the U. S. Environmental Protection Agency, Region II, under EPA Grant No. P002102-01-0 as authorized by the Federal Water Pollution Control Act Amendments of 1972, PL 92-500.

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HYDROGEOLOGIC FRAMEWORK

The study region is underlain by consolidated and unconsolidated rocks ranging in age from Precambrian to Recent. The northwestern part of the region covering about 160 square miles falls within the Triassic Lowland physiographic region and is underlain by sedimentary and igneous rocks. To the southeast lies the Coastal Plain, a region extending over some 220 square miles. The Coastal Plain is underlain by a thick wedge of sands, gravels, clays, and silts of Cretaceous age. These deposits were laid down by rivers in a deltaic environment and generally thicken in a downdip direction. Younger sediments overlie older sediments in a southeastward direction. The stratigraphic sequence of the various rock units together with their water-bearing properties is shown on Table 1.

Major ground-water reservoirs which are also the most heavily pumped are Triassic sandstones and shales of the Brunswick Formation and the Farrington and Old Bridge Sands of Cretaceous age. Aquifers of lesser importance are the Sayreville Sand, the Englishtown Sand, and the Mount Laurel and Wenonah Sands, all of Cretaceous age and the Pensauken Formation and glacial drift deposits of Pleistocene age.

The Triassic bedrock north of the Raritan River is overlain by sediments of glacial age. East of Plainfield, these deposits consist mostly of glacial till (unsorted sand, gravel, boulders and clay),but to the west and south, permeable glacial outwash deposits are present. The aquifers extend beyond the confines of the study region; the Triassic aquifer northward into Union County and westward across the Millstone River into Somerset County,and the

Table 1 - (Continued)

System	Unit	Lithologic description	Thickness (feet)	Water-bearing characteristics
Cretaceous	Magothy Formation	Fine lignitic sand and black clay	90 - 130	Not important as aquifer. Well are low but sufficient for domesti purposes.
	Amboy Stoneware Clay	Gray to black clay with carbonaceous material	0 - 30	Considered to be lower facies of thy Formation. Confining bed.
	Old Bridge Sand	Fine- to coarse-grained white to yellow sand	20 - 110	Major aquifer tapped by many we Median specific capacity is 20 gp Transmissivity range 140,000 to 230,000 gpd/ft. Artificially rec in places. Well yields 200 to 1, gpm.
	South Amboy Fire Clay	Varicolored clay	0 - 35	Confining bed.
	Sayreville Sand	Fine, white micaceous sand	0 - 40	Not continuous. Unimportant as aquifer.
	Woodbridge Clay	Gray clay and clayey sand	50 - 100	Major confining bed overlying Fa rington Sand.
	Farrington Sand	Gray to yellow fine- to medium-grained sand. Contains some clay layers.	30 - 150	Major aquifer tapped by many we Median specific capacity is 29 gpr Transmissivity range 50,000 to 150,000 gpd/ft. Well yields 500 2,000 gpm.
	Raritan Fire Clay	Varicolored basal clay	0 - 90	Confining bed.
Triassic	Brunswick Formation (Newark Group)	Red shale interbedded with siltstone and sandstone	5,000+	Major aquifer north of Raritan Riv Specific capacity is 0.1 to 25 gpm Transmissivity range 1,000 to 4, gpd/ft. Well yields 50 to 700 gp
	Lockatong Formation (Newark Group)	Hard shale and argillite	1,000+	Present only in small areas. Of little importance as aquifers.
	Stockton Formation (Newark Group)	Conglomerate and sandstone	1,000+	

Coastal Plain aquifers start at the Fall Line and probably continue southward into Mercer and Monmouth Counties. Tracing of the Old Bridge and Farrington Sands beyond the Middlesex County borders is difficult due to complex stratigraphic conditions.

Ground water in the bedrock aquifer is found in fractures and other openings, in contrast to the unconsolidated Coastal Plain deposits where ground water fills the voids between individual grains of the sediment. Both water-table and confined or artesian aquifers are present. The Triassic sandstone and shale and both the Farrington and Old Bridge Sands are under water-table conditions where exposed in the outcrop area. Where overlain by other sediments or zones of low permeability, these aquifers become confined.

Water-table aquifers are recharged by precipitation and sometimes by fluids disposed of in the subsurface, such as septic tank or cesspool effluent. Ordinarily, surface-water bodies act as discharge areas for water-table aquifers; however, in areas of heavy pumping where ground-water levels have fallen below river, stream, or lake levels, the water-table aquifers might receive recharge through surface-water infiltration if geologic conditions are favorable.

The artesian aquifers receive recharge from several sources, namely precipitation on the outcrop area, vertical leakage from confining beds above or below the aquifer, and infiltration of water from rivers or lakes in contact with the aquifer. The impact of man's activities has led to water-level declines and changes in natural head relationships as will be discussed shortly.

On the Coastal Plain, the extensively distributed and thick clay beds such as the Wood-

bridge, Merchantville and Woodbury act as confining beds and to a large degree prevent downward or upward movement of water in the hydrologic section. Under pre-pumping conditions, the aquifers were brimful with water, discharging excess water to streams that crossed the outcrop area or causing ground-water flow to move downdip through the confined aquifer to discharge points along the Atlantic Ocean. For example, heads in the Farrington Sand at the beginning of exploitation in 1897 were about 30 to 40 feet above land surface in the Perth Amboy well field and the wells flowed. Increased pumpage over the years decreased the head and the present potentiometric surface in the region is about 70 feet below sea level, indicating a historic head decline of roughly 100 feet. No historical decline of the water table in the Old Bridge Sand or Triassic rocks is known in spite of large seasonal water-level variations.

Historical trends of water levels in the Farrington Sand are shown on Figures 1 and 2. These records from U. S. Geological Survey observation wells depict downward trends in the South River, Perth Amboy and Duhernal Sayreville (Dusay) observation wells located in the pumping zones. The Fisher observation well (Figure 1) shows a stable water-level trend; it is located in the recharge area removed from the influence of pumping (locations of all wells are shown on Plate 14). Figures 3 and 4 show the historical record of water-level fluctuation in seven observation wells tapping the Old Bridge Sand (for locations of wells see Plate 13). As shown, water levels in the Duhernal wells declined to below sea level during the drought period 1963-65 but have now recovered to pre-drought elevations. No long-term dewatering of the Old Bridge aquifer is evident.

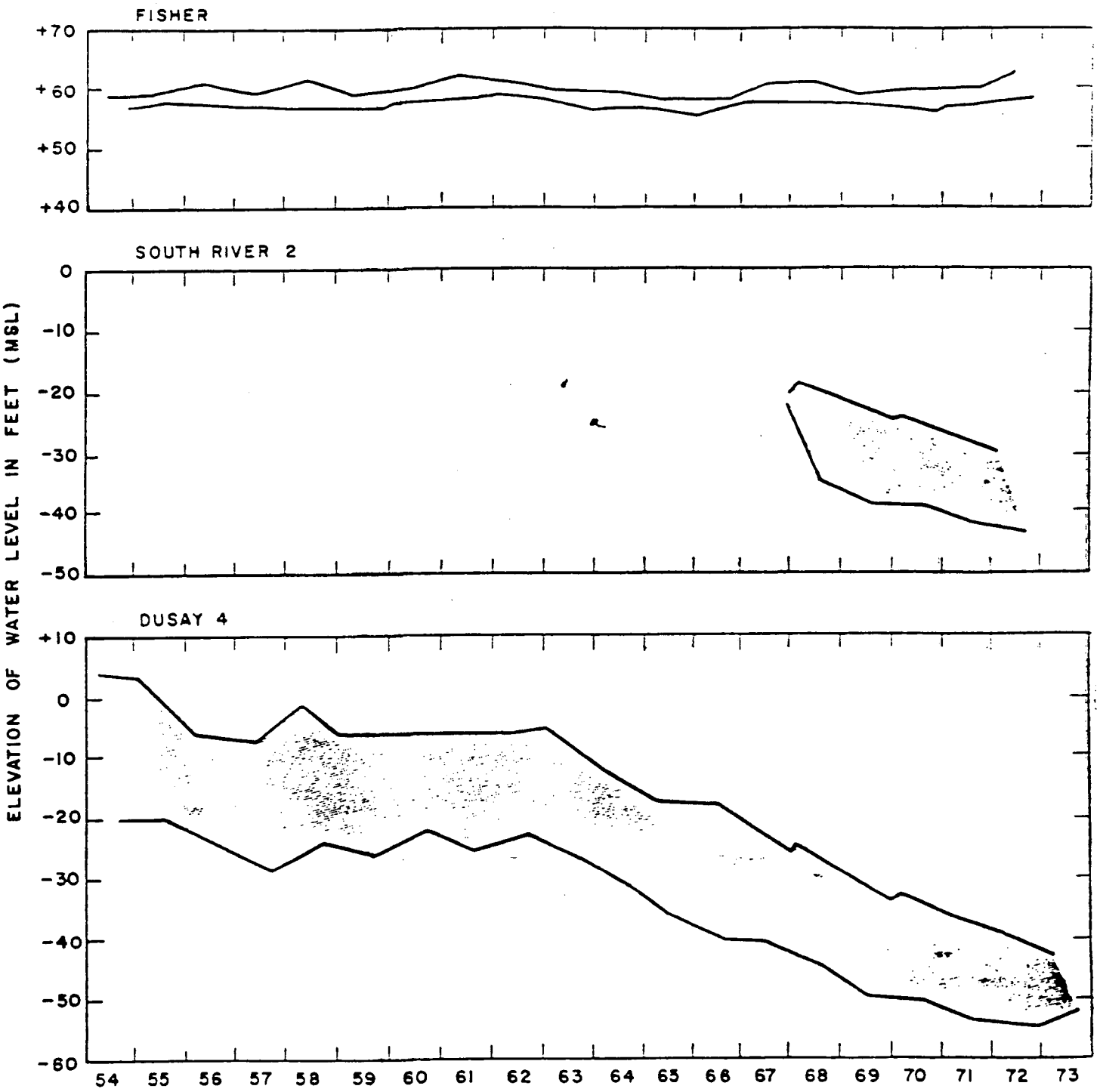


Figure 1 - Yearly high and low water levels in U. S. Geological Survey observation wells tapping the Farrington Sand.

SALT-WATER INTRUSION

Salt-water intrusion in the Middlesex 208 region is limited to the Farrington Sand in the vicinity of the Raritan and South Rivers; no salt-water intrusion has occurred in the Old Bridge Sand. The Farrington Sand occurs stratigraphically between the Raritan Fire Clay and the Woodbridge Clay (see Plate 3 - Cross Section II) and outcrops in a northeast-trending belt both north and south of the Raritan River. Although the outcrop area of this formation is divided by the Raritan River, the Farrington does occur beneath it. A buried northeast-trending Triassic age diabase ridge, 4,000 to 6,000 feet wide, underlies the Farrington Sand in the area of the Raritan River between Sayreville and Perth Amboy (see Plate 8 - Contours on Upper Surface of Bedrock Beneath Coastal Plain). The surface of this buried ridge is highly irregular, but its general topographic expression in upper Cretaceous time had a strong effect on Farrington sedimentation. Many test wells drilled through the materials overlying the ridge have gone directly from the Woodbridge Clay into the diabase and it is apparent that in many places between Sayreville and Perth Amboy, the Farrington Sand was either not deposited on top of this diabase ridge, or else was laid down and subsequently eroded. The sand was deposited in enough places however, so that salt water from the Raritan and South Rivers and the Washington Canal can move across the top of the ridge and into the Farrington Sand south of the Raritan River.

In Special Report 7 [3], it was pointed out that deepening of the Washington Canal in 1929 provided easy access for salt water to enter the Farrington Sand. In addition, it was also noted that heavy pumpage centered in the Parlin area and elsewhere might

intrusion into the Farrington Sand from both the Raritan River and Arthur Kill. Because of the thinness of the aquifer here and the natural low head, continued pumping in close proximity to these two surface-water bodies will cause additional salt-water intrusion.

No widespread salt-water intrusion problems exist in the Old Bridge Sand. The main reason for this is that while the Old Bridge aquifer is heavily pumped (30 mgd in 1974), most of this pumpage is in the outcrop area where the aquifer is recharged, thereby keeping the water level in the Old Bridge Sand generally above sea level. Also, artificial recharge ponds at the Duhernal Water System and Sayreville and Perth Amboy Water Departments increase the effective ground-water recharge in this area. By maintaining the head above sea level, intrusion of salt water from the surrounding saline and brackish surface-water bodies is prevented.

Furthermore the Old Bridge Sand, unlike the Farrington which underlies the Raritan River, Washington Canal and South River, is exposed to saline surface-water bodies at only two localities. In the general area of the South Amboy well field, the Old Bridge Sand outcrops adjacent to the Raritan Bay and probably underlies it for some distance off shore. Also, downstream of Duhernal Dam the Old Bridge outcrop area is crossed by the South River and two of its tributaries, Deep Run and Tennent Brook. The South River, Deep Run, and Tennent Brook are affected by tides in Raritan Bay. The chloride content of these three streams varies depending on the tidal stage and the ground- and surface-water flow entering the stream, but appreciably increased chloride concentrations have been found in the South River upstream almost as far as Duhernal Dam.

ent. On Triassic areas, infiltration is low and surface runoff quite high, whereas the opposite is true for the sands and gravels of the Coastal Plain. The Coastal Plain area north of the Raritan River was excluded from the water balance as the aquifers there are of little or no importance. In preparing the two water budgets, a number of assumptions were made. Underflow of ground water into the water budget regions was assumed to be equal to underflow out of the region, thus cancelling this component. Also, the hydrologic systems were considered to be in long-term dynamic equilibrium with negligible changes in ground-water storage.

Water-budget analyses of both the Coastal Plain and the Triassic Lowland are given in Table 6. In the overall Coastal Plain water budget, the water input is 400 mgd based on 44 inches of precipitation per year, which is equivalent to roughly 2 mgd per square mile. Half of this quantity, 22 inches or 200 mgd, is lost to the atmosphere by evapotranspiration, and 20 inches or 180 mgd runs off in streams. Evapotranspiration of shallow ground water in swampy areas covering 15 square miles equals 15 mgd and spring flow to salt-water bodies is estimated at 5 mgd.

The ground-water budget for the Coastal Plain shows ground-water recharge of about 140 mgd, which is derived through subtracting direct or storm runoff (estimated at 60 mgd or 15 percent of annual precipitation) and evapotranspiration from precipitation (400 mgd). Outflow of ground-water discharge to streams equals about 13 inches per year or 120 mgd. Evapotranspiration losses of shallow ground water and spring flow total 20 mgd.

In the Triassic Lowland, the overall water budget shows precipitation equaling 340 mgd, based on 44 inches or about 2 mgd per square mile, half of which is lost to evapotranspiration

Withdrawing large quantities of water in excess of natural replenishment, however, produces a decline in water levels as water is taken from storage, which in turn may lead to salt-water intrusion in coastal zones. As the eastern portion of the Farrington Sand is experiencing large head declines and locally, salt-water intrusion, removing additional ground water from storage within the aquifer in that area would not be recommended. Instead a more widely distributed pumping network might be required to eliminate excessive drawdowns in the coastal zone and to utilize the large ground-water reserves. More detailed recommendations for ground-water management techniques in both the Coastal Plain and Triassic Lowland are given in a later section of the report.

EFFECT OF THE PROPOSED CRAB ISLAND RESERVOIR ON GROUND-WATER SUPPLIES OF THE FARRINGTON AND OLD BRIDGE SANDS

A tidal dam has been proposed on the Raritan River downstream from Crab Island. The proposed reservoir surface would be 7.5 feet above mean sea level. The purpose of the reservoir is for flood protection, water supply, and recreation. The reservoir would prevent salt water from moving with the tides of the Raritan River, Washington Canal, and South River to recharge areas of the aquifers. It would raise fresh-water heads in the aquifers, thereby lowering the potential for salt-water intrusion. It is hoped that the reservoir would act to recharge water to the aquifers in response to ground-water pumpage. Water from the reservoir could also be used for artificial recharge of the aquifers.

The effect of the proposed reservoir on ground-water supplies in both the Farrington and Old Bridge Sands was studied by Remson and Fungaroli [7] of the U.S. Geological Survey

REFERENCE NO. 13

DR. S. OKULEWICZ

Geological Investigations of the Coastal Plain of Southern New Jersey

Part 2:

A. Hydrogeology and the Coastal Plain

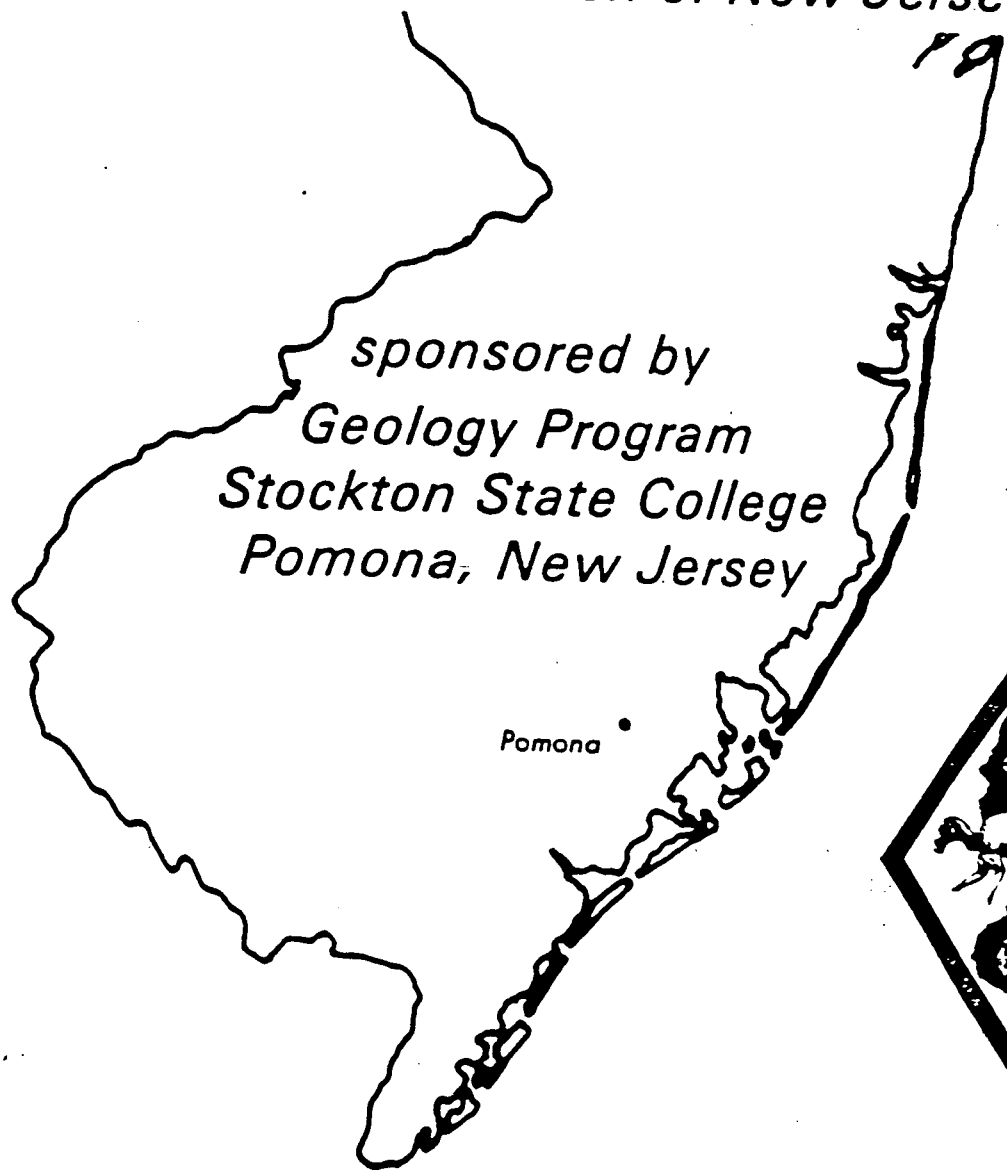
edited by Claude M. Epstein

B. Paleontologic Investigations

edited by Raymond W. Talkington

2nd Annual Meeting of the Geological Association of New Jersey

sponsored by
Geology Program
Stockton State College
Pomona, New Jersey



p.150

sand that generally strike northeast-southwest and thicken as a wedge southeasterly from a featheredge at the outcrop to more than 1,000 feet in southeastern Monmouth County (Zapecza, 1984).

The Farrington aquifer, which consists of the Farrington Sand Member of the Raritan Formation, overlies a crystalline rock basement in the western part of the study area and the Raritan Fire Clay downdip of the outcrop area. In areas near its outcrop, the Farrington Sand Member also overlies the diabase Palisades sill (figures 1 and 2). The member consists of sands and gravels with clay lenses. The Farrington aquifer thickens from 50 feet in and near its outcrop to about 100 to 125 feet in the southeastern part of the study area (Zapecza, 1984). In the study area, the aquifer is overlain by the Woodbridge Clay Member of the Raritan Formation. Locally, this micaceous silt and clay confining bed includes sand and clay lenses of the Sayreville Sand and the South Amboy Fire Clay Members of the Raritan Formation (Farlekas, 1979). The confining-bed thickness increases from less than 50 feet in the outcrop area to more than 150 feet farther downdip in this area (Zapecza, 1984).

The Old Bridge aquifer, generally, is equivalent to the Old Bridge Sand Member, the basal unit of the Magothy Formation. Locally, where the South Amboy Fire Clay member of the Raritan Formation is thin or missing, the Old Bridge aquifer may include the Sayreville Sand Member as shown in figure 2 (Farlekas, 1979). The aquifer is composed of medium sands locally interbedded with clayey silts (Farlekas, 1979). From the outcrop, the unit thickens to about 125 feet downdip at a depth of 700 to 800 feet below sea level in the southeastern part of the study area. Localized interbedded sand, silt, and clay sequences pinch out and interfinger with the overlying confining bed downdip (Zapecza, 1984).

The Merchantville-Woodbury confining bed overlies the PRMA system throughout the study area. Zapecza (1984) described it as the most extensive confining bed in the New Jersey Coastal Plain. The confining bed thickness ranges from about 100 feet in the study area to approximately 300 to 350 feet toward the east (Zapecza, 1984).

Detailed discussions of geologic characteristics and stratigraphy of the Raritan and Magothy Formations and overlying Coastal Plain deposits are in Barksdale and others (1943), Gill and Farlekas (1976), and Zapecza (1984).

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PREVIOUS INVESTIGATIONS IN THE VICINITY OF SAYREVILLE, AND SOUTH RIVER BOROUGHS, AND THE CITY OF SOUTH AMBOY

Unpublished test-borehole data resulting from commercial development has provided most of the hydrogeologic information in the Boroughs of Sayreville, and South River and the city of South Amboy for this investigation. The earliest information comes from the pits that were dug into the clay beds near the South River and Raritan River. Meredith Johnson compiled U.S. Army Corps of Engineers (USACE) and New Jersey Department of Transportation test borings in the South and Raritan Rivers (M. Johnson, unpublished worksheets on file at NJDEP, 1925-40). Johnson's worksheets show that the Farrington aquifer pinches out against the Palisades diabase sill in some locations near the estuary waterways.

Barksdale and others (1943), reported on the regional hydrogeology and ground-water supply. His report included an areal delineation of the extent of the Palisades sill. Subsequent analysis on the extent and the depth of the sill from borings and well records was done by Steven Whitney of the NJGS (Whitney, S., New Jersey Geological Survey, written commun., 1969). An aeromagnetic survey of this area by the U.S. Geological Survey (1979) may indicate that the sill is present further to the west than previously determined by either Whitney or Barksdale.

Two projects proposed by the USACE in the 1960's concerned the hydrogeology of this area. The first was a proposal to dam the South River and form a freshwater reservoir (U.S. Army Corps of Engineers, 1962). Appel (1962) prepared a preliminary report for this project that included data on the permeability properties and distribution of the alluvium along the South and Raritan Rivers. Another study examined the potential effects of continued dredging of the rivers by the USACE (Appel, U.S. Geological Survey, written commun., 1962). This study shows the extent and location of the Farrington aquifer, and the confining alluvium above and the confining Palisades sill below the aquifer. The study also shows that the areal distribution of the chloride migration pattern is a function of both the sediment permeability beneath the estuary waterways and the irregular aquifer thickness. Table 3 summarizes the hydrogeologic data for this area.

REFERENCE NO. 14

Form DWR-138
11/80

Cc d: 2641334

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTIC
DIVISION OF WATER RESOURCES

PERMIT NO. 26-771

APPLICATION NO.

COUNTY Middlesex

WELL RECORD

1. OWNER STOLT TERMINALS INC. ADDRESS 920 STATE ST.

Owner's Well No. SURFACE ELEVATION Fe (Above mean sea level)

2. LOCATION Lot: 1A Block: 425 Municipality: Perth Amboy City

3. DATE COMPLETED 8/20/85 DRILLER Somerville Well Drilling Co.

4. DIAMETER: Top 10 inches Bottom 6 inches TOTAL DEPTH 580 Fe

5. CASING: Type drive Diameter 6 Inches Length 160 Fe

6. SCREEN: Type Size of Opening Diameter Inches Length Fe

Range in Depth { Top Feet / Bottom Feet } Geologic Formation

Tail Piece: Diameter Inches Length Feet

7. WELL FLOWS NATURALLY Gallons per minute at Feet above surface

Water rises to Feet above surface

8. RECORD OF TEST: Date 8/20/85 Yield 45 Gallons per minute

Static water level before pumping 50 Feet below surface

Pumping level 460 feet below surface after 8 hours pumping

Drawdown 410 Feet Specific Capacity 2 Gals. per min. per ft. of drawdown

How pumped air How measured weir

Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT:

Type Mfrs. Name

Capacity G.P.M. How Driven H.P. R.P.M.

Depth of Pump in well Feet Depth of Footpiece in well Feet

Depth of Air Line in well Feet Type of Meter on Pump Size Inches

10. USED FOR incustrial AMOUNT { Average Gallons Daily / Maximum Gallons Daily }

11. QUALITY OF WATER good Sample: Yes X No

Taste none Odor none Color clear Temp. °F.

12. LOG 0-160' sand/clay-160-580'cerintine Are samples available? no
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA Somerville Well Drilling Co., Inc.

14. DATA OBTAINED BY same Date 8/20/85

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

ATTACHMENT: C
p.159

REFERENCE NO. 15

GROUND-WATER SITE DATA

DATA RELIABILITY (C3) [redacted]
field checked, poor location, minimal data, unchecked

SITE TYPE (C2) [redacted]
collector, drain, excavation, sink-hole, connector well, multiple wells, nutcrop, pond, tunnel, well, test hole

DATE OF CONSTRUCTION (C21) __ - __ - 19__
month day year

USE OF SITE (C23) [redacted]
anode, standby, emer. supply, drain, geothermal, seismic, heat reservoir, mine, observation, oil or gas, recharge, represurize, test, unused, withdrawal, waste, destroyed.

SECONDARY USE OF SITE (C301) (SEE USE OF SITE) [ ]

TERTIARY USE OF SITE (C302) (SEE USE OF SITE) [ ]

USE OF WATER (C24)

A	B	C	D	E	F	H	I	J	K	M	N	P	Q	R	S	T	U	Y	Z
air cond.,	bottling,	commercial,	dewater,	power,	fire,	domestic,	irrigation,	industrial (cooling),	mining,	medicinal,	industrial,	public supply,	aquaculture,	recreation,	stock,	institutional,	unused,	desalination	other

SECONDARY USE OF WATER (C25) (SEE USE OF WATER) [ ]

TERTIARY USE OF WATER (C26) (SEE USE OF WATER) [ ]

AQUIFER TYPE (C713)

U	N	C	M	X
unconfined, single	unconfined, multiple	confined, single	confined, multiple	mixed

PRIMARY AQUIFER (C714) [ ]

HOLE DEPTH (C27) [ ] . [ ]

WELL DEPTH (C28) [ ] . [ ]

SOURCE OF DEPTH DATA (C29)

A	D	G	L	M	O	R	S	Z
other gov't.,	driller,	geologist,	logs,	memory,	owner,	other reported,	reporting agency,	other

WATER LEVEL (C30) [ ] . [ ]

DATE WATER LEVEL MEASURED (C31) (Mandatory if C30, water level, has a value) __ - __ - 19__
month day year

METHOD OF WATER-LEVEL MEASUREMENT (C34)

A	B	C	E	G	H	L	M	N	R	S	T	V	Z
airline,	analog,	calibrated airline,	estimated,	pressure gage,	calibrated press. gage,	geophysical logs,	manometer	non-rec. gage,	reported,	steel tape,	electric tape,	calibrated elec. tape,	other

SITE STATUS FOR WATER LEVEL (C37)

D	E	F	G	H	I	J	N	O	P	R	S	T	V	W	X	Z
dry,	recently flowing,	flowing,	nearby flowing,	nearby recently flowing,	injector site,	injector site monitor,	measurement discon.,	obstruction,	pumping,	recently pumped,	nearby pumping,	nearby recently pumped,	foreign substance,	well destroyed,	surface water effects,	other

SOURCE OF WATER-LEVEL DATA (C33)

A	D	G	L	M	O	R	S	Z
other gov't.,	driller,	geologist,	logs,	memory,	owner,	other reported,	reporting agency,	other

CONSTRUCTION DATA

RECORD TYPE (C764) [redacted]

RECORD SEQUENCE NO. (C723) [redacted]

DATE OF CONSTRUCTION (C60) __ - __ - 19__
month day year

NAME OF CONTRACTOR (C63) [ ]

SOURCE OF DATA (C64)

A	D	G	L	M	O	R	S	Z
other gov't.,	driller,	geologist,	logs,	memory,	owner,	other reported,	reporting agency,	other

METHOD OF CONSTRUCTION (C65)

A	B	C	D	H	J	P	R	T	V	W	Z
air-rotary,	bored or augered,	cable tool,	dug,	hydraulic rotary,	jetted,	air percussion,	reverse rotary,	trenching,	driven,	drive wash,	other

TYPE OF FINISH (C66)

C	F	G	H	O	P	S	T	W	X	Z
porous stratum,	gravel wirpert.,	gravel screen,	horiz. gallery,	open end,	perf or slotted,	screen,	sand point,	walled,	open hole,	other

TYPE OF SEAL (C67)

B	C	G	N	Z
bentonite,	clay,	cement grout,	none,	other

BOTTOM OF SEAL (C68) [ ]

METHOD OF DEVELOPMENT (C69)

A	B	C	J	N	P	S	Z
air-lift pump,	bailed,	compressed air,	jetted,	none,	pumped,	surged,	other

HOURS OF DEVELOPMENT (C70) [ ]

SPECIAL TREATMENT (C71)

C	D	E	F	H	M	Z
chemicals,	dry ice,	explosives,	deflocculent,	hydrofracturing,	mechanical,	other

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34	100CNZC	CENOZOIC ERATHEM
34	110QRNR	QUATERNARY SYSTEM
34	111ALVM	HOLOCENE ALLUVIUM
34	111HLCN	HOLOCENE SERIES
34	111HPPM	UNDIFFERENTIATED HOLOCENE,PLEISTOCENE,PLIOCENE,AND MIOCENE
34	111SWMP	SWAMP DEPOSIT
34	112BRDG	BRIDGETON FORMATION
34	112CPMY	CAPE MAY FORMATION
34	112DLTC	DELTAIC SAND FACIES
34	112ESRNC	ESTUARINE CLAY FACIES
34	112ESRNS	ESTUARINE SAND FACIES
34	112GCLK	GLACIAL LAKE DEPOSITS
34	112GKMK	KAME AND KAME TERRACE DEPOSITS
34	112GLCD	GLACIAL DELTA DEPOSITS
34	112HLBC	HOLLY BEACH WATER-BEARING ZONE
34	112MORN	MORAINE
34	112MRIN	MARINE SAND FACIES
34	112PKBG	PENSAUKEN-BRIDGETON FORMATIONS
34	112PLCC	PLEISTOCENE SERIES-COHANSEY SAND
34	112PLSC	PLEISTOCENE SERIES
34	112PNSK	PENSAUKEN FORMATION
34	112SFDF	STRATIFIED DRIFT
34	112TILL	TILL
34	120TRTR	TERTIARY SYSTEM
34	121BCHL	BEACON HILL GRAVEL
34	121CKKD	COHANSEY SAND-KIRKWOOD FORMATION
34	121CNSY	COHANSEY SAND
34	121PCMC	PLIOCENE-MIOCENE SERIES
34	121PLCN	PLIOCENE SERIES
34	122KRKD	KIRKWOOD FORMATION
34	122KRKDL	KIRKWOOD FORMATION,LOWER SAND
34	122KRKDU	KIRKWOOD FORMATION,UPPER SAND
34	122MOCN	MIOCENE SERIES
34	123OLGC	OLIGOCENE SERIES
34	124EOCN	EOCENE SERIES
34	124MNSQ	MANASQUAN FORMATION
34	124MQVC	MANASQUAN-VINCENTOWN FORMATIONS
34	124PNPN	PINEY POINT FORMATION
34	124SKRV	SHARK RIVER MARL
34	125HRRS	HORNERSTOWN SAND
34	125PLCN	PALEOCENE SERIES
34	125VCHR	VINCETOWN FORMATION-HORNERSTOWN SAND
34	125VNCN	VINCENTOWN FORMATION
34	200MSZC	MESOZOIC ERATHEM
34	210CRCS	CRETACEOUS SYSTEM
34	211EGLS	ENGLISHTOWN FORMATION
34	211FRNG	FARRINGTON SAND MEMBER OF RARITAN FORMATION
34	211MCVL	MERCHANTVILLE FORMATION
34	211MGRR	MAGOTHY-RARITAN FORMATIONS
34	211MGTY	MAGOTHY FORMATION
34	211MLRL	MOUNT LAUREL SAND
34	211MLRW	MOUNT LAUREL SAND-WENONAH FORMATION
34	211MRPA	MAGOTHY-RARITAN-POTOMAC AQUIFER SYSTEM, UNDIFFERENTIATED
34	211MRPAL	MAGOTHY-RARITAN-POTOMAC AQUIFER SYSTEM, LOWER AQUIFER
34	211MRPAM	MAGOTHY-RARITAN-POTOMAC AQUIFER SYSTEM, MIDDLE AQUIFER
34	211MRPAU	MAGOTHY-RARITAN-POTOMAC AQUIFER SYSTEM, UPPER AQUIFER
34	211MRSL	MARSHALLTOWN FORMATION
34	211NVSK	NAVESINK FORMATION
34	211ODBG	OLD BRIDGE SAND MEMBER OF MAGOTHY FORMATION
34	211RDBK	RED BANK SAND
34	211RRTN	RARITAN FORMATION
34	211SRVL	SAYREVILLE SAND MEMBER OF RARITAN FORMATION
34	211TNTN	TINTON SAND
34	211WBMV	WOODBURY CLAY-MERCHANTVILLE FORMATION
34	211WDBR	WOODBURY CLAY
34	211WNNH	WENONAH FORMATION
34	217PTMC	POTOMAC GROUP
34	227BNTN	BOONTON FORMATION
34	227BRCK	BRUNSWICK GROUP
34	227BRCKS	BRUNSWICK GROUP SEDIMENTARY
34	227BSLT	BASALT
34	227CGLM	CONGLOMERATE
34	227DIBS	DIABASE
34	227FLVL	FELTVILLE FORMATION

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34	227HKMN	HOOK MOUNTAIN BASALT
34	227NWRK	NEWARK SUPERGROUP
34	227ORGM	ORANGE MOUNTAIN BASALT
34	227PRKS	PREAKNESS BASALT
34	227PSSC	PASSAIC FORMATION
34	227TOWC	TOWACO FORMATION
34	230TRSC	TRIASSIC SYSTEM
34	231CGLMU	UNCLASSIFIED CONGLOMERATES
34	231HMCK	HAMMER CREEK FORMATION
34	231LMCG	LIMESTONE CONGLOMERATE
34	231LCKG	LOCKATONG FORMATION
34	231QRCG	QUARTZITE CONGLOMERATE
34	231SCKN	STOCKTON FORMATION
34	300PLZC	PALEOZOIC ERATHEM
34	300WSCK	WISSAHICKON GNEISS
34	324KTTNL	LOWER KITTATINY LIMESTONE
34	324KTTNM	MIDDLE KITTATINY LIMESTONE
34	340DVNN	DEVONIAN SYSTEM
34	341SKMK	SKUNNEMUNK CONGLOMERATE
34	344BLVL	BELLVALE SANDSTONE
34	344CRNL	CORNWALL SHALE
34	344ESPS	ESOPUS FORMATION
34	344KNUS	KANOUSE SANDSTONE
34	344MRCL	MARCELLUS SHALE
34	344ONDG	ONONDAGA LIMESTONE
34	347CMNS	COEYMANS FORMATION
34	347DEPU	DEPUE LIMESTONE MEMBER OF COEYMANS FORMATION
34	347DNVL	DUTTONVILLE MEMBER OF RONDOUT FORMATION
34	347FBKV	FLATBROOKVILLE MEMBER OF NEW SCOTLAND FORMATION
34	347KKBG	KALKBERG LIMESTONE
34	347MNSK	MINISINK LIMESTONE
34	347MPCG	MASHIPACONG MEMBER OF RONDOUT FORMATION
34	347MSKZ	MASKENOZHA MEMBER
34	347NSCD	NEW SCOTLAND FORMATION
34	347ORSK	ORISKANY FORMATION
34	347PREN	PORT EWEN SHALE
34	347PRVL	PETERS VALLEY MEMBER OF COEYMANS FORMATION
34	347RNDT	RONDOUT FORMATION
34	347RVEN	RAVENA MEMBER OF COEYMANS LIMESTONE
34	347SILD	SHAWNEE ISLAND MEMBER OF COEYMANS FORMATION
34	347SMVL	STORMVILLE MEMBER OF COEYMANS FORMATION
34	347TCKR	THACKER MEMBER OF MANLIUS LIMESTONE
34	347WTPR	WHITEPORT DOLOMITE MEMBER OF RANDOUT FORMATION
34	350GRPD	GREEN POND CONGLOMERATE
34	350HGFL	HIGH FALLS FORMATION
34	350SLRN	SILURIAN SYSTEM
34	351BDVL	BOSSARDVILLE LIMESTONE
34	351CVBK	CLOVE BROOK MEMBER OF DECKER FORMATION
34	351DCKR	DECKER FORMATION
34	351LNGD	LONGWOOD SHALE
34	351PXID	POXONO ISLAND FORMATION
34	351WPKC	WALLPACK CENTER MEMBER OF DECKER FORMATION
34	354SNGK	SHAWANGUNK FORMATION
34	360KTTN	KITTATINNY LIMESTONE
34	360ODVC	ORDOVICIAN SYSTEM
34	361BSKL	BUSHKILL MEMBER OF MARTINSBURG SHALE
34	361MRBG	MARTINSBURG SHALE
34	361PAGL	PEN ARGYL MEMBER OF MARTINSBURG SHALE
34	361RMBG	RAMSEYBURG MEMBER OF MARTINSBURG SHALE
34	364JKBG	JACKSONBURG LIMESTONE
34	367EPLR	EPLER FORMATION
34	367KTTNU	UPPER KITTATINY LIMESTONE
34	367RCKB	RICKENBACH DOLOMITE
34	370CMBR	CAMBRIAN SYSTEM
34	371ALNN	ALLENTOWN DOLOMITE
34	374LSVL	LEITHSVILLE FORMATION
34	377HRDS	HARDYSTON QUARTZITE
34	400BLMR	BALTIMORE GNEISS
34	400FRKL	FRANKLIN LIMESTONE
34	400PCMB	PRECAMBRIAN ERATHEM
34	BASEMENT	BASEMENT
34	BEDROCK	BEDROCK

GWSI

UNIQUE ID	SITE OWNER
230356	SAYREVILLE W D
230357	SAYREVILLE W D
230358	SAYREVILLE W D
230359	SAYREVILLE W D
230360	SAYREVILLE W D
230361	SAYREVILLE W D
230362	PERTH AMBOY WATER DEPARTM
230363	SAYREVILLE W D
230364	SAYREVILLE W D
230365	DUHERNAL W CO
230366	SAYREVILLE W D
230367	SAYREVILLE W D
230368	SAYREVILLE W D
230369	SAYREVILLE W D
230370	HERCULES POWDER
230371	HERCULES POWDER
230372	SAYREVILLE W D
230373	SAYREVILLE W D
230374	SAYREVILLE W D
230375	SAYREVILLE W D
230376	HERCULES POWDER
230377	HERCULES POWDER
230378	INSUL - CAUSTIC
230379	DUHERNAL W CO
230380	HERCULES POWDER
230380	
230381	PARAGON BRICK COMPANY
230382	E I DUPONT
230383	E I DUPONT
230384	HERCULES POWDER
230385	DUHERNAL W CO
230386	E I DUPONT
230387	DUHERNAL W CO
230388	DUHERNAL W CO
230389	E I DUPONT
230389	
230390	HERCULES POWDER
230391	HERCULES POWDER
230391	
230392	E I DUPONT
230393	E I DUPONT
230393	
230394	E I DUPONT
230395	DUHERNAL W CO
230396	DUHERNAL W CO
230397	DUHERNAL W CO
230397	
230398	DUHERNAL W CO
230399	DUHERNAL W CO
230400	SAYREVILLE W D
230401	SAYREVILLE W D
230402	SAYREVILLE W D
230403	SAYREVILLE W D
230403	
230404	SAYREVILLE W D
230405	G S PARKWAY
230406	DUHERNAL W CO
230407	G S PARKWAY
230408	G S PARKWAY
230409	DUHERNAL W CO
230410	DUHERNAL W CO
230411	SOUTH AMBOY W D
230412	SOUTH AMBOY W D
230413	SOUTH AMBOY W D
230414	SOUTH AMBOY W D
230415	NL INDUSTRIES
230416	NJ STEEL & STRC
230417	NJ STEEL & STRC
230418	NL INDUSTRIES
230419	NL INDUSTRIES
230420	NL INDUSTRIES
230420	
230421	NL INDUSTRIES
230422	DUHERNAL W CO
230423	NL INDUSTRIES
230424	DUHERNAL W CO
230425	DUHERNAL W CO
230426	E I DUPONT
230427	SWAN HILL ICE C
230428	JERS CENTRAL PL
230429	JERS CENTRAL PL
230430	JERS CENTRAL PL
230431	JERS CENTRAL PL
230432	SOUTH RIVER W D
230432	
230433	NJ WATER POLICY
230434	SOUTH RIVER W D
230435	SOUTH RIVER W D
230436	SOUTH RIVER W D
230437	SOUTH RIVER W D

LOCAL ID	MUNICIPALITY	LAT	LON	ALTITUDE	DEPTH	DIAMETER
SWD F	SAYREVILLE BORO	402514	0741955	29.00	74.0	
SWD TEST 4	SAYREVILLE BORO	402616	0742029	20.00	89.0	
SWD A	SAYREVILLE BORO	402617	0741945	48.00	90.0	
SWD D	SAYREVILLE BORO	402618	0741952	29.00	75.0	
SWD TEST 2	SAYREVILLE BORO	402618	0741952	50.00	78.0	
SWD E	SAYREVILLE BORO	402619	0741958	28.00	62.0	
AMBOY 60	SAYREVILLE BORO	402619	0742009	25.00	67.0	
TEST 1 1944	SAYREVILLE BORO	402620	0742039	23.00	205	
SWD 3	SAYREVILLE BORO	402620	0742124	5	107	
DUH SAY 4	SAYREVILLE BORO	402633	0742120	5.70	160	
SWD L	SAYREVILLE BORO	402624	0741939	63.00	89.0	
SWD G	SAYREVILLE BORO	402624	0741944	46.00	97.0	
1	SAYREVILLE BORO	402626	0741936	58.00	94.0	
SWD H	SAYREVILLE BORO	402630	0741949	45.00	83.0	
HERCULES 6	SAYREVILLE BORO	402631	0742053	20.00	194	
HERCULES 5	SAYREVILLE BORO	402638	0742022	48.00	228	
SWD TEST 5	SAYREVILLE BORO	402642	0741940	85.00	108	
SWD TEST 6	SAYREVILLE BORO	402643	0741932	95.00	106	
SWD TEST 7	SAYREVILLE BORO	402647	0741936	110.00	60.0	
SWD TEST 8	SAYREVILLE BORO	402648	0741930	100.00	129	
HERCULES 3	SAYREVILLE BORO	402649	0742025	40.80	220	
HERCULES OBS 2	SAYREVILLE BORO	402654	0742043	40.00	223	
1-1958	SAYREVILLE BORO	402654	0742126	20.00	120	
DUHRNL OBS 40F	SAYREVILLE BORO	402656	0742104	30.00	184	
HERCULES 2	SAYREVILLE BORO	402659	0742020	47.50	237	
HERCULES 2	SAYREVILLE BORO	402659	0742020	47.50	237	
PARAGON 1	SAYREVILLE BORO	402701	0742159		103	
'	SAYREVILLE BORO	402703	0741857	93.00	118	
9A	SAYREVILLE BORO	402703	0741859	96.56	116	
HERCULES 1REPT	SAYREVILLE BORO	402705	0742023	54.30	225	
DUHRNL OBS 32F	SAYREVILLE BORO	402706	0742130	27.00	125	
6	SAYREVILLE BORO	402701	0741917	102.00	314	
DUHRNL OBS 39F	SAYREVILLE BORO	402711	0742045	40.00	193	
DUHRNL OBS 59F	SAYREVILLE BORO	402711	0742045	40.00	223	
5	SAYREVILLE BORO	402710	0741910	106.92	309	
5	SAYREVILLE BORO	402710	0741910	106.92	307	
HERCULES OBS 1	SAYREVILLE BORO	402712	0742045	35.00	198	
HERCULES 4	SAYREVILLE BORO	402711	0742030	46.70	226	
HERCULES 4	SAYREVILLE BORO	402711	0742030	46.70	226	
1	SAYREVILLE BORO	402716	0741922	101.60	286	
3	SAYREVILLE BORO	402715	0741932	94.38	284	
3	SAYREVILLE BORO	402715	0741932	94.38	284	
FARLIN OBS	SAYREVILLE BORO	402715	0741932	90.00	307	
DUHRNL OBS 33F	SAYREVILLE BORO	402715	0742050	36.00	175	
DUHRNL OBS 27F	SAYREVILLE BORO	402713	0742213	8.00		
DUHRNL OBS 55F	SAYREVILLE BORO	402728	0742044	70.	189	
DUHRNL OBS 55F	SAYREVILLE BORO	402728	0742044	70.	187	
DUHRNL OBS 58F	SAYREVILLE BORO	402736	0741949	90.00	255	
DUHRNL OBS 57F	SAYREVILLE BORO	402741	0741958	70.00	240	
R-1973	SAYREVILLE BORO	402743	0741615	100.00	92.0	20.00
MORGAN F	SAYREVILLE BORO	402744	0741628	44.00	288	
TEST WELL 3-69	SAYREVILLE BORO	402745	0741628	30.00	140	
SWD 0-1973	SAYREVILLE BORO	402745	0741631	40.00	136	
SWD 0-1973	SAYREVILLE BORO	402745	0741631	40.00	136	
MORGAN OBS 1	SAYREVILLE BORO	402745	0741645	23.35	243	
CHEESEQUAKE 2	SAYREVILLE BORO	402753	0741711	70.00	107	
DUHRNL OBS 28F	SAYREVILLE BORO	402753	0742218	6.00	50.0	
CHEESEQUAKE 3	SAYREVILLE BORO	402802	0741627	73.00	122	
CHEESEQUAKE 1	SAYREVILLE BORO	402803	0741627	73.00	122	
DUHRNL OBS 36F	SAYREVILLE BORO	402751	0742002	95.00	224	
DUHRNL OBS 29F	SAYREVILLE BORO	402813	0742205	10.00	60.0	
SAWD 8	SAYREVILLE BORO	402822	0741630	10.00	234	
SAWD 5	SAYREVILLE BORO	402823	0741631	10.00	52.0	
SAWD 9	SAYREVILLE BORO	402824	0741631	10.00	48.0	
SAWD 10	SAYREVILLE BORO	402825	0741632	10.00	48.0	
4	SAYREVILLE BORO	402835	0741815	109.00	251	
TEST WELL 2	SAYREVILLE BORO	402834	0741920	13.00	192	
TEST WELL 1	SAYREVILLE BORO	402836	0741919	10.00	130	
3	SAYREVILLE BORO	402842	0741808	117.00	270	
2	SAYREVILLE BORO	402854	0741804	104.00	253	
1-1934	SAYREVILLE BORO	402905	0741800	121.00	266	
1-1934	SAYREVILLE BORO	402905	0741800	121.00	266	
TEST 3	SAYREVILLE BORO	402905	0741800	119.00		10.00
DUHRNL OBS 35F	SAYREVILLE BORO	402920	0741804	65.00	156	
CL TEST 1	SAYREVILLE BORO	402943	0741808	30.00	94.0	
DUHRNL OBS 34F	SAYREVILLE BORO	402945	0741752	16.00	129	
FARLIN 60F	SAYREVILLE BORO	402729	0741937	147.00	288	
FARLIN 60F	SAYREVILLE BORO	402729	0741937	147.00	288	
SWAN HILL 1	SOUTH AMBOY CITY	402900	0741644	20.00	52.0	
WERNER STA 5	SOUTH AMBOY CITY	402922	0741658	9	160	
WERNER STA 6	SOUTH AMBOY CITY	402923	0741648	18.00	177	
[illegible]-1972	SOUTH AMBOY CITY	402923	0741651	12.00	165	
WERNER STA 4	SOUTH AMBOY CITY	402926	0741649	10.00	168	
SRWD 4	SOUTH RIVER BORO	402557	0742138	18.30	182	9.00
SRWD 4	SOUTH RIVER BORO	402557	0742138	18.30	182	
SO RIVER 4	SOUTH RIVER BORO	402555	0742133	20.00	33.0	
SRWD 2	SOUTH RIVER BORO	402556	0742141	20.00	198	
INFIL GALLERY	SOUTH RIVER BORO	402556	0742141	20.00	15.0	
SRWD 1	SOUTH RIVER BORO	402557	0742138	20.00	193	
SRWD 3	SOUTH RIVER BORO	402559	0742142	19.70	198	

STATION ID	AQUIFER
402614074195301	2110DBG
402616074202901	2110DBG
402617074194501	2110DBG
402618074195201	2110DBG
402618074195202	2110DBG
402619074195801	2110DBG
402619074200901	2110DBG
402620074203901	211FRNG
402620074212401	211FRNG
402623074212701	211FRNG
402624074193901	2110DBG
402624074194401	2110DBG
402626074193601	2110DBG
402630074194901	2110DBG
402631074205301	211FRNG
402638074202201	211FRNG
402642074194001	2110DBG
402643074193201	2110DBG
402647074193601	2110DBG
402648074193001	2110DBG
402649074202501	211FRNG
402654074204301	211FRNG
402654074212601	211FRNG
402656074210401	211FRNG
402659074202001	211FRNG
402659074202001	211FRNG
402701074215901	211FRNG
402703074185901	2110DBG
402703074185902	2110DBG
402705074202301	211FRNG
402706074213001	211FRNG
402708074192201	211FRNG
402711074204501	211FRNG
402711074204502	211FRNG
402712074192101	211FRNG
402712074192101	211FRNG
402712074204501	211FRNG
402713074203201	211FRNG
402713074203201	211FRNG
402715074192401	211FRNG
402715074193201	211FRNG
402715074193201	211FRNG
402715074193202	211MRPA
402715074210201	211FRNG
402718074221301	211FRNG
402728074204401	211FRNG
402728074204401	211FRNG
402741074194901	211FRNG
402741074195801	211FRNG
402743074162101	2110DBG
402744074162801	211FRNG
402745074162802	2110DBG
402745074163101	2110DBG
402745074163101	2110DBG
402746074314501	211FRNG
402753074171101	211MRPA
402753074221801	211FRNG
402754074171401	211MRPA
402754074171402	2110DBG
402755074200201	211FRNG
402913074220501	211FRNG
402822074163001	211FRNG
402823074163101	2110DBG
402824074163101	2110DBG
402825074163201	2110DBG
402831074181501	211FRNG
402834074192001	211FRNG
402836074191901	211FRNG
402842074181101	211FRNG
402854074180501	211FRNG
402905074180001	211FRNG
402905074180001	211FRNG
402905074180002	211FRNG
402920074180401	211FRNG
402942074180901	211FRNG
402945074175501	211FRNG
402958074193801	211FRNG
402958074193801	211FRNG
402904074164801	2110DBG
402922074165801	211FRNG
402923074155601	211FRNG
402923074165101	211FRNG
402926074155001	211FRNG
402557074213802	211FRNG
402557074213802	211FRNG
402555074213301	2110DBG
402556074214101	211FRNG
402556074214102	2110DBG
402557074213801	211FRNG
402559074214201	211FRNG

SCREENED INTERVAL		W	S	DATE	PERMIT	DEPTH DRILLED	UNIQUE ID
53.00	74.00	P	W	19590221			230356
75.00	89.00	U	T	1963			230357
70.00	80.00	P	W	19651006			230358
64.00	75.00	P	W	19580926			230359
67.00	78.00	U	T	1963			230360
39.00	62.00	P	W	1958			230361
52.00	67.00	P	W	19701117			230362
185.00	205.00	U	T	19441025			230363
		U	D	1937			230364
148.00	160.00	U	D	1931			230365
79.00	89.00	P	W	19651202			230366
56.00	87.00	P	W	19600323			230367
83.00	94.00	P	W	1960			230368
67.00	83.00			19600816			230369
164.00	194.00	U	W	19460805			230370
182.00	228.00	U	W	19290319			230371
98.00	108.00	U	T	1963			230372
95.00	106.00	U	T	19630419			230373
49.00	60.00	U	T	1963			230374
117.00	128.00	U	T	1963			230375
180.00	220.00	N	W	19280302			230376
212.00	223.00	U	D	1954			230377
110.00	120.00	N	W	1958			230378
		U	Z	19440329			230379
184.00	237.00	N	W	19271222			230380
181.00	237.00	N	W				230380
		U	W	1927			230381
93.00	118.00	U	Z	19371105			230382
97.00	116.00	N	W	19540811			230383
170.00	225.00	N	W	19391229			230384
		U	Z				230385
253.00	314.00	N	W	19300404			230386
183.00	193.00	U	U	19430527			230387
212.00	223.00	U	Z	1934			230388
257.00	304.00	N	W	1928			230389
249.00	304.00	N	W				230389
187.00	198.00	U	D	19530805			230390
163.00	172.00	U	U	1928			230391
187.00	226.00	U	U				230391
237.00	291.00	N	W	1924			230392
246.00	285.00	N	W	19250901			230393
244.00	284.00	N	W				230393
		U	D				230394
		U	Z	1938			230395
		U	Z				230396
169.00	175.00	U	Z	19460524			230397
185.00	189.00	U	Z				230397
250.00	255.00	U	Z	19480916			230398
230.00	240.00	U	Z	19480902			230399
57.00	82.00	P	W				230400
254.00	288.00	P	W	19620607			230401
117.00	140.00	U	T	19690718			230402
79.00	98.00	P	W	19730126			230403
116.00	136.00	P	W				230403
238.00	248.00	U	D	19660602			230404
88.00	107.00	U	Z	19540623			230405
		U	Z				230406
		U	Z	19600712			230407
92.00	121.50	U	Z	19690806			230408
219.00	229.00	U	Z	1941			230409
50.00	60.00	U	Z				230410
209.00	234.00	U	U	19470226	46-00144		230411
		U	Z	1937			230412
25.00	47.00	U	Z	1965			230413
38.00	48.00	P	W	19570522	26-04078		230414
220.00	251.00	U	W	1952			230415
168.00	192.00	U	T	1972			230416
114.00	130.00	U	T	19720414			230417
240.00	270.00	U	W	1934			230418
220.00	253.00	U	U	1934			230419
36.00	66.00	U	Z	19340501			230420
236.00	266.00	U	Z				230420
		U	Z	19340501		334	230421
		U		19481004			230422
75.00	84.00	U	T	1956			230423
		U	Z				230424
282.00	288.00	U	D	19660510			230425
		U	D				230425
40.00	52.00	U	Z	1922			230427
		U	U	1956			230428
154.00	177.00	U	U	1969			230429
135.00	165.00	N	W	19721013			230430
143.00	168.00	U	Z	1952			230431
149.50	179.50	P	W	19750512	28-08788	207	230432
150.00	180.00	P	W			207	230432
30.00	33.00	U	D	19680126			230433
173.00	198.00	P	W	1952	28-00332		230434
		P	W	1916			230435
163.00	192.00	P	W	1922			230436
162.00	198.00	U	Z	19670502	28-06069		230437

4916

UNIQUE ID	SITE OWNER	LOCAL ID	MUNICIPALITY	LAT	LON	ALTITUDE	DEPTH	DIAMETER	STATION ID	AQUIFER	SCREENED INTERVAL		W	S	DATE	PERMIT	DEPTH DRILLED	UNIQUE ID
230438	SOUTH RIVER BOR	SRWD	SOUTH RIVER BORO	402559	0742142	19.70	187	12.00	402559074214202	211FRNG	132.00	182.00	P	W	197707	28-09722	202	230438
230438	SOUTH RIVER W D	SRWD	SOUTH RIVER BORO	402559	0742142	19.70	187		402559074214202	211FRNG			P	W			202	230438
230439	SOUTH RIVER W D	SRWD 2 OBS	SOUTH RIVER BORO	402633	0742200	20.69	126		402633074220001	211FRNG	121.00	126.00	U	O	1967			230439
230440	CHADWICK, THOMAS	1	SOUTH RIVER BORO	402649	0742226	15.00	195		402647074222701	211FRNG			N	W	1922			230440
230440	BEE CAB CO	1	SOUTH RIVER BORO	402643	0742226	15.00	195		402647074222701	211FRNG			N	W				230440
230440	HODGES BUS CO	1	SOUTH RIVER BORO	402648	0742225	15.00	195		402647074222701	211FRNG			N	W				230440
230441	HERBERT SAND CO	HSC 1	SOUTH RIVER BORO	402742	0742309	6.40	52.0		402748074230601	211FRNG	49.00	52.00	U	T	1964			230441
230442	SPOTSWOOD WD	SWWD 3	SPOTSWOOD BORO	402252	0742432	30.00	91.0		402252074243201	211ODBG	63.50	77.92	P	W	197306	28-07828		230442
230442		SWWD 3	SPOTSWOOD BORO	402252	0742432	30.00	91.0		402252074243201	211ODBG	64.00	78.00	P	W				230442
230443	SPOTSWOOD WD	TEST WELL 1	SPOTSWOOD BORO	402329	0742318	20.00	79.0		402318074233301	211ODBC	59.00	79.00	U	T	19700727			230443
230444	DUHERNAL W CO	DUHERNAL 9	SPOTSWOOD BORO	402326	0742313	14.34	72.0		402326074231301	211ODBG	62.00	72.00	U	O	19381026			230444
230445	SPOTSWOOD WD	TW 4F-75	SPOTSWOOD BORO	402328	0742318	12.00	264	12.00	402328074231801	211FRNG	195.00	215.00	U	T	197607		328	230445
230445		TW 4F-75	SPOTSWOOD BORO	402328	0742318	12.00	264		402328074231801	211FRNG	219.00	239.00	U	T			328	230445
230445		TW 4F-76	SPOTSWOOD BORO	402328	0742318	12.00	264		402328074231801	211FRNG	254.00	264.00	U	T			328	230445
230446	DUHERNAL W CO	DUHERN OBS 13F	SPOTSWOOD BORO	402328	0742331	20.00	280		402328074233101	211FRNG	244.00	251.00	U	Z	19460427			230446
230446		DUHERN OBS 13F	SPOTSWOOD BORO	402328	0742331	20.00	280		402328074233101	211FRNG	273.00	280.00	U	Z				230446
230447	SPOTSWOOD WD	SWWD 1	SPOTSWOOD BORO	402329	0742319	19.00	85.0		402329074231901	211ODBG	64.00	85.00	P	W	19561126	28-02172		230447
230448	SPOTSWOOD WD	SWWD 2	SPOTSWOOD BORO	402330	0742316	20.00	83.0		402330074231601	211ODBG	62.00	83.00	U	Z	19571122	28-02173		230448
230449	DUHERNAL W CO	DUHERNAL 17	SPOTSWOOD BORO	402352	0742250		60.0		402352074225001	211MRPA			U	O				230449
230450	DUHERNAL W CO	DUHERNL OBS 11	SPOTSWOOD BORO	402400	0742245		69.0		402400074224501	211MRPA			U	O				230450
230451	SCHWEITZER, P J	5	SPOTSWOOD BORO	402401	0742243	36.00	89.0		402401074224301	211ODBG	69.00	89.00	N	W	19410826			230451
230452	SCHWEITZER, P J	8	SPOTSWOOD BORO	402401	0742243	25.00	276		402401074224302	211FRNG	226.00	276.00	N	W	19470522			230452
230453	SCHWEITZER, P J	1	SPOTSWOOD BORO	402404	0742235	30.00	285		402404074223501	211FRNG	265.00	285.00	U	Z	19290121			230453
230454	SCHWEITZER, P J	3	SPOTSWOOD BORO	402404	0742235		70.0		402404074223503	211ODBG	49.00	74.00	N	W	19290321			230454
230455	SCHWEITZER, P J	2	SPOTSWOOD BORO	402404	0742235		61.0		402404074223504	211ODBG	36.00	61.00	N	W	19290129			230455
230456	SCHWEITZER, P J	1R	SPOTSWOOD BORO	402404	0742235	21.00	275		402404074223505	211FRNG	235.00	275.00	N	W	19560606			230456
230457	SCHWEITZER, P J	6	SPOTSWOOD BORO	402405	0742247	30.50	73.0		402405074224701	211ODBG	53.00	73.00	N	W	19421024			230457
230458	SCHWEITZER, P J	7	SPOTSWOOD BORO	402408	0742243	33.00	76.0		402408074224301	211ODBG	61.00	76.00	N	W	19460625			230458
230459	SCHWEITZER, P J	3R	SPOTSWOOD BORO	402412	0742248	35.00	68.0		402412074224801	211ODBG	58.00	68.00	N	W	19600218			230459
230460	SCHWEITZER, P J	5	SPOTSWOOD BORO	402421	0742230	25.00	63.0		402421074223001	211ODBG	53.00	63.00	N	W	19610324			230460
230461	SCHWEITZER, P J	4R	SPOTSWOOD BORO	402421	0742233	35.00	59.0		402421074223301	211ODBG	49.00	59.00	N	W	19610216			230461
230462	UNION CARBIDE	CARBIDE 1	WOODBRIDGE TWP	403043	0741842	15.00	57.0		403043074184201	211FRNG	47.00	57.00	N	W	19650928			230462
230463	HEYDEN CHEM CO	1	WOODBRIDGE TWP	403050	0741915	10.00	190		403050074191601	231BRCK			N	W	1934			230463
230464	HEYDEN CHEM CO	3-1934	WOODBRIDGE TWP	403050	0741915	10.00	50.0		403050074191602	211FRNG			N	W	1934			230464
230465	HEYDEN CHEM CO	4-1934	WOODBRIDGE TWP	403050	0741915	10.00	45.0		403050074191603	211FRNG			N	W	1934			230465
230466	CATALIN CORP	1	WOODBRIDGE TWP	403051	0741931	10.00	38.0		403051074193101	211FRNG			N	W	1940			230466
230467	CATALIN CORP	2	WOODBRIDGE TWP	403051	0741931	10.00	32.0		403051074193102	211FRNG			N	W	1940			230467
230468	CATALIN CORP	3	WOODBRIDGE TWP	403051	0741931	10.00	42.0		403051074193103	211FRNG			N	W	1940			230468
230469	CATALIN CORP	4	WOODBRIDGE TWP	403051	0741931	10.00	31.0		403051074193104	211FRNG			N	W	1940			230469
230470	CATALIN CORP	5	WOODBRIDGE TWP	403051	0741931	10.00	34.0		403051074193105	211FRNG			N	W	1944			230470
230471	CATALIN CORP	6	WOODBRIDGE TWP	403051	0741931	10.00	210		403051074193106	231BRCK			N	W	1944			230471
230472	AMERICAN CYANAMID CO	CYAN WDBRG EJ	WOODBRIDGE TWP	403233	0741620	15.00	80.0		403233074162001	211MNPA			U	Z	19470131			230472
230473	SWIFT AND CO	SWIFT 1	WOODBRIDGE TWP	403233	0741633	30.00	59.0		403233074163301	211FRNG	39.00	59.00	N	W	19551125			230473
230473	HAAGEN DAZS INC	SWIFT 1	WOODBRIDGE TWP	403233	0741633	30.00	59.0		403233074163301	211FRNG			N	W				230473
230474	SWIFT AND CO	RECHARGE WELL	WOODBRIDGE TWP	403233	0741633		61.0		403233074163302	211FRNG	41.00	61.00	N	W	19551210			230474
230474	HAAGEN DAZS INC	RECHARGE WELL	WOODBRIDGE TWP	403233	0741633		61.0		403233074163302	211FRNG			N	W				230474
230475	CLOVER GREEN DY	DAIRY WELL	WOODBRIDGE TWP	403233	0741647	45.00	68.0		403233074164701	211FRNG			N	W	1936			230475
230476	NJ WOOD FINISH	NJ WOOD 3	WOODBRIDGE TWP	403234	0741633	35.00	77.0		403234074163301	211FRNG			N	W	19420227			230476
230476	ALPHA ASSOC	NJ WOOD 3	WOODBRIDGE TWP	403234	0741633	35.00	77.0		403234074163301	211FRNG			N	W				230476
230477	VULCAN DETINING	1	WOODBRIDGE TWP	403236	0741543	10.00	10.0		403236074154301	211FRNG			N	W	1913			230477
230478	AMERICAN CYANAMID CO	CYANAMID 3A	WOODBRIDGE TWP	403236	0741615	9.00	60.0		403236074161601	211FRNG	45.00	60.00	N	W	19581215	26-01889		230478
230479	AMERICAN CYANAMID CO	CYAN WDBRG	WOODBRIDGE TWP	403236	0741615	15.00	74.0		403236074161602	211FRNG	44.00	54.00	U	Z	19470129			230479
230479		CYAN WDBRG	WOODBRIDGE TWP	403236	0741616	15.00	74.0		403236074161602	211FRNG	46.00	56.00	U	Z				230479
230479		CYAN WDBRG	WOODBRIDGE TWP	403236	0741616	15.00	74.0		403236074161602	211FRNG	63.00	73.00	U	Z				230479
230479		CYAN WDBRG	WOODBRIDGE TWP	403236	0741615	15.00	74.0		403236074161602	211FRNG	64.00	75.00	U	Z				230479
230480	AMERICAN CYANAMID CO	CYAN WDBRG 1	WOODBRIDGE TWP	403236	0741617	10.00	28.0		403236074161701	211FRNG			U	Z	1910			230480
230481	VULCAN DETINING	2	WOODBRIDGE TWP	403238	0741542	10.00	15.0		403238074154201	211FRNG			N	W	1927			230481
230482	AMERICAN CYANAMID CO	TEST 1	WOODBRIDGE TWP	403242	0741617	11.00	76.0		403242074161701	211FRNG	44.00	54.00	U	O				230482
230482		TEST 1	WOODBRIDGE TWP	403242	0741617	11.00	76.0		403242074161701	211FRNG	64.00	76.00	U	O				230482
230483	PORT READING CO	READING 10	WOODBRIDGE TWP	403406	0741431	10.00	45.0		403406074143101	211FRNG			N	W				230483
230484	PORT READING CO	READING 6	WOODBRIDGE TWP	403406	0741433	10.00	42.0		403406074143301	211FRNG			N	W				230484
230485	PORT READING CO	READING 14	WOODBRIDGE TWP	403406	0741441	10.00	30.0		403406074144101	211FRNG			N	W				230485
230486	PORT READING CO	READING 15	WOODBRIDGE TWP	403407	0741436	10.00	42.0		403407074143601	211FRNG			N	W				230486
230487	READING RAILROAD	2	WOODBRIDGE TWP	403407	0741447	20.00	41.0		403407074144701	211FRNG	31.00	41.00	N	W	19480512			230487
230488	READING RAILROAD	1	WOODBRIDGE TWP	403407	0741447	20.00	41.0		403407074144702	211FRNG	31.00	41.00	N	W	19480422			230488
230489	PORT READING CO	READING 17	WOODBRIDGE TWP	403408	0741433	10.00	43.0		403408074143301	211FRNG			N	W				230489
230490	MONROE TWP MUA	5 R	MONROE TWP	401925	0742620	167.00	325	20.00	401925074262002	211ODBG	287.00	325.00	I	W	197410	28-08490	329	230490
230491	ELIZABETHTOWN W	PLAINSBORO 2	PLAINSBORO TWP	401937	0743431	70.00	67.0	0.00	401937074343101	211FRNG	47.00	67.00	P	W	197803	28-09278	77.0	230491
230492	BASF-WYANDOTTE	BASF 3	SOUTH BRUNSWICK TWP	402129	0742823	130.00	276	13.00	402129074282302	211FRNG	230.00	276.00	N	W	19780428		300	230492
230493	SCHWEITZER, P J	10	EAST BRUNSWICK TWP	402410	0742247	5.00	73.0		402410074224701	211ODBG	62.00	72.00	N	W			73.0	230493
230494	SPOTSWOOD WD	SWWD 5	SPOTSWOOD BORO	402329	0742331	23.00	97.0		402338074231501	211ODBG	83.00	97.00	P	W	19780623	28-10465	104	230494
230495	STANLEY	1	WOODBRIDGE TWP	403234	0741630	40.00	60.0		403234074163001	211FRNG			N	W	19680403			230495
230496	FORSGATE INC	MONROE 2	MONROE TWP	402046	0742732	120.00	144		402046074273201	211ODBG	135.00	144.00	H	W	19760224		144	230496
230497	FORSGATE INC	HWH WELL	MONROE TWP	402107	0742747	130.00	114		402109074274701	211ODBG	109.00	114.00	H	W	19750415		115	230497
230498	FORSGATE INC	MONROE 3	MONROE TWP	402054	0742805	140.00	98.0		402054074280601	211ODBG	92.00	98.00	H	W	19760226		99.0	230498
230499	SPOTSWOOD WD	SWWD 4F	SPOTSWOOD BORO	402328	0742318	20.00	287		402328074231802	211FRNG	198.00	282.00	P	W	19770428	28-09559	325	230499
230500	SOUTH BRUNSWICK	BROADWAY 1	SOUTH BRUNSWICK TWP	402018	0743021	105.00	161		402018074302101	211ODBG	131.00	161.00	U	Z	197807			230500
230501	SOUTH BRUNSWICK	DAVID MI 1	SOUTH BRUNSWICK TWP	402347	0742726	100.00	170		402347074272601	211MRPA	150.00	170.00	U	Z	197807			230501
230502	ANHEUSER BUSCH	BUSCH 7	EAST BRUNSWICK TWP	402432	0742215	38.00	260	26.00	402432074221501	211FRNG	210.00	260.00	J	W	19780321	28-10174	310	230502
230503	EDNAITIS, PETER	EDNAITIS 1	MONROE TWP	401938	0742404	140.00	440	8.08	401938074240401	211FRNG	410.00	440.00	I	W	19640930		440	230503
230504	FORSGATE INC	1-IRR	MONROE TWP	402047	0742820	141.00	340		402047074282001	211FRNG	288.00	308.00	I	W	19720717		365	230504
230504		1-IRR	MONROE TWP	402047	0742820	141.00	340		402047074282001	211FRNG	325.00	340.00	I	W			365	230504
230505	DYAL, LEE	DYAL2-1967	CRANBURY TWP	401920	0743247	90.00	82.0		401920074324701	211ODBG	20.00	30.00	I	W	19670609		82.0	230505
230505		DYAL2-1967	CRANBURY TWP	401920	0743247	90.00	82.0		401920074324701	211ODBG	40.00	80.00	I	W			82.0	230505
230506	SMITH, LAWRENCE	1958	EAST BRUNSWICK TWP	402358	074261	120.00	223		402401074261201	211FRNG	213.00	223.00	I	W	19580711		255	230506
230507	DANSER, FRANK	UNUSED DOM	CRANBURY TWP	401901	0743154	105.00	130		401801074315401	211ODBG			U	U				230507
230508	DANSER, FRANK	DOMEST 73	CRANBURY TWP	401901	0743154	105.00	90.0		401801074315402	211ODBG			H	W	1973			230508
230509	NAFFI BROS CO	MARZ MASON	OLD BRIDGE TWP	402530	0741602	130.00	135		402530074160202	211ODBG	126.00	136.00	U	Z	19610818			230509
230510	IBM CORP	SW 20	SOUTH BRUNSWICK TWP	402234	0743114	119.70	65.0	0.00	402234074311401	211FRNG	30.00	65.00	U	O	19780223	28-10269	66.5	230510
230511	IBM CORP	S BRUNSWICK TWP	SOUTH BRUNSWICK TWP	402232	0743114	117.70	95.0		402234074311402	211FRNG	65.00	95.00	N	W				230511

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UNIQUE ID	SITE OWNER	LOCAL ID	MUNICIPALITY	LAT	LON	ALTITUDE	DEPTH	DIAMETER	STATION ID	AQUIFER	SCREENED INTERVAL		W	S	DATE	PERMIT	DEPTH DRILLED	UNIQUE ID
230512	FREMAN, W	E BRUNSWICK TWP	EAST BRUNSWICK TWP	402531	0742822	85.00			402531074282201	211FRNG			H	W				230512
230513	WILLIAMS, EDR	E BRUNSWICK TWP	EAST BRUNSWICK TWP	402357	0742632	95.00	20.0		402357074263202	211FRNG			S	W				230513
230514	HERBERT SAND CO	E BRUNSWICK TWP	EAST BRUNSWICK TWP	402755	0742258	4.90	35.0	6.00	402755074225801	211FRNG	25.00	35.00	N	W	19760820		40.0	230514
230515	RAAB, GEORGE	E BRUNSWICK TWP	EAST BRUNSWICK TWP	402425	0742520	109.00			402425074252001	211DDBG			I	W				230515
230516	NOVAK	HULSART	OLD BRIDGE TWP	402123	0741849	110.06	19.0		402122074184601	211EGLS	0.00	19.00	U	O				230516
230517	KAISER AG CHEM	MONROE TWP	MONROE TWP	401923	0742830	120.00	196		401923074283001	211DDBG	165.00	196.00	N	W			300	230517
230519	COMPUTER SYSTEMS	NJE-AIR CONDITIO	SOUTH BRUNSWICK TWP	402155	0743213	80	347	12	402209074313401	231SCKN	205.00	347.00	A	W	19600217	28-03746	347	230519
230519	NJE CORP	NJE-AIR CONDITIO	SOUTH BRUNSWICK TWP	402155	0743213	80	347		402209074313401	231SCKN			A	W			347	230519
230520	BOYKO, OLLIE	1	PLAINSBORO TWP	402044	0743342	80.00	73.0	6.00	402044074334201	211FRNG	68.00	73.00	H	W	19761019	28-09369	75.0	230520
230521	COLUMBIAN CARBN	COLUMBIAN 1	PLAINSBORO TWP	402023	0743740	80.00	300		402023074374001	231LCKG			N	W		48-00030		230521
230522	SCHWEITZER, F J	11	SPOTSWOOD BORO	402413	0742241	25.00	63.0	24.00	402348074230201	211DDBG	53.00	63.00	N	W	19781014		68.0	230522
230523	STANLEY CORP	2	PERTH AMBOY CITY	403229	0741635	15.0	61.5	14.00	403217074164101	211FRNG	46.50	61.50	N	W	19770616		62.0	230523
230524	BIRD & SONS	2	PERTH AMBOY CITY	403212	0741619	20.00	67.0	12.00	403212074161901	211FRNG	57.00	67.00	N	W	19791008	26-04798	67.0	230524
230525	FORRESTAL LABS	7	PLAINSBORO TWP	402050	0743608	100.00	449		402050074360801	231BRCK				W				230525
230526	DOW JONES CO	DOW JONES 1-FIRE	SOUTH BRUNSWICK TWP	402218	0743512	80.00	505	14	402207074351301	231LCKG	37	505	U	W	19620424	28-04393	505	230526
230526		DOW JONES 1-FIRE	SOUTH BRUNSWICK TWP	402218	0743512	80.00	505	10	402207074351301	231LCKG			U	W			505	230526
230527	COLUMBIAN CARBN	10-1962	SOUTH BRUNSWICK TWP	402302	0743342	80.00	705	10.00	402302074334201	231BRCK	23.00	702.00	N	W	19510210	28-00222	705	230527
230528	GULF OIL CO	ABAN	SOUTH BRUNSWICK TWP	402447	0743020	95.00	220		402447074302001	211MRPA			U	U				230528
230529	ROMATOWSKI, C	GAS LITE RES	EAST BRUNSWICK TWP	402448	0742730	90.00			402451074272801	211FRNG			U	W			274	230529
230529	KOEE JAPANESE REST	GAS LITE RES	EAST BRUNSWICK TWP	402448	0742730	90.00			402451074272801	211FRNG			U	W			274	230529
230530	BRUNSWICKTWN WC	BWC 8	SOUTH BRUNSWICK TWP	402518	0743309	180.00	805	12.00	402518074330901	231BRCK	32.00	805.00	P	W	19591202		805	230530
230531	BRUNSWK RUBBER	2-1961	SOUTH BRUNSWICK TWP	402526	0743129	125.00	257	8	402522074313001	231BRCK	42	257	N	W	19610621		257	230531
230532	BRUNSWICKTWN WC	BWC 9	SOUTH BRUNSWICK TWP	402526	0743414	140.00	486	12.00	402526074341401	231BRCK	59.00	486.00	P	W	19600208		486	230532
230533	FLAGPOST INN	1	SOUTH BRUNSWICK TWP	402528	0743138	130.00	400		402528074313801	231BRCK			H	W				230533
230534	PERTH AMBOY WATER DEPARTM	OLD DEEP 8	OLD BRIDGE TWP	402536	0742018	10.00			402536074201802	211DDBG			P	W			96.0	230534
230535	BRUNSWICKTWN WC	BWC 7	SOUTH BRUNSWICK TWP	402547	0743305	170.00	703	12.00	402547074330501	231BRCK	34.00	703.00	P	W	19590820		703	230535
230536	JOHNSON & JOHNSON CO	WATER TANK	NORTH BRUNSWICK TWP	402620	0743015	100.00			402620074301501	231BRCK			N	W			296	230536
230537	BARATTA BUILDER	HOUSE WELL	MILLSTONE BORO	402645	0742620	65.00	310		402645074262001	231BRCK			H	W				230537
230538	E I DUPONT	2-DBS	SAYREVILLE BORO	402734	0741925	130.00	146		402734074192501	211DDBG			U	O				230538
230539	ROBIE RUBBER CO	1	NEW BRUNSWICK CITY	402820	0742647	120.00	225		402820074264701	211MRPA			N	W				230539
230540	JOHNSON & JOHNSON CO	1	NORTH BRUNSWICK TWP	403000	0742644	40.00	601		403000074264401	231BRCK			N	W				230540
230541	SHELL OIL CO	44	WOODBRIDGE TWP	403231	0741518	17.00	36.0		403231074151801	211FRNG			N	W				230541
230542	SHELL OIL CO	21(8)	WOODBRIDGE TWP	403232	0741522	5.00	22.0		403232074152201	211FRNG			N	W				230542
230543	SHELL OIL CO	51(2)	WOODBRIDGE TWP	403242	0741526	24.76	42.0		403242074152601	211FRNG			U	O				230543
230544	SHELL OIL CO	41(1)	WOODBRIDGE TWP	403242	0741531	20.00	28.5		403242074153101	211FRNG			U	I				230544
230545	SHELL OIL CO	5	WOODBRIDGE TWP	403243	0741533	20.00	44.5		403243074153301	211FRNG			N	W				230545
230546	SHELL OIL CO	9	WOODBRIDGE TWP	403249	0741538	22.00	43.0		403249074153801	211FRNG			N	W				230546
230547	SHELL OIL CO	3	WOODBRIDGE TWP	403250	0741534	26.00	43.0		403250074153401	211FRNG			U	O				230547
230548	SHELL OIL CO	8(87)	WOODBRIDGE TWP	403257	0741539	16.92	36.0		403257074153901	211FRNG			U	O				230548
230549	SAYREVILLE W D	SWD R	SAYREVILLE BORO	402745	0741645	23.00	111	0.00	402746074164501	211DDBG	70.00	111.00	P	W	19800501	29-10300	137	230549
230550	A T PRINTING CO	5	DUNELLEN BORO	403537	0742720	80.00	325	12.00	403537074272001	231BRCK			C	W	19500831		326	230550
230551	SOUTH RIVER W D	SWWD 6	SOUTH RIVER BORO	402548	0742155	47.00	213	20.00	402557074215501	211FRNG	155.00	208.00	P	W	198003	28-11524	217	230551
230552	SOUTH BRUNSWICK MUA	15	SOUTH BRUNSWICK TWP	402018	0743021	105.00	166	32.00	402018074302102	211FRNG	116.00	126.00	P	W	19790501		184	230552
230552		15	SOUTH BRUNSWICK TWP	402018	0743021	105.00	166		402018074302102	211FRNG	146.00	166.00	P	W			184	230552
230553	MONROE TWP MUA	TEST 16	MONROE TWP	401950	0742750	125.00		9.00	401950074275001	211FRNG			U	I	19800717		464	230553
230554	SAYREVILLE W D	SWD 5	SAYREVILLE BORO	402745	0741645	100.00	286	20.00	402738074165901	211FRNG	213.00	286.00	P	W	19800421		302	230554
230555	MONROE TWP MUA	TEST 17	MONROE TWP	402010	0742811	135.00	205	20.00	401958074281901	211DDBG	165.00	200.00	P	W	19800725	28-11720	383	230555
230556	MONROE TWP MUA	TW-16A	MONROE TWP	401950	0742721	137.00	215	9.00	401950074272101	211DDBG	160.00	178.00	U	I	19801009	28-11719	444	230556
230556		TW-16A	MONROE TWP	401950	0742721	137.00	215		401950074272101	211DDBG	185.00	215.00	U	I			444	230556
230557	SOUTH AMBOY W D	SAWD 7A	SAYREVILLE BORO	402940	0741629	20.00	58.0	20.00	392833074163701	211DDBG	48.00	58.00	P	W	19790921	26-04812	58.0	230557
230558	FUTT, STEPHEN	1	WOODBRIDGE TWP	403220	0741820		302		403220074182001	231BRCK			I	W	19541127			230558
230559	SECURITY STEEL	1	WOODBRIDGE TWP	403420	0741633		614		403420074163301	231BRCK			N	W				230559
230560	NATIONAL VARNISH	1	WOODBRIDGE TWP	403553	0741527		405		403553074152701	231BRCK			N	W				230560
230561	HOME FOR DIAB VETS	1	EDISON TWP	403313	0741607		614		403313074160701	231BRCK								230561
230562	NEW DOVER CHURCH	1	EDISON TWP	403500	0742033		111		403500074203301	231BRCK								230562
230563	PERTH AMBOY WATER DEPARTM	1	OLD BRIDGE TWP	402527	0742007		260		402527074200701	211FRNG			U	W				230563
230564	SOUTH BRUNSWICK TOWNSHIP	130-1	SOUTH BRUNSWICK TWP	402015	0743018	100.00	164	12.00	402015074301801	211FRNG	134.00	164.00	U	T	19780627	28-10532	176	230564
230565	MONROE TWP MUA	ROSSMORE GC 17	MONROE TWP	401958	0742819	130.00	197	0.00	401958074281902	211DDBG	165.00	197.00	P	W	19800814		383	230565
230566	STAUFFER CHEM	D-2	SOUTH BRUNSWICK TWP	402129	0742901	124.10	225	0.00	402129074290102	211FRNG	122.00	225.00	U	O	19820302	28-12856	239	230566
230567	MONROE TWP MUA	MTMUA 16A	MONROE TWP	401950	0742750	137.00	244	0.00	401950074275002	211DDBG	163.00	171.00	P	W	19830707	28-13397	250	230567
230567		MTMUA 16A	MONROE TWP	401950	0742750	137.00	244		401950074275002	211DDBG	181.00	187.00	P	W			250	230567
230567		MTMUA 16A	MONROE TWP	401950	0742750	137.00	244		401950074275002	211DDBG	193.00	213.00	P	W			250	230567
230567		MTMUA 16A	MONROE TWP	401950	0742750	137.00	244		401950074275002	211DDBG	234.00	244.00	P	W			250	230567
230568	SCHWEITZER, F J	12	SPOTSWOOD BORO	402410	0742231	25.00	280	0.00	402410074223101	211FRNG	210.00	280.00	N	W	19830217	28-12880	289	230568
230569	SAYREVILLE W D	SWF 1	SAYREVILLE BORO	402738	0741700	90.00	137	0.00	402738074170901	211DDBG	102.00	132.00	P	W	19820323	29-11861	163	230569
230570	PERTH AMBOY WATER DEPARTM	PERTH AMBOY 6	OLD BRIDGE TWP	402538	0741950	15.00	80.0	0.00	402538074195001	211DDBG	60.00	80.00	P	W	19821108	29-12351	86.0	230570
230571	PERTH AMBOY WATER DEPARTM	PERTH AMBOY 7	OLD BRIDGE TWP	402531	0741932	15.00	82.0	0.00	402528074193801	211DDBG	67.00	82.00	P	W	19830328	29-12352	90.0	230571
230572	CIPANY, NICHOLAS	CIPANY 1	WOODBRIDGE TWP	403207	0741817	150.00	123		403207074181701	211FRNG			H	W	19650825	26-03264	123	230572
230574	FOWESKA, FRANK	FOWESKA 1	SAYREVILLE BORO	402737	0741736	100.00	135	0.00	402737074173601	211FRNG	125.00	135.00	I	W	19710602	26-04393	140	230574
230575	MCKEON, JOHN	MCKEON 1	SOUTH AMBOY CITY	402725	0741704	15.00	133	0.00	402525074170401	211FRNG	127.00	133.00	H	W	19751015	26-04635	138	230575
230576	SPINELLO CONST CO	SPINELLO 1	SOUTH AMBOY CITY	402933	0741718	30.00	165	0.00	402933074171801	211DDBG			U	I		26-04710	165	230576
230577	CHEVRON OIL CO	SP-13A	PERTH AMBOY CITY	403210	0741520	6.80	57.0	7.88	403210074152001	211FRNG	37.00	57.00	U	O	19811105	26-05321	61.0	230577
230578	CHEVRON OIL CO	E15A	WOODBRIDGE TWP	403236	0741543	5.00	64.2	7.88	403236074154302	211FRNG	44.20	64.20	U	O	19811113	26-05324	75.5	230578
230580	PERTH AMBOY WATER DEPARTM	DBS 1	OLD BRIDGE TWP	402517	0742050	20.00	62.0	0.00	402517074205001	211DDBG	57.00	62.00	U	I	19541220	28-01524	85.0	230580
230581	PARLIN SUPPLY CO	1	SAYREVILLE BORO	402734	0742037	80.00	44.0	0.00	402734074203701	211DDBG	24.00	44.00	I	W	19740601	29-08423	70.0	230581
230582	MID CO UTIL AUTH	MADISON CONNET	OLD BRIDGE TWP	402505	0742129	15.00	61.0	6.00	402505074212901	211DDBG	56.00	61.00	I	W	19780901	28-10495	85.0	230582
230583	AIR PRODUCTS	AIR PRODUCTS 1	SOUTH BRUNSWICK TWP	402154	0742931	105.00	172	0.00	402154074293101	211FRNG	152.00	172.00	N	W	19780824	28-10515	175	230583
230584	TOWN & COUNTRY METAL	GAM CHDY 1	MONROE TWP	401610	0742624	125.00	240	0.00	401610074262401	211DDBG	230.00	240.00	F	W	19780904	28-10626	240	230584
230585	CHIRLIAN, PAUL	DEEPWELL	EAST BRUNSWICK TWP	402450	0742330	120.00	248	0.00	402450074233001	211FRNG	238.00	248.00	I	W	19801111	28-11899	248	230585
230586	PRETINICK, MICHAEL	2	CRANBURY TWP	401943	0742926	110.00	170	0.00	401943074292601	211DDBG	80.00	170.00	I	W	19810620	28-12332	177	230586
230587	KOSMO, JOSEPH	KOSMO 1	OLD BRIDGE TWP	402205	0742123	90.00	166	0.00	402205074212301	211DDBG	160.00	166.00	H	W	19811119	28-12534	185	230587
230588	STAUFFER CHEM	D-1	SOUTH BRUNSWICK TWP	402120	0742859	127.00	238	0.00	402120074285901	211FRNG	198.00	238.00	U	O	19820323	28-12855	239	230588
230589	STAUFFER CHEM	D-3	SOUTH BRUNSWICK TWP	402129	0742854	124.50	229	0.00	402129074285401	211FRNG	129.00	229.00	U	O	19820315	28-12857	229	230589
230590	E I DUPONT	LAYNE 57 OBS	SAYREVILLE BORO	402721	0741957	90.00	79.0	0.00	402721074195701	211DDBG	74.00	79.00	U	O	19550505	29-01391	126	230590
230591	E I DUPONT	LAYNE 58 OBS	SAYREVILLE BORO	402655	0741916	85.00	92.7	0.00	402655074191601	211DDBG	88.70	92.70	U	O	19550513	29-01390	126	230591
230592	E I DUPONT	LAYNE 59 3 OBS	SAYREVILLE BORO	402659	0741910	80.00	98.0	0.00	402659074191001	211DDBG	94.00	98.00	U	O	19550804	29-01593	113	230592
230593	OLD BRIDGE DEV CORP	552	OLD BRIDGE TWP	402158	0741910	95.00	307	0.00	402158074191001	211DDBG	273.00	278.00	U	O	19810518	29-11116	355	230593
230593		552	OLD BRIDGE TWP	402158	0741910	95.00	307		402158074191001	211DDBG	307.00	307.00	U	O			355	230593
230594	OLD BRIDGE DEV CORP	PW 81 TW1	OLD BRIDGE TWP	402157	0741911	95.00	315	0.00	402157074191101	211DDBG	275.00	315.00	U	O	19810701	29-11122	355	230594
230595	OLD BRIDGE DEV CORP	554	OLD BRIDGE TWP	402153	0741915	105.00	290	0.00	402153074191501	211DDBG	285.00	290.00	U	O	19810701	29-11118	298	230595

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UNIQUE ID	SITE OWNER	LOCAL ID	MUNICIPALITY	LAT	LON	ALTITUDE	DEPTH	DIAMETER	STATION ID	AQUIFER	SCREENED INTERVAL		W	S	DATE	PERMIT	DEPTH DRILLED	UNIQUE ID
230771	SCHARF, STEVEN	SCHARF 1	MONROE TWP	401718	0742449	110.00	320	4.00	401718074244901	211ODBG	310.00	320.00	H	W	19821123	28-13112	330	230771
230772	KOKOSA, GEORGE	KOKOSA 1	MONROE TWP	402036	0742706	145.00	150	0.00	402036074270601	211ODBG	147.00	150.00	H	W	19560824	28-01994	151	230772
230773	TEE-N-JAY FARM	T-N-J 1	MONROE TWP	401942	0742232	90.00	295	0.00	401942074223201	211ODBG	285.00	295.00	U	W	19731201	28-08150	295	230773
230774	RESNICK, LEWIS	RESNICK 1	MONROE TWP	401623	0742819	110.00	215	0.00	401623074281901	211ODBG	205.00	215.00	H	W	19810530	28-12288	215	230774
230775	SEPTAK, JOHN J	SEPTAK 1	MONROE TWP	401717	0742721	120.00	190	0.00	401717074272101	211ODBG	182.00	190.00	H	W	19791019	28-11436	190	230775
230776	SIMONSON BROS	HOUSE WELL	PLAINSBORO TWP	402047	0743329	80.00	70.0	0.00	402047074332901	211FRNG	65.00	70.00	H	W	19850731	28-15832	70.0	230776
230777	CHOU (SHADOW OAKS)	CHOU 1	CRANBURY TWP	401746	0743008	100.00	88.0	0.00	401746074320801	211ODBG	80.00	88.00	H	W	19810603	28-11996	88.0	230777
230778	FINN, WILLIAM	FINN 1	CRANBURY TWP	401834	0743311	100.00	130	0.00	401834074331101	211FRNG	122.00	130.00	H	W	19830624	28-13314	130	230778
230779	BERESFORD, JAMES	THRIFT STORE	CRANBURY TWP	401813	0743043	120.00	120	0.00	401813074304301	211ODBG	110.00	120.00	C	W	19750402	28-08750	120	230779
230780	ZAITZ, MAX (PRESCH)	ZAITZ 1	CRANBURY TWP	401826	0743330	100.00	90.0	0.00	401826074333001	211FRNG	85.00	90.00	H	W	19690115	28-06575	90.0	230780
230781	JOCAMA CONST CO	OLD BRIDGE TWP	OLD BRIDGE TWP	402225	0741821	60.00	235	0.00	402225074182101	211ODBG	225.00	235.00	H	W	19800828	28-11788	235	230781
230782	OLD BRIDGE MUA	OLD BRIDGE 12	OLD BRIDGE TWP	402353	0742056	30.00	337	0.00	402353074205601	211FRNG	230.00	245.00	P	W	19840801	28-14095	345	230782
230782		OLD BRIDGE 12	OLD BRIDGE TWP	402353	0742056	30.00	337		402353074205601	211FRNG	255.00	265.00	P	W			345	230782
230782		OLD BRIDGE 12	OLD BRIDGE TWP	402353	0742056	30.00	337		402353074205601	211FRNG	272.00	302.00	P	W			345	230782
230782		OLD BRIDGE 12	OLD BRIDGE TWP	402353	0742056	30.00	337		402353074205601	211FRNG	312.00	317.00	P	W			345	230782
230782		OLD BRIDGE 12	OLD BRIDGE TWP	402353	0742056	30.00	337		402353074205601	211FRNG	322.00	327.00	P	W			345	230782
230782		OLD BRIDGE 12	OLD BRIDGE TWP	402353	0742056	30.00	337		402353074205601	211FRNG	330.00	337.00	P	W			345	230782
230783	OLD BRIDGE PARKS&REC	SOCCER ASSN 1	OLD BRIDGE TWP	402327	0741630	90.00	265	0.00	402327074162001	211ODBG	245.00	265.00	I	W	19830518	29-12817	265	230783
230784	NAVEDO, JOE	NAVEDO 1	OLD BRIDGE TWP	402327	0742054	30.00	69.0	0.00	402327074205401	211ODBG	63.00	69.00	H	W	19820701	28-13023	70.0	230784
230785	SKISTIMAS, CHARLES	FEROSA 1	EAST BRUNSWICK TWP	402358	0742518	140.00	121	0.00	402358074251801	211ODBG	116.00	121.00	H	W	19741101	28-08649	124	230785
230786	HOLSTEIER, HENRY	HOLSTEIER 1	PLAINSBORO TWP	401919	0743403	100.00	63.0	0.00	401919074340301	211FRNG	55.00	63.00	H	W	19791120	28-11501	63.0	230786
230787	ELY, JOHN	ELY 1	SOUTH BRUNSWICK TWP	402128	0743055	100.00	110	0.00	402128074305501	211FRNG	100.00	110.00	H	W	19810807	23-12434	120	230787
230788	EAST BRUNSWICK TWP	DBS WELL 7	EAST BRUNSWICK TWP	402430	0742552	95	132.75		402430074255201	211FRNG	126.75	132.75	U	I	19731016	28-08850	160	230788
230789	EAST BRUNSWICK TWP	DBS WELL 6	EAST BRUNSWICK TWP	402416	0742553	130	276.25		402416074255301	211FRNG	212.25	217.25	U	I	19731002	28-08812	289	230789
230789		DBS WELL 6	EAST BRUNSWICK TWP	402416	0742553	130	276.25		402416074255301	211FRNG	271.25	276.25	U	I			289	230789
230790	US GEOLOGICAL SURVEY	S. RIVER HIGH	SOUTH RIVER BORO	402627	0742247	75		6.25	402627074224701				U	T	19850905	28-15614	147	230790
230791	US GEOLOGICAL SURVEY	LINPRO	PLAINSBORO TWP	401940	0743353	80		6.25	401940074335301				U	T	19850912	28-15615	150	230791
230792	PRINCETON UNIVERSITY	TEST WELL 1	PLAINSBORO TWP	402059	0743601	97.6	60.0		402059074360101	231SCKN	31.0	60.0	U	D	19851201	28-16112	60.0	230792
230793	PRINCETON UNIVERSITY	TEST WELL 2	PLAINSBORO TWP	402100	0743601	97.7	68.0		402059074360101	231SCKN	31.0	68.0	U	D	19851201	28-16113	68.0	230793
230794	PRINCETON UNIVERSITY	TEST WELL 3	PLAINSBORO TWP	402100	0743559	95.7	81.0		402058074360001	231SCKN	30.0	81.0	U	D	19851201	28-16114	81.0	230794
230795	PRINCETON UNIVERSITY	TEST WELL 4	PLAINSBORO TWP	402100	0743559	96.7	120.0		402058074360002	231SCKN	100.0	120.0	U	D	19851201	28-16115	120.0	230795
230796	PRINCETON UNIVERSITY	TEST WELL 5	PLAINSBORO TWP	402058	0743559	96.7	60.0		402058074355901	231SCKN	30	60.0	U	D	19851201	28-16116	60.0	230796
230797	PRINCETON UNIVERSITY	TEST WELL 6	PLAINSBORO TWP	402100	0743557	95.9	73.0		402059074355701	231SCKN	26	73	U	D	19851201	28-16117	73.0	230797
230798	PRINCETON UNIVERSITY	TEST WELL 7	PLAINSBORO TWP	402100	0743600	93.4	85.0		402059074360001	231SCKN	41.0	85.0	U	D	19851201	28-16118	85.0	230798
230799	PRINCETON UNIVERSITY	TEST WELL 8	PLAINSBORO TWP	402100	0743558	93.8	75.0		402059074355801	231SCKN	30	75.0	U	D	19851201	28-16119	75.0	230799
230800	PRINCETON UNIVERSITY	TEST WELL 9	PLAINSBORO TWP	402058	0743559	96.8	110.0		402058074355902	231SCKN	90.0	110.0	U	D	19860201	28-16120	110.0	230800
230801	PRINCETON UNIVERSITY	TEST WELL 10	PLAINSBORO TWP	402100	0743601	97.1	125.0		402059074360102	231SCKN	100.0	125.0	U	D	19860201	28-16251	125.0	230801
230802	BREESE	BREESE 1	SOUTH BRUNSWICK TWP	402323	0742838	100.	122.	8.5	402323074283801	211FRNG	112.	122.	H	W	19810122	28-12037	126.	230802
230803	GABOURY	GABOURY 1	MONROE TWP	402224	0742500	40.	60.	4.	402224074250001	211ODBG	50.	60.	H	W	19801101	28-14176	60.	230803
230804	MIDDLESEX COUNTY UTILITIE	K-01	WOODBRIDGE TWP	402945	0741937	3.4			402945074193701					T	19670000		36.5	230804
230805	MIDDLESEX COUNTY UTILITIE	K-02	WOODBRIDGE TWP	402948	0741939	4.4			402948074193901					T	19670000		31.5	230805
230806	MIDDLESEX COUNTY UTILITIE	WOODBRIDGE TWP		402952	0741939	3.5			402952074193901					T	19670000		31.5	230806
230807	MIDDLESEX COUNTY UTILITIE	K-04	WOODBRIDGE TWP	402957	0741933	5.0			402957074193301					T	19670000		26.5	230807
230808	MIDDLESEX COUNTY UTILITIE	K-05	WOODBRIDGE TWP	403008	0741919	2.8			403008074191901					T	19670000		31.5	230808
230809	MIDDLESEX COUNTY UTILITIE	K-06	WOODBRIDGE TWP	403012	0741913	4.4			403012074191301					T	19670000		26.5	230809
230810	MIDDLESEX COUNTY UTILITIE	K-08	WOODBRIDGE TWP	402946	0741935	-16.3			402946074193501					T	19670000		36.	230810
230811	MIDDLESEX COUNTY UTILITIE	K-09	WOODBRIDGE TWP	402936	0741928	4.4			402936074192801				U	T	19670000		58.5	230811
230812	MIDDLESEX COUNTY UTILITIE	K-10	SAYREVILLE BORO	402922	0741918	-4.			402922074191801					T	19670000		58.	230812
230813	MIDDLESEX COUNTY UTILITIE	K-11	SAYREVILLE BORO	402919	0741916	-8.1			402919074191601					T	19670000		46.0	230813
230814	TRANSCONTINENTAL GAS PIPE	TC-243	OLD BRIDGE TWP	402803	0741405	0.0			402803074140501				U	T	19650915		29.1	230814
230815	TITANIUM PIGMENT CO.	TP-101B	WOODBRIDGE TWP	403034	0741728	0.0			403034074172801				U	T	19360707		44.	230815
230816	TITANIUM PIGMENT CO.	TP-102B	WOODBRIDGE TWP	403039	0741808	0.0			403039074180801				U	T	19360709		50.	230816
230817	TITANIUM PIGMENT CO.	TP-103B	WOODBRIDGE TWP	403029	0741838	0.0			403029074183801				U	T	19360710		75.	230817
230818	TITANIUM PIGMENT CO.	TP-104	WOODBRIDGE TWP	403029	0741827	0.0			403029074182701				U	T	19360711		59.5	230818
230819	TITANIUM PIGMENT CO.	TP-105B	WOODBRIDGE TWP	403022	0741843	0.0			403022074184301				U	T	19360713		70.	230819
230820	TITANIUM PIGMENT CO.	TP-106	WOODBRIDGE TWP	403021	0741838	0.0			403021074183801				U	T	19360713		52.	230820
230821	TITANIUM PIGMENT CO.	TP-107	WOODBRIDGE TWP	403020	0741844	0.0			403020074184401				U	T	19360713		50.	230821
230822	TITANIUM PIGMENT CO.	TP-108B	WOODBRIDGE TWP	403019	0741840	0.0			403019074184001				U	T	19360714		71.	230822
230823	TITANIUM PIGMENT CO.	TP-109	WOODBRIDGE TWP	403018	0741845	0.0			403018074184501				U	T	19360714		55.5	230823
230824	TITANIUM PIGMENT CO.	TP-110	SAYREVILLE BORO	403017	0741841	0.0			403017074184101				U	T	19360715		52.5	230824
230825	TITANIUM PIGMENT CO.	TP-111B	SAYREVILLE BORO	403016	0741845	0.0			403016074184501				U	T	19360715		57.	230825
230826	TITANIUM PIGMENT CO.	TP-112	SAYREVILLE BORO	403014	0741842	0.0			403014074184201				U	T	19360715		51.	230826
230827	TITANIUM PIGMENT CO.	TP-113	SAYREVILLE BORO	403013	0741847	0.0			403013074184701				U	T	19360716		48.75	230827
230828	TITANIUM PIGMENT CO.	TP-114	SAYREVILLE BORO	403010	0741844	0.0			403010074184401				U	T	19360716		57.5	230828
230829	TITANIUM PIGMENT CO.	TP-115	SAYREVILLE BORO	403008	0741845	0.0			403008074184501				U	T	19360716		53.	230829
230830	TITANIUM PIGMENT CO.	TP-116	SAYREVILLE BORO	403007	0741850	0.0			403007074185001				U	T	19360717		41.	230830
230831	TITANIUM PIGMENT CO.	TP-117	SAYREVILLE BORO	403005	0741846	0.0			403005074184601				U	T	19360717		55.	230831
230832	TITANIUM PIGMENT CO.	TP-118	SAYREVILLE BORO	403005	0741851	0.0			403005074185101				U	T	19360719		52.5	230832
230833	TITANIUM PIGMENT CO.	TP-119B	SAYREVILLE BORO	403002	0741848	0.0			403002074184801						19360717			230833
230834	TITANIUM PIGMENT CO.	TP-120	SAYREVILLE BORO	403003	0741852	0.0			403003074185201				U	T	19360724		61.5	230834
230835	TITANIUM PIGMENT CO.	TP-121	SAYREVILLE BORO	403000	0741849	0.0			403000074184901				U	T	19360721		59.	230835
230836	TITANIUM PIGMENT CO.	TP-122	SAYREVILLE BORO	403001	0741853	0.0			403001074185301				U	T	19360723		46.5	230836
230837	TITANIUM PIGMENT CO.	TP-123	SAYREVILLE BORO	402953	0741847	0.0			402953074184701				U	T	19360721		49.	230837
230838	TITANIUM PIGMENT CO.	TP-124	SAYREVILLE BORO	402958	0741849	0.0			402958074184901				U	T	19360722		44.	230838
230839	TITANIUM PIGMENT CO.	TP-125	SAYREVILLE BORO	402958	0741854	0.0			402958074185401				U	T	19360723		52.	230839
230840	TITANIUM PIGMENT CO.	TP-126	SAYREVILLE BORO	402957	0741850	0.0			402957074185001				U	T	19360722		41.	230840
230841	TITANIUM PIGMENT CO.	TP-127	SAYREVILLE BORO	402956	0741855	0.0			402956074185501				U	T	19360723		37.	230841
230842	TITANIUM PIGMENT CO.	TP-128	SAYREVILLE BORO	402953	0741852	0.0			402953074185201				U	T	19360723		39.	230842
230843	TITANIUM PIGMENT CO.	TP-130	WOODBRIDGE TWP	403027	0741833	0.0			403027074183301				U	T	19360720		70.	230843
230844	TITANIUM PIGMENT CO.	TP-131	WOODBRIDGE TWP	403026	0741831	0.0			403026074183101				U	T	19360720		63.	230844
230845	TITANIUM PIGMENT CO.	TP-132	SAYREVILLE BORO	403024	0741830	0.0			403024074183001				U	T	19360721		53.	230845
230846	US ARMY CORPS OF ENGINEERS	DM-6-1	EDISON TWP	402913	0742030	8.0			402913074203001				U	T	19650700		63.7	230846
230847	US ARMY CORPS OF ENGINEERS	DM-6-2	EDISON TWP	402905	0742028	-2.5			402905074202801				U	T	19650700		61.	230847
230848	US ARMY CORPS OF ENGINEERS	DM-6-3	SAYREVILLE BORO	402858	0742024	0.0			402858074202401				U	T	19650700		67.	230848
230849	US ARMY CORPS OF ENGINEERS	DM-6-4	SAYREVILLE BORO	402854	0742024	2.5			402854074202401				U	T	19650700		64.8	230849
230850	US ARMY CORPS OF ENGINEERS	DM-6-5	SAYREVILLE BORO	402846	0742020	5.8			402846074202001				U	T	19650700		82.	230850
230851	US ARMY CORPS OF ENGINEERS	DM-6-6	WOODBRIDGE TWP	402945	0741937	7.0			402945074193901				U	T	19650700		30.	230851
230852	US ARMY CORPS OF ENGINEERS	DM-20E	SAYREVILLE BORO	402804	0742242	5.4			402804074224001				U	T			56.	230852
230853	US ARMY CORPS OF ENGINEERS	DM-21E	SAYREVILLE BORO	402813	0742232	5.4			402813074223201				U	T			56.	230853
230854	US ARMY CORPS OF ENGINEERS	DM-22E	SAYREVILLE BORO	402816	0742221	5.6			402816074222101				U	T			56.	230854

UNIQUE ID	SITE	LOCAL ID	MUNICIPALITY	LAT	LON	ALTITUDE	DEPTH	DIAMETER	STATION ID	AQUIFER	SCREENED INTERVAL	W	S	DATE	PERMIT	DEPTH DRILLED	UNIQUE ID
230855	US ARMY CORPS OF ENGINEERS	DH-23E	SAYREVILLE BORO	402818	0742208	6.0			402818074220801			U	T			56.	230855
230856	US ARMY CORPS OF ENGINEERS	DH-24E	EDISON TWP	402826	07421[illegible]	[illegible]			402826074215501			U	T			56.	230856
230857	US ARMY CORPS OF ENGINEERS	DH-25E	EDISON TWP	402832	0742144	6.1			4028320742144[illegible]			U	T			56.	230857
230858	US ARMY CORPS OF ENGINEERS	DH-26E	EDISON TWP	402837	0742133	7.0			402837074213301			U	T			[illegible]	230858
230859	US ARMY CORPS OF ENGINEERS	DH-27E	SAYREVILLE BORO	402846	0742115	7.4			402846074211501			U	T				
230860	US ARMY CORPS OF ENGINEERS	DH-28E	SAYREVILLE BORO	402855	0742100	7.0			402855074210001			U	T			54.	230860
230861	US ARMY CORPS OF ENGINEERS	DH-31F	EDISON TWP	402837	0742138	6.1			402837074213801			U	T			30.	230861
230862	MIDDLESEX COUNTY UTILITIE	0-01	SOUTH AMBOY CITY	402912	0741640	8.4			402912074164001			U	T	19550300		17.	230862
230863	MIDDLESEX COUNTY UTILITIE	0-04	SOUTH AMBOY CITY	402932	0741806	8.9			402932074180601			U	T	19550300		39.	230863
230864	MIDDLESEX COUNTY UTILITIE	0-16	SOUTH AMBOY CITY	402848	0741442	0.0			402848074144201			U	T	19550300		98.	230864
230865	MIDDLESEX COUNTY UTILITIE	0-19	SOUTH AMBOY CITY	402851	0741455	0.0			402851074145501			U	T	19550300		88.	230865
230866	MIDDLESEX COUNTY UTILITIE	0-29	SOUTH AMBOY CITY	402900	0741542	0.0			402900074154201			U	T	19550300		50.	230866
230867	MIDDLESEX COUNTY UTILITIE	0-30	SOUTH AMBOY CITY	402901	0741550	0.0			402901074155001			U	T	19550300		101.	230867
230868	MIDDLESEX COUNTY UTILITIE	0-33	SOUTH AMBOY CITY	402904	0741605	0.0			402904074160501			U	T	19550300		25.	230868
230869	MIDDLESEX COUNTY UTILITIE	0-35	SOUTH AMBOY CITY	402905	0741615	0.0			402905074161501			U	T	19550300		20.	230869
230870	MIDDLESEX COUNTY UTILITIE	0-37	SOUTH AMBOY CITY	402908	0741630	2.7			402908074163001			U	T	19550300		20.5	230870
230871	MIDDLESEX COUNTY UTILITIE	0-43	SOUTH AMBOY CITY	402910	0741643	13.4			402910074164301			U	T	19550300		21.	230871
230872	MIDDLESEX COUNTY UTILITIE	0-50	SOUTH AMBOY CITY	402915	0741654	25.5			402915074165401			U	T	19550300		34.	230872
230873	MIDDLESEX COUNTY UTILITIE	0-54	SOUTH AMBOY CITY	402925	0741740	28.5			402925074174001			U	T	19550300		30.5	230873
230874	MIDDLESEX COUNTY UTILITIE	0-57A	SOUTH AMBOY CITY	402926	0741822	118.			402926074182201			U	T	19550300		110.	230874
230875	MIDDLESEX COUNTY UTILITIE	0-57A6	SOUTH AMBOY CITY	402928	0741816	108.8			402928074181601			U	T	19550300		39.	230875
230876	MIDDLESEX COUNTY UTILITIE	0-58	SOUTH AMBOY CITY	402924	0741828	103.2			402924074182801			U	T	19550300		86.	230876
230877	MIDDLESEX COUNTY UTILITIE	SR-01	SAYREVILLE BORO	402802	0742212	6.0		2.5	402802074221201			U	T	19750314		40.	230877
230878	MIDDLESEX COUNTY UTILITIE	SR-02	SAYREVILLE BORO	402800	0742213	4.9		2.5	402800074221301			U	T	19750314		39.5	230878
230879	MIDDLESEX COUNTY UTILITIE	SR-03	SAYREVILLE BORO	402757	0742216	5.4		2.5	402757074221601			U	T	19750319		31.5	230879
230880	MIDDLESEX COUNTY UTILITIE	SR-04	SAYREVILLE BORO	402753	0742217	6.6		2.5	402753074221701			U	T	19750317		30.	230880
230881	MIDDLESEX COUNTY UTILITIE	SR-05	SAYREVILLE BORO	402748	0742216	3.5		2.5	402748074221601			U	T	19750317		30.	230881
230882	MIDDLESEX COUNTY UTILITIE	SR-06	SAYREVILLE BORO	402743	0742215	3.0		2.5	402743074221501			U	T	19750317		30.	230882
230883	MIDDLESEX COUNTY UTILITIE	SR-07	SAYREVILLE BORO	402739	0742215	3.4		2.5	402739074221501			U	T	19750319		31.5	230883
230884	MIDDLESEX COUNTY UTILITIE	SR-08	SAYREVILLE BORO	402735	0742215	3.6		2.5	402735074221501			U	T	19750319		36.	230884
230885	MIDDLESEX COUNTY UTILITIE	SR-09	SAYREVILLE BORO	402731	0742215	5.		2.5	402731074221501			U	T	19750318		30.	230885
230886	MIDDLESEX COUNTY UTILITIE	SR-10	SAYREVILLE BORO	402727	0742214	5.3		2.5	402727074221401			U	T	19750318		31.5	230886
230887	MIDDLESEX COUNTY UTILITIE	SR-11	SAYREVILLE BORO	402725	0742214	8.6		2.5	402725074221401			U	T	19750318		30.	230887
230888	MIDDLESEX COUNTY UTILITIE	SR-12	SAYREVILLE BORO	402721	0742213	0.		2.5	402721074221301			U	T	19750318		30.	230888
230889	MIDDLESEX COUNTY UTILITIE	SR-13	SAYREVILLE BORO	402719	0742213	10.8		2.5	402719074221301			U	T	19750319		30.	230889
230890	MIDDLESEX COUNTY UTILITIE	SR-14	SAYREVILLE BORO	402717	0742213	8.7		2.5	402717074221301			U	T	19750319		31.5	230890
230891	MIDDLESEX COUNTY UTILITIE	SR-15	SAYREVILLE BORO	402716	0742211	2.4		2.5	402716074221101			U	T	19750319		30.	230891
230892	MIDDLESEX COUNTY UTILITIE	SR-16	SAYREVILLE BORO	402712	0742212	8.0		2.5	402712074221201			U	T	19750319		30.	230892
230893	MIDDLESEX COUNTY UTILITIE	SR-17	SAYREVILLE BORO	402709	0742212	7.2		2.5	402709074221201			U	T	19750321		31.5	230893
230894	MIDDLESEX COUNTY UTILITIE	SR-18	SAYREVILLE BORO	402705	0742209	7.8		2.5	402705074220901			U	T	19750407		32.	230894
230895	MIDDLESEX COUNTY UTILITIE	SR-19	SAYREVILLE BORO	402703	0742206	7.4		2.5	402703074220601			U	T	19750404		32.	230895
230896	MIDDLESEX COUNTY UTILITIE	SR-20	SAYREVILLE BORO	402659	0742201	10.		2.5	402659074220101			U	T	19750321		26.5	230896
230897	MIDDLESEX COUNTY UTILITIE	SR-21	SAYREVILLE BORO	402658	0742159	5.9		2.5	402658074215901			U	T	19750321		26.5	230897
230898	MIDDLESEX COUNTY UTILITIE	SR-23	SAYREVILLE BORO	402652	0742152	8.5		2.5	402652074215201			U	T	19750321		25.	230898
230899	MIDDLESEX COUNTY UTILITIE	SR-24	SAYREVILLE BORO	402651	0742143	8.3		2.5	402651074214301			U	T	19750321		26.5	230899
230900	MIDDLESEX COUNTY UTILITIE	SR-25	SAYREVILLE BORO	402651	0742139	9.2		2.5	402651074213901			U	T	19750320		26.5	230900
230901	MIDDLESEX COUNTY UTILITIE	SR-26	SAYREVILLE BORO	402651	0742132	10.0		2.5	402651074213201			U	T	19750321		32.	230901
230902	MIDDLESEX COUNTY UTILITIE	SR-28	SAYREVILLE BORO	402647	0742129	3.5		2.5	402547074212901			U	T	19750325		26.5	230902
230903	MIDDLESEX COUNTY UTILITIE	SR-30	SAYREVILLE BORO	402642	0742128	5.6		2.5	402642074212801			U	T	19750408		32.	230903
230904	MIDDLESEX COUNTY UTILITIE	SR-31	SAYREVILLE BORO	402628	0742122	9.18		2.5	402623074212201			U	T	19750325		33.	230904
230905	MIDDLESEX COUNTY UTILITIE	SR-32	SAYREVILLE BORO	402623	0742121	9.74		2.5	402623074212101			U	T	19750325		37.	230905
230906	MIDDLESEX COUNTY UTILITIE	SR-34	SAYREVILLE BORO	402614	0742115	7.03		2.5	402614074211501			U	T	19750408		27.	230906
230907	MIDDLESEX COUNTY UTILITIE	SR-35	SAYREVILLE BORO	402608	0742113	8.84		2.5	402608074211301			U	T	19750326		31.5	230907
230908	MIDDLESEX COUNTY UTILITIE	SR-36	SAYREVILLE BORO	402605	0742112	9.22		2.5	402605074211201			U	T	19750326		21.5	230908
230909	MIDDLESEX COUNTY UTILITIE	SR-37	SAYREVILLE BORO	402558	0742108	7.19		2.5	402558074210801			U	T	19750326		27.	230909
230910	MIDDLESEX COUNTY UTILITIE	SR-39	SAYREVILLE BORO	402553	0742107	1.2		2.5	402553074210701			U	T	19750403		43.	230910
230911	MIDDLESEX COUNTY UTILITIE	SR-41	SAYREVILLE BORO	402543	0742108	9.66		2.5	402543074210801			U	T	19750326		22.	230911
230912	MIDDLESEX COUNTY UTILITIE	SR-42	SAYREVILLE BORO	402535	0742110	9.99		2.5	402535074211001			U	T	19750327		22.	230912
230913	MIDDLESEX COUNTY UTILITIE	SR-43	SAYREVILLE BORO	402527	0742111	9.0		2.5	402527074211101			U	T	19750328		27.	230913
230914	MIDDLESEX COUNTY UTILITIE	SR-44	SAYREVILLE BORO	402525	0742112	11.91		2.5	402525074211201			U	T	19750327		21.5	230914
230915	MIDDLESEX COUNTY UTILITIE	SR-46	SAYREVILLE BORO	402519	0742113	7.38		2.5	402519074211301			U	T	19750327		22.5	230915
230916	MIDDLESEX COUNTY UTILITIE	SR-47	SAYREVILLE BORO	402517	0742115	1.3		2.5	402517074211501			U	T	19750401		38.2	230916
230917	MIDDLESEX COUNTY UTILITIE	SR-48	OLD BRIDGE TWP	402516	0742116	3.27		2.5	402516074211601			U	T	19750327		21.5	230917
230918	MIDDLESEX COUNTY UTILITIE	SR-48C	OLD BRIDGE TWP	402514	0742114	2.61		2.5	402514074211401			U	T	19750411		24.	230918
230919	MIDDLESEX COUNTY UTILITIE	SR-52	OLD BRIDGE TWP	402509	0742123	4.0		2.5	402509074212301			U	T	19750411		22.	230919
230920	MIDDLESEX COUNTY UTILITIE	SR-53	OLD BRIDGE TWP	402505	0742128	11.59		2.5	402505074212801			U	T	19750328		21.5	230920
230921	MIDDLESEX COUNTY UTILITIE	SR-54	OLD BRIDGE TWP	402502	0742134	4.27		2.5	402502074213401			U	T	19750328		22.	230921
230922	MIDDLESEX COUNTY UTILITIE	SR-56	OLD BRIDGE TWP	402459	0742139	1.4		2.5	402457074213901			U	T	19750402		35.	230922
230923	MIDDLESEX COUNTY UTILITIE	SR-57	OLD BRIDGE TWP	402457	0742142	4.25		2.5	402457074214201			U	T	19750328		21.5	230923
230924	MIDDLESEX COUNTY UTILITIE	SR-58	EAST BRUNSWICK TWP	402454	0742149	7.93		2.5	402454074214901			U	T	19750331		22.	230924
230925	MIDDLESEX COUNTY UTILITIE	SR-60	EAST BRUNSWICK TWP	402449	0742201	15.3		2.5	402449074220101			U	T	19750331		27.	230925
230926	MIDDLESEX COUNTY UTILITIE	SR-65	EAST BRUNSWICK TWP	402606	0742118	15.		2.5	402606074211801			U	T	19760318		27.	230926
230927	MIDDLESEX COUNTY UTILITIE	SR-66	EAST BRUNSWICK TWP	402605	0742122	9.49		2.5	402605074212201			U	T	19760318		22.	230927
230928	MIDDLESEX COUNTY UTILITIE	SR-67	EAST BRUNSWICK TWP	402605	0742125	9.98		2.5	402605074212501			U	T	19760319		22.	230928
230929	MIDDLESEX COUNTY UTILITIE	SR-68	EAST BRUNSWICK TWP	402603	0742128	3.96		2.5	402603074212801			U	T	19760319		22.	230929
230930	MIDDLESEX COUNTY UTILITIE	SR-71	EAST BRUNSWICK TWP	402601	0742133	0.1		2.5	402601074213301			U	T	19760323		27.	230930
230931	MIDDLESEX COUNTY UTILITIE	SR-72	EAST BRUNSWICK TWP	402602	0742135	15.73		2.5	402602074213501			U	T	19760322		30.	230931
230932	PRINCETON UNIVERSITY	CORE HOLE 1	PLAINSBORO TWP	402058	0743558	98.			402058074355801	2315CKN		U				120	230932
230933	ELIZABETHTOWN WATER COM-A	EIGHTH STREET	SOUTH PLAINFIELD BORO	403549	0742608	70	350	12	403549074260801	231BRCK	81 350	P	W	19650305	25-12632	350	230933
230934	AMERICAN METAL MOLDING	FOUR	EDISON TWP	403208	0742413	120	500	15	403208074241801	231BRCK	50 500	N	W	19821000	25-23302	500	230934
230934		FOUR	EDISON TWP	403208	0742418	120	500	10	403208074241801	231BRCK		N	W			500	230934
230936	COLUMBIAN CHEMICALS	ELEVEN	SOUTH BRUNSWICK TWP	402258	07433[illegible]	80	305	12	402258074334001	231LCKG	26.5 305	N	W	19510321	28-00247	305	230936
230936		ELEVEN	SOUTH BRUNSWICK TWP	402252	07433[illegible]	80	305	8	402258074334001	231LCKG		N	W			305	230936
230937	MIDDLESEX COUNTY UTILITIE	I-3	SAYREVILLE BORO	402815	0742203	8.0		2.5	402815074220301			U	T	19750331		40.	230937
230938	MIDDLESEX COUNTY UTILITIE	I-4	SAYREVILLE BORO	402815	0742204	0.4		2.5	402815074220401			U	T	19750326		55.5	230938
230939	MIDDLESEX COUNTY UTILITIE	I-5	SAYREVILLE BORO	402815	0742205	-0.1		2.5	402815074220501			U	T	19750328		56.7	230939
230940	MIDDLESEX COUNTY UTILITIE	I-6	SAYREVILLE BORO	402816	0742206	8.82		2.5	402816074220601			U	T	19750318		40.	230940
230941	MIDDLESEX COUNTY UTILITIE	I-7	SAYREVILLE BORO	402819	0742213	4.2		2.5	402819074221301			U	T	19750325		40.	230941
230942	MIDDLESEX COUNTY UTILITIE	I-8	SAYREVILLE BORO	402820	0742214	3.9		2.5	402820074221401			U	T	19750331		42.	230942
230943	MIDDLESEX COUNTY UTILITIE	I-9	SAYREVILLE BORO	402821	0742218	5.		2.5	402821074221801			U	T	19750401		42.	230943

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UNIQUE ID	SITE OWNER	LOCAL ID	MUNICIPALITY	LAT	LON	ALTITUDE	DEPTH	DIAMETER	STATION ID	AQUIFER	SCREENED INTERVAL	W	S	DATE	PERMIT	DEPTH DRILLED	UNIQUE ID
230944	MIDDLESEX COUNTY UTILITIES	L-10	SAYREVILLE BORO	402825	0742226	4.4		2.5	402825074222601			U	T	19750402		42.	230944
230945	MIDDLESEX COUNTY UTILITIES	L-11	SAYREVILLE BORO	402828	0742232	10.8		2.5	402828074223201			U	T	19750409		42.	230945
230946	MIDDLESEX COUNTY UTILITIES	L-12	SAYREVILLE BORO	402828	0742233	.07		2.5	402828074223301			U	T	19750410		46.	230946
230947	MIDDLESEX COUNTY UTILITIES	L-13	SOUTH RIVER BORO	402827	0742234	.7			402827074223401			U	T	19750410		42.	230947
230948	MIDDLESEX COUNTY UTILITIES	L-13A	SOUTH RIVER BORO	402830	0742236	5.0		2.5	402830074223601			U	T	19750509		42.	230948
230949	MIDDLESEX COUNTY UTILITIES	L-14	SOUTH RIVER BORO	402830	0742237	3.9			402830074223701			U	T	19750402		37.	230949
230950	MIDDLESEX COUNTY UTILITIES	L-15	SOUTH RIVER BORO	402831	0742239	3.6		2.5	402831074224001			U	T	19750401		36.	230950
230951	MIDDLESEX COUNTY UTILITIES	L-16	SOUTH RIVER BORO	402833	0742242	3.96		2.5	402833074224201			U	T	19750331		37.	230951
230952	MIDDLESEX COUNTY UTILITIES	L-17	SOUTH RIVER BORO	402836	0742249	3.66		2.5	402836074224901			U	T	19750328		33.	230952
230953	MIDDLESEX COUNTY UTILITIES	L-18	SOUTH RIVER BORO	402838	0742253	5.06		2.5	402838074225301			U	T	19750327		36.	230953
230954	MIDDLESEX COUNTY UTILITIES	L-19	SOUTH RIVER BORO	402840	0742259	4.26		2.5	402840074225901			U	T	19750326		31.	230954
230955	MIDDLESEX COUNTY UTILITIES	L-20	SOUTH RIVER BORO	402841	0742301	3.1		2.5	402841074230101			U	T	19750325		25.	230955
230956	MIDDLESEX COUNTY UTILITIES	L-21	SOUTH RIVER BORO	402844	0742306	4.9		2.5	402844074230601			U	T	19750403		34.	230956
230957	MIDDLESEX COUNTY UTILITIES	L-22	SOUTH RIVER BORO	402846	0742309	7.21		2.5	402846074230901			U	T	19750404		35.3	230957
230958	MIDDLESEX COUNTY UTILITIES	L-23	SOUTH RIVER BORO	402849	0742311	7.6		2.5	402849074231101			U	T	19750403		40.	230958
230959	MIDDLESEX COUNTY UTILITIES	L-24	SOUTH RIVER BORO	402851	0742313	11.16		2.5	402851074231301			U	T	19750327		21.	230959
230960	MIDDLESEX COUNTY UTILITIES	L-25	SOUTH RIVER BORO	402853	0742316	11.34		2.5	402853074231601			U	T	19750326		23.	230960
230961	MIDDLESEX COUNTY UTILITIES	L-26	SOUTH RIVER BORO	402854	0742318	10.2		2.5	402854074231801			U	T	19750324		39.	230961
230962	MIDDLESEX COUNTY UTILITIES	L-27	SOUTH RIVER BORO	402855	0742320	10.0		2.5	402855074232001			U	T	19750324		18.	230962
230963	MIDDLESEX COUNTY UTILITIES	L-28	SOUTH RIVER BORO	402856	0742326	7.4		2.5	402856074232601			U	T	19750324		30.	230963
230964	MIDDLESEX COUNTY UTILITIES	L-29	SOUTH RIVER BORO	402855	0742329	7.7		2.5	402855074232901			U	T	19750324		36.	230964
230965	MIDDLESEX COUNTY UTILITIES	L-30	SOUTH RIVER BORO	402854	0742333	20.9		2.5	402854074233301			U	T	19750321		50.	230965
230966	MIDDLESEX COUNTY UTILITIES	L-32	SOUTH RIVER BORO	402854	0742336	17.		2.5	402854074233601			U	T	19750320		52.	230966
230967	MIDDLESEX COUNTY UTILITIES	L-33	SOUTH RIVER BORO	402853	0742341	0.0		2.5	402853074234101			U	T	19750409		15.	230967
230968	MIDDLESEX COUNTY UTILITIES	L-34	SOUTH RIVER BORO	402854	0742342	9.6		2.5	402854074234201			U	T	19750328		41.	230968
230969	MIDDLESEX COUNTY UTILITIES	L-36	SOUTH RIVER BORO	402855	0742343	9.9		2.5	402855074234301			U	T	19750327		33.	230969
230970	MIDDLESEX COUNTY UTILITIES	L-38	SOUTH RIVER BORO	402857	0742346	1.3		2.5	402857074234601			U	T	19750411		19.8	230970
230971	MIDDLESEX COUNTY UTILITIES	L-39	NEW BRUNSWICK CITY	402963	0742347	6.3		2.5	402963074234701			U	T	19750519		28.	230971
230972	MIDDLESEX COUNTY UTILITIES	L-40	NEW BRUNSWICK CITY	402996	0742346	6.5		2.5	402996074234601			U	T	19750516		27.	230972
230973	NEW JERSEY HIGHWAY DEPART	NJ-01	SAYREVILLE BORO	403023	0741804	2.6			403023074180401			U	T	19380107		68.5	230973
230974	NEW JERSEY HIGHWAY DEPART	NJ-02	SAYREVILLE BORO	403023	0741803	2.6			403023074180301			U	T	19380108		62.	230974
230975	NEW JERSEY HIGHWAY DEPART	NJ-03	SAYREVILLE BORO	403026	0741804	2.6			403026074180401			U	T	19380111		78.5	230975
230976	NEW JERSEY HIGHWAY DEPART	NJ-04	SAYREVILLE BORO	403025	0741802	2.6			403025074180201			U	T	19380112		66.	230976
230977	NEW JERSEY HIGHWAY DEPART	NJ-05	SAYREVILLE BORO	403027	0741804	2.6			403027074180401			U	T	19380117		73.	230977
230978	NEW JERSEY HIGHWAY DEPART	NJ-06	SAYREVILLE BORO	403027	0741803	2.6			403027074180301			U	T	19380115		93.	230978
230979	NEW JERSEY HIGHWAY DEPART	NJ-07	SAYREVILLE BORO	403030	0741804	2.6			403030074180401			U	T	19380119		92.	230979
230980	NEW JERSEY HIGHWAY DEPART	NJ-08	SAYREVILLE BORO	403031	0741802	2.6			403031074180201			U	T	19380118		81.	230980
230981	NEW JERSEY HIGHWAY DEPART	NJ-09	SAYREVILLE BORO	403033	0741803	2.6			403033074180301			U	T	19380113		68.	230981
230982	NEW JERSEY HIGHWAY DEPART	NJ-10	SAYREVILLE BORO	403033	0741802	2.6			403033074180201			U	T	19380114		67.	230982
230983	NEW JERSEY HIGHWAY DEPART	NJ-11	WOODBRIDGE TWP	403035	0741803	2.6			403035074180301			U	T	19380111		74.5	230983
230984	NEW JERSEY HIGHWAY DEPART	NJ-12	WOODBRIDGE TWP	403034	0741802	2.6			403034074180201			U	T	19380110		75.	230984
230985	NEW JERSEY HIGHWAY DEPART	NJ-13	WOODBRIDGE TWP	403037	0741803	2.6			403037074180301			U	T	19380108		71.	230985
230986	NEW JERSEY HIGHWAY DEPART	NJ-14	WOODBRIDGE TWP	403037	0741802	2.6			403037074180201			U	T	19380107		74.2	230986
230987	NEW JERSEY HIGHWAY DEPART	NJ-15	WOODBRIDGE TWP	403039	0741803	2.6			403039074180301			U	T	19380114		74.6	230987
230988	NEW JERSEY HIGHWAY DEPART	NJ-16	WOODBRIDGE TWP	403039	0741802	2.6			403039074180201			U	T	19380113		73.	230988
230989	NEW JERSEY HIGHWAY DEPART	NJ-17	WOODBRIDGE TWP	403040	0741803	2.6			403040074180301			U	T	19380112		77.	230989
230990	NEW JERSEY HIGHWAY DEPART	NJ-18	WOODBRIDGE TWP	403041	0741802	2.6			403041074180201			U	T	19380111		77.	230990
230991	NEW JERSEY HIGHWAY DEPART	NJ-19	WOODBRIDGE TWP	403043	0741803	2.6			403043074180301			U	T	19380108		79.	230991
230992	NEW JERSEY HIGHWAY DEPART	NJ-20	WOODBRIDGE TWP	403043	0741802	2.6			403043074180201			U	T	19380104		73.	230992
230993	NEW JERSEY HIGHWAY DEPART	NJ-21A	SAYREVILLE BORO	403025	0741804	2.6			403025074180401			U	T	19380215		64.	230993
230994	NEW JERSEY HIGHWAY DEPART	NJ-22	SAYREVILLE BORO	403025	0741803	2.6			403025074180301			U	T	19380221		62.3	230994
230995	NEW JERSEY HIGHWAY DEPART	NJ-23	SAYREVILLE BORO	403028	0741804	2.6			403028074180401			U	T	19380221		80.	230995
230996	NEW JERSEY HIGHWAY DEPART	NJ-24	SAYREVILLE BORO	403027	0741802	2.6			403027074180201			U	T	19380221		94.5	230996
230997	NEW JERSEY HIGHWAY DEPART	NJ-25	SAYREVILLE BORO	403030	0741804	2.6			403030074180402			U	T	19380223		97.	230997
230998	NEW JERSEY HIGHWAY DEPART	NJ-26	SAYREVILLE BORO	403030	0741803	2.6			403030074180301			U	T	19380221		81.	230998
230999	NEW JERSEY HIGHWAY DEPART	NJ-27	SAYREVILLE BORO	403029	0741804	2.6			403029074180402			U	T	19380226		80.	230999
231000	US ARMY CORPS OF ENGINEERS	DH-1	SAYREVILLE BORO	402845	0741529	0.0			402845074152901			U	T	19630600		41.7	231000
231001	US ARMY CORPS OF ENGINEERS	DH-2	SAYREVILLE BORO	402813	0741512	0.0			402813074151201			U	T	19630600		22.	231001
231002	US ARMY CORPS OF ENGINEERS	DH-3	OLD BRIDGE TWP	402823	0741436	0.0			402823074143601			U	T	19630600		40.1	231002
231003	US ARMY CORPS OF ENGINEERS	DH-4	OLD BRIDGE TWP	402751	0741413	0.0			402751074141301			U	T	19630600		27.	231003
231004	US ARMY CORPS OF ENGINEERS	DH-27A	SAYREVILLE BORO	402813	0741530	0.0			402813074153001			U	T	19630600		35.	231004
231005	US ARMY CORPS OF ENGINEERS	DH-29	OLD BRIDGE TWP	402755	0741458	0.0			402755074145801			U	T	19630600		31.5	231005
231007	US ARMY CORPS OF ENGINEERS	DH-30	OLD BRIDGE TWP	402731	0741348	0.0			402731074134801			U	T	19630600		40.	231007
231008	CLARK, ROMAN	DOMESTIC	EAST BRUNSWICK TWP	402414	0742625	120	66		402414074262501	211CDBG	58	66	H	W	19830222	28-13318	78	231008
231009	YAROS, JOHN	DOMESTIC	SOUTH BRUNSWICK TWP	402157	0743525	110	51		402127074351901	211MRCA			H	W	19620816	28-04465	51	231009
231010	ZINSMEISTER, JACK	DOMESTIC	PLAINSBORO TWP	401844	0743448	60	79		401844074344801	211FRNG	76	79	H	W	19670901	28-06237	81	231010
231011	MAN. & ENG. CORP.	MWE2	SAYREVILLE BORO	402833	0742041	6.		6.	402833074204101			U	U	19290000		63.	231011
231012	MAN. & ENG. CORP.	MWE2A	SAYREVILLE BORO	402917	0742046	22.		6.	402917074204601			U	U	19290000		73.6	231012
231013	MAN. & ENG. CORP.	MWE2B	SAYREVILLE BORO	402906	0742044	35.		8.	402906074204401			U	U	19290000		163.	231013
231014		MWE2B	SAYREVILLE BORO	402906	0742044	35.		6	402906074204401			U	U			163.	231013
231014	MAN. & ENG. CORP.	MWE3	SAYREVILLE BORO	402739	0742027	100.		6.	402739074202701			U	U	19290000		311.	231014
231015	HERCULES POWDER CO	TEST WELL 5	SAYREVILLE BORO	402819	0742107	28.	128.	5.	402819074210701	211FRNG	120.9	128.	U	W	19380113		129.	231015
231016	E.I. DUPONT	LAYNE #4	SAYREVILLE BORO	402722	0741942	88.	277.5	18.	402722074194201	211FRNG	221.58	257.	U	W	19270807		292.	231016
231016		LAYNE #4	SAYREVILLE BORO	402722	0741942	88.	277.5	12.	402722074194201	211FRNG	267.17	277.5	U	W			292.	231016
231017	SAYRE & FISHER	29A	SAYREVILLE BORO	402818	0742127	16.			402818074212701			U	U			975.	231017
231018	E.I. DUPONT	1 A	SAYREVILLE BORO	402841	0742037	5.0		5.	402841074203701			U	Z	19410218		80.5	231018
231019	E.I. DUPONT	2 B	SAYREVILLE BORO	402840	0742029	15.		5.	402840074202901			U	Z	19410220		106.42	231019
231020	E.I. DUPONT	3-C	SAYREVILLE BORO	402838	0742022	10.		5.	402838074202201			U	Z	19410222		83.25	231020
231021	E.I. DUPONT	4-D	SAYREVILLE BORO	402836	0742014	15.		5.	402836074201401			U	Z	19410225		91.67	231021
231022	E.I. DUPONT	5 E	SAYREVILLE BORO	402835	0742007	15.		5.	402835074200701			U	Z	19410227		98.25	231022
231023	E.I. DUPONT	7 G	SAYREVILLE BORO	402833	0741950	25.		5.	402833074195001			U	Z	19410304		129.75	231023
231024	E.I. DUPONT	9-H	SAYREVILLE BORO	402833	0741942	25.		5.	402833074194201			U	Z	19410306		122.25	231024
231025	E.I. DUPONT	10-J	SAYREVILLE BORO	402834	0741926	10.		5.	402834074192601			U	Z	19410318		125.75	231025
231026	E.I. DUPONT	11 K	SAYREVILLE BORO	402845	0741924	14.		5.	402845074192401			U	Z	19410320		119.	231026
231027	E.I. DUPONT	13-M	SAYREVILLE BORO	402905	0741917	8.		5.	402905074191701			U	Z	19410315		99.17	231027
231028	E.I. DUPONT	14 N	SAYREVILLE BORO	402910	0741912	10.		5.	402910074191201			U	Z	19410313		98.67	231028
231029	E.I. DUPONT	15 O	SAYREVILLE BORO	402916	0741908	18.		5.	402916074190801			U	Z	19410000		109.5	231029
231030	NATIONAL LEAD	16 P	SAYREVILLE BORO	402922	0741905	18.		5.	402922074190501			U	Z	19410212		108.75	231030
231031	NATIONAL LEAD	17-Q	SAYREVILLE BORO	402926	0741859	18.		5.	402926074185901			U	Z	19410210		120.67	231031
231032	NATIONAL LEAD	18 R	SAYREVILLE BORO	402929	0741853	18.		5.	402929074185301			U	Z	19410207		117.83	231032

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UNIQUE ID	SITE OWNER	LOCAL ID	MUNICIPALITY	LAT	LON	ALTITUDE	DEPTH	DIAMETER	STATION ID	AQUIFER	SCREENED INTERVAL	W	S	DATE	PERMIT	DEPTH DRILLED	UNIQUE ID
231033	NATIONAL LEAD	19-S	SAYREVILLE BORO	402933	0741846	18.		5.	402933074184601			U	Z	19410205		111.5	231033
231034	NATIONAL LEAD	20 T	SAYREVILLE BORO	402937	0741843	18.		5.	402937074184001			U	Z	19410203		113.67	231034
231035	CALIFORNIA REFINING	TEST WELL #4	PERTH AMBOY CITY	403210	0741621	25.		6.	403210074162101			U	T	19510905	26-00111	110.	231035
231036	CALIFORNIA REFINING	TEST WELL #6	PERTH AMBOY CITY	403200	0741605	17.		6.	403200074160501			U	T	19510905	26-00122	106.	231036
231037	CALIFORNIA REFINING	TEST WELL #7	PERTH AMBOY CITY	403156	0741626	54.		6.	403156074162601			U	T	19510905	26-00125	136.	231037
231038	CALIFORNIA REFINING	TEST WELL #8	PERTH AMBOY CITY	403214	0741714	66.		6.	403214074171401			U	T	19510905	26-00126	113.	231038
231039	CALIFORNIA REFINING	TEST WELL #9	PERTH AMBOY CITY	403158	0741608	53.		6.	403158074160801			U	T	19510905	26-00123	116.	231039
231040	CALIFORNIA REFINING	TEST WELL #15	PERTH AMBOY CITY	403156	0741622	56.		6.	403156074162201			U	T	19510905	26-00257	139.5	231040
231041	MIDDLESEX COUNTY UTILITIE	MONITORING #1	SAYREVILLE BORO	402807	0742204	5.	58.	4.	402807074220401	211FRNG	48.	58.	U	O	19780200	28-10143	76.	231041
231042	MIDDLESEX COUNTY UTILITIE	MONITORING #2	SAYREVILLE BORO	402757	0742214	5.	57.	4.	402757074221401	211FRNG	47.	57.	U	O	19780200	28-10142	66.	231042
231043	DOW JONES CO	BACKUP-2	SOUTH BRUNSWICK TWP	402207	0743510	120	150	6	402207074351001	231LCKG	73	150	U	W	19790700	28-11137	150	231043
231044	MAGYAR SAVINGS & LOAN ASS	MAGYAR 1	SOUTH BRUNSWICK TWP	402630	0743206	130	185	10	402630074320601	231BRCK	50	185	C	W	19691104	28-06766	185	231044
231044		MAGYAR 1	SOUTH BRUNSWICK TWP	402630	0743206	130	185	6	402630074320601	231BRCK			C	W			185	231044
231045	NJ DEPT OF TRANSPORTATION	SAND HILLS 1	SOUTH BRUNSWICK TWP	402434	0743238	240	245	8	402434074323801	231LCKG	71.83	245	H	W	19590629	28-03473	245	231045
231046	CITIES SERVICE CO	15-1970	SOUTH BRUNSWICK TWP	402301	0743320	75	342	8	402301074332001	231LCKG	67	342	N	W	19700831	28-06846	342	231046
231046	COLUMBIAN CHEMICALS	15 1970	SOUTH BRUNSWICK TWP	402301	0743320	75	342		402301074332001	231LCKG			N	W			342	231046
231047	DITKEN, JR. ED	DITKEN 1	NORTH BRUNSWICK TWP	402602	0742910	110	85	10	402602074291001	231BRCK	50	85	1	W	19810717	28-12317	85	231047
231047		DITKEN 1	NORTH BRUNSWICK TWP	402602	0742910	110	85	6	402602074291001	231BRCK			1	W			85	231047
231049	CARDONE, ANGELO C	CARDONE	NORTH BRUNSWICK TWP	402703	0742928	120	74	6	402703074292801	231BRCK	25	74	H	W	19640826	28-05084	74	231048
231049	FASTORE, JOSEPH	FASTORE 1	NORTH BRUNSWICK TWP	402824	0742751	110	175	6	402824074275101	231BRCK	50	175	1	W	19800921	28-11860	175	231049
231050	RLVEY, EMERY J	SOD FARM WELL	NORTH BRUNSWICK TWP	402721	0743031	100	234	6	402721074303101	231BRCK	26	234	1	W	19630926	28-04791	234	231050
231051	RUTGERS UNIVERSITY	COOK FARM HOUSE	NORTH BRUNSWICK TWP	402804	0742537	50	160	10	402804074253901	231BRCK	53	160	H	W	19740227	25-17373	160	231051
231051		COOK FARM HOUSE	NORTH BRUNSWICK TWP	402804	0742539	50	160	6	402804074253901	231BRCK			H	W			160	231051
231052	GARY MANUFACTURING	INDUSTRIAL-1977	NEW BRUNSWICK CITY	402806	0742839	90	125	10	402806074283901	231BRCK	54	125	N	W	19771000	25-19397	125	231052
231052		INDUSTRIAL-1977	NEW BRUNSWICK CITY	402806	0742839	90	125	6	402806074283901	231BRCK			N	W			125	231052
231053	RUTGERS UNIVERSITY	RUTGERS GOLF COU	PISCATAWAY TWP	403110	0742812	60	300	12	403110074281201	231BRCK	55	300	1	W	19800630	25-21440	300	231053
231053		RUTGERS GOLF COU	PISCATAWAY TWP	403110	0742812	60	300	8	403110074281201	231BRCK			1	W			300	231053
231054	RIES INTERNATIONAL	ONE	WOODBRIDGE TWP	403503	0741542	15	300	10	403503074154201	231BRCK	50	300	C	W	19800124	26-04831	300	231054
231054	USA EASTERN	ONE	WOODBRIDGE TWP	403503	0741542	15	300	6	403503074154201	231BRCK			C	W			300	231054
231055	MIDDLESEX WATER COMPANY	TINGLEY LANE 5	EDISON TWP	403527	0742223	75	532	12	403527074222301	231BRCK	40.18	532	P	W	19550705	25-04516	532	231055
231056	MIDDLESEX COUNTY UTILITIE	MONITORING #3	SAYREVILLE BORO	402743	0742216	5.	53.	4.	402743074221601	211FRNG	43.	53.	U	O	19780200	28-10141	77.	231056
231057	US ARMY CORPS OF ENGINEER	DH-26A		402887	0741586	0.			402887074158601			U	T	19630600		35.5	231057
231058	US GEOLOGICAL SURVEY	HESS BROS #1		402704	0742139	25.	122.	8.75	402704074213901	211FRNG	112.	122.	U	O	19861029	28-17742-5	173.	231058
231059	US GEOLOGICAL SURVEY	HESS BROS #2		402704	0742139	25.	148.	8.75	402704074213902	211FRNG	138.	148.	U	O	19861120	28-17743-6	167.	231059
231059		HESS BROS #2		402704	0742139	25.	148.	4.	402704074213902	211FRNG			U	O			167.	231059
231060	US GEOLOGICAL SURVEY	MARSH AVE #1		402802	0742022	40.	148.	8.75	402802074202201	211FRNG	138.	148.	U	O	19861207	25-28904-7	251.	231060
231061	ELIZABETHTOWN WC	SEBRINGS MILL 8	MIDDLESEX BORO	403504	0743026	35	430	16	403504074302601	231BRCK	51	430	P	W	19651119	25-13397	430	231061
231061		SEBRINGS MILL 8	MIDDLESEX BORO	403504	0743026	35	430	12	403504074302601	231BRCK			P	W			430	231061
231062	ST AUGUSTINE CHURCH	SCHOOL 1	SOUTH BRUNSWICK TWP	402557	0743221	145	300	12	402557074322101	231BRCK	42.17	300	U	W	19620727	28-04424	300	231062
231062		SCHOOL 1	SOUTH BRUNSWICK TWP	402559	0743221	145	300	8	402559074322101	231BRCK			U	W			300	231062
231063	FMC RESEARCH LAB	1-WELLNITZ FARM	PLAINSBORO TWP	402026	0743730	95.75	443	13.33	402026074373001	231PCKN	422	443	N	W	19560700	28-01854	443	231063
231065	PRINCETON FOLDING BOX CO	SARSTEDT 1	SOUTH BRUNSWICK TWP	402150	0743601	100	325	6	402150074360101	231LCKG	72	325	C	W	19610515	28-04388	326	231065
231065	SARSTEDT INC	SARSTEDT 1	SOUTH BRUNSWICK TWP	402150	0743601	100	325		402150074360101	231LCKG			C	W			326	231065
231066	WHITE, STANLEY	DOMESTIC-1985	CRANBURY TWP	401819	0743402	90	90		401819074340201	211FRNG	80	90	H	W	19850125	28-14823	95	231066
231067	PROTINICK, MICHAEL	DOMESTIC 2-1966	CRANBURY TWP	402008	0743251	100	70		402008074325101	211FRNG	64	70	H	W	19660916	28-06022	70	231067
231068	PROTINICK, JOHN	DOMESTIC 1-1972	CRANBURY TWP	401943	0742925	110	128		401943074292501	211ODBG	125	128	H	W	19720700	28-07578	129	231068
231069	BARCLAY FARMS	BARCLAY FARMS DO	CRANBURY TWP	401901	0743134	105	64		401901074313401	211ODBG	61	64	H	W	19650800	28-05555	66	231069
231070		APPLEGATE #6		401948	0742745	125.	285.		401948074274501	211FRNG	245.	285.	U	Z				231070
231071	MIDDLESEX WATER COMPANY	PARK 25	SOUTH PLAINFIELD BORO	403545	0742433	70	448	12	403545074243301	231BRCK	74	448	P	W	19650000	25-11815	448	231071
231072	MIDDLESEX WATER COMPANY	TINGLEY 2	EDISON TWP	403536	0742228	80	560	12	403536074222801	231BRCK	74	454	P	W	19500000	25-03970	560	231072
231072		TINGLEY 2	EDISON TWP	403536	0742228	80	560	12	403536074222801	231BRCK			P	W	19541122		560	231072
231073	KENDALL CONTINENTAL	KENDALL PARK 3	SOUTH BRUNSWICK TWP	402525	0743351	160	412	14	402525074335101	231BRCK	35	412	I	Z	19560428		412	231073
231073	SOUTH BRUNSWICK TWP	KENDALL PARK 3	SOUTH BRUNSWICK TWP	402525	0743351	160	412	10	402525074335101	231BRCK			I	Z			412	231073
231074	ST AUGUSTINE CHURCH	CHURCH 1	SOUTH BRUNSWICK TWP	402557	0743214	145	125.5	6	402557074321401	231BRCK	43.42	125.5	U	W	19530106	28-00757	125.5	231074
231075	ASHWILL CORPORATION	INDUSTRIAL 1	NORTH BRUNSWICK TWP	402543	0743107	110	251	14	402543074310701	231BRCK	31.17	251	U	W	19541209	28-01429	251	231075
231075	STEARNS & FOSTER CO	INDUSTRIAL 1	NORTH BRUNSWICK TWP	402543	0743107	110	251	10	402543074310701	231BRCK			U	W			251	231075
231076	US GEOLOGICAL SURVEY	CORE HOLE A	NORTH BRUNSWICK TWP	402630	0742959	110	68	6	402630074295902	231BRCK	12	68	U	Z	19860327	29-16276	68	231076
231076		CORE HOLE A	NORTH BRUNSWICK TWP	402630	0742959	110	68	3	402630074295902	231BRCK			U	Z			68	231076
231077	US GEOLOGICAL SURVEY	JOISL-SAY		402831	0742120	7	56	6.25	402831074212001	211FRNG	46	56	U	O	19870227		73	231077
231078	US GEOLOGICAL SURVEY	SAYER ST		402721	0742210	12	78	6.25	402721074221001	211FRNG	68	78	U	O	19870205		84	231078
231079	CAPTIVE PLASTICS	BACKUP-1983	PISCATAWAY TWP	403330	0742843	60	230	8	403330074284301	231BRCK	50	230	N	W	19830526	25-23677	230	231079
		1977-MAIN	PISCATAWAY TWP	403330	0742842	60	200	10	403330074284201	231BRCK	50	200	J	W	19770000		200	231080
231080		[illegible]	PISCATAWAY TWP	403330	0742842	60	200	8	403330074284201	231BRCK			J	W			200	231080
231081	COLUMBIAN CHEMICALS	1-1948	SOUTH BRUNSWICK TWP	402300	[illegible]	70	221	6	402300074333001	231LCKG	25	221	N	W	19480000	48-00030	221	231081
231083	JOHNSON & JOHNSON CO	IRRIGATION-UNUSE	NORTH BRUNSWICK TWP	402630	0742959	110	409	6	[illegible]074295901	231BRCK	20	409	U	W	19600000		409	231083
231084	PRINCETON UNIVERSITY	DOE WELL D1	PLAINSBORO TWP	402048	0743555	80.9	5.1	0.5	402048074355501		3.6	5.1	[illegible]		[illegible]	[illegible]	5.1	231084
231085	PRINCETON UNIVERSITY	DOE WELL D2	PLAINSBORO TWP	402052	0743558	86.3	5.8		402052074355801	231SCKN	4.3	5.8	U	O	19850716	28-16087	[illegible]	
231086	PRINCETON UNIVERSITY	DOE WELL D3	PLAINSBORO TWP	402052	0743558	86.3	17.0		402052074355802	231SCKN	14.0	17.0	U	O	19861023	28-17693	17.0	231086
231087	PRINCETON UNIVERSITY	DOE WELL D4	PLAINSBORO TWP	402051	0743555	84.4	19.		402051074355501	231SCKN	16.	19.	U	O	19861030	28-17694	19.	231087
231088	PRINCETON UNIVERSITY	DOE WELL D5	PLAINSBORO TWP	402050	0743553	81.5	18.0		402050074355301	231SCKN	15.	18.	U	O	19861030	28-17693	18.0	231088
231089	PRINCETON UNIVERSITY	DOE WELL H1	PLAINSBORO TWP	402039	0743601	77.6	6.2		402039074360101		4.7	6.2	U	O	19850628	28-16082	6.2	231089
231090	PRINCETON UNIVERSITY	DOE WELL H1A	PLAINSBORO TWP	402039	0743601	77.4	18.0		402039074360102	231SCKN	15.0	18.	U	O	19861030	28-17690	18.0	231090
231091	PRINCETON UNIVERSITY	DOE WELL H2	PLAINSBORO TWP	402040	0743602	80.5	5.2		402040074360201		3.7	5.2	U	O	19850716	28-16083	5.2	231091
231092	PRINCETON UNIVERSITY	DOE WELL H3	PLAINSBORO TWP	402042	0743606	84.5	10.1		402042074360601		8.6	10.1	U	O	19850716	28-16084	10.1	231092
231093	PRINCETON UNIVERSITY	DOE WELL H3A	PLAINSBORO TWP	402042	0743606	84.4	19.5		402042074360602	231SCKN	16.5	19.5	U	O	19861030	28-17691	19.5	231093
231094	PRINCETON UNIVERSITY	DOE WELL H4	PLAINSBORO TWP	402047	0743609	88.1	9.7		402047074360901		8.2	9.7	U	O	19850716	28-16085	9.7	231094
231095	PRINCETON UNIVERSITY	DOE WELL H4A	PLAINSBORO TWP	402047	0743609	88.3	16.2		402047074360902	231SCKN	13.2	16.2	U	O	19861030	28-17692	16.2	231095
231096	PRINCETON UNIVERSITY	DOE WELL N1	PLAINSBORO TWP	402103	0743556	91.5	9.5		402103074355601		8.0	9.5	U	O	19850628	28-16090	9.5	231096
231097	PRINCETON UNIVERSITY	DOE WELL N2	PLAINSBORO TWP	402102	0743559	92.3	9.6		402102074355901		8.1	9.6	U	O	19850716	28-16091	9.6	231097
231098	PRINCETON UNIVERSITY	DOE WELL N3	PLAINSBORO TWP	402102	0743601	92.0	16.3		402102074360101	231SCKN	14.8	16.3	U	O	19850923	28-16092	16.3	231098
231099	PRINCETON UNIVERSITY	DOE WELL N4A	PLAINSBORO TWP	402103	0743606	75.9	11.0		402103074360601	231SCKN	8.	11.	U	O	19861030	28-17688	11.0	231099
231100	PRINCETON UNIVERSITY	DOE WELL N4B	PLAINSBORO TWP	402103	0743606	75.9	6.0		402103074360602		3.	6.	U	O	19861030	28-17689	12.0	231100
231101	PRINCETON UNIVERSITY	DOE WELL R2	PLAINSBORO TWP	402101	0743552	89.9	13.9		402101074355201		12.4	13.9	U	O	19850627	28-16088	13.9	231101
231102	PRINCETON UNIVERSITY	DOE WELL R3	PLAINSBORO TWP	402059	0743557	93.5	10.3		402059074355702		8.8	10.3	U	O	19850628	28-16089	10.3	231102
231103	PRINCETON UNIVERSITY	DOE WELL R4A	PLAINSBORO TWP	402100	0743554	93.5	18.0		402100074355401	231SCKN	15.0	18.0	U	O	19860303	28-16093	18.0	231103
231104	PRINCETON UNIVERSITY	DOE WELL R4B	PLAINSBORO TWP	402100	0743554	93.5	15.		402100074355402		12.	15.	U	O	19861030	28-17696	15.	231104
231105	PRINCETON UNIVERSITY	DOE WELL R5A	PLAINSBORO TWP	402100	0743553	92.7	30.0		402100074355301	231SCKN	27.0	30.0	U	O	19860300	28-16094	30.0	231105
231106	PRINCETON UNIVERSITY	DOE WELL R5B	PLAINSBORO TWP	402100	0743553	92.7	23.0		402100074355302		20.	23.0	U	O	19861030	28-17697	23.0	231106
231107	PRINCETON UNIVERSITY	DOE WELL R6	PLAINSBORO TWP	402100	0743556	91.3	27.0		402100074355201	231SCKN	24.0	27.0	U	O	19860300	28-16095	27.0	231107
231108	PRINCETON UNIVERSITY	DOE WELL R8A	PLAINSBORO TWP	402101	0743549	36.3	28.0		402101074354901	231SCKN	25.0	28.0	U	O	19860300	28-16096	28.0	231108

P.176

REFERENCE NO. 16

NUS CORPORATION
SUPERFUND DIVISION

PROJECT NOTES

TO: El Beth File (JO30)

DATE: March 26, 1992

FROM: Claire Baruxis

COPIES: —

SUBJECT: Potable water supply wells located within 4 miles of the El Beth site.

REFERENCE: See below.

Summary: Potable water supply wells that are located within a 4-mile radius of the El Beth site have been identified and the number of people served have been determined. Private wells and public wells (including emergency supply wells) have been addressed.

The Sayreville Water Dept. and South Amboy Water Dept. wells are located within 4 miles of the El Beth site, across the Raritan River. The South Amboy wells currently are not in use; they are reserved for emergency use only. South Amboy obtains its water from the Perth Amboy system. No other public potable water supply wells are located within 4 miles of the site. Other municipalities in the area obtain their water from wells located outside of the site's 4-mile radius, or from surface water supplies, which are not located along the site's 15-mile surface water route. USGS data for wells with production rates greater than 75 gal/minute in Middlesex County include, within 4 miles of the El Beth site, three domestic wells. Two of the wells are reported to be not in use; one is located 4 miles from the El Beth site, and its current status has not been confirmed.

Wells and populations served are listed on the following page. A list of references is given, and references are attached.

(continued on reverse)

NUS 443A 58 1182

Potable Water Supply Wells Located Within 4 miles of the E.L. Beth Site.

Distance Category, miles	Potable Water Supply Well Identification	Population Served	Comments
0.0 to 0.25	(none)	0	—
>0.25 to 0.50	(none)	0	—
>0.50 to 1.0	(none)	0	—
>1.0 to 2.0	(none)	0	—
>2.0 to 3.0	South Amboy public wells	8,500	These wells currently are not in use; they are being maintained for emergency use only. South Amboy obtains its water from the Beth Amboy supply. These wells are located across the River from the E.L. Beth site facility
>3.0 to 4.0	Sayreville public wells	approximately 12,000	Five wells; 2 draw from the aquifer of concern (Farrington) and 3 draw from the more shallow, Old Bridge aquifer. The water from the deep and shallow wells at this location is mixed. Recharge water from the South River is also mixed with the well water.
	Private well approx. 4 miles from E.L. Beth site.	(Estimate 4 people)	Current status not confirmed

NUS CORPORATION
SUPERFUND DIVISION

PROJECT NOTES

TO: EL Beth File

DATE: March 26, 1992

FROM: Claire Bampis

COPIES: –

SUBJECT: Potable water supply wells located within 4 miles of the EL Beth site.

REFERENCE: The following references document potable water supply wells within 4 miles of the EL Beth site, and those communities served by other sources:

1. Telecon Note: Conversation between Mr. Joe Rudy, Sayreville Water Dept., and Claire Bampis, HNUS, March 16, 1992.
2. Telecon Note: Conversation between Kathy, South Amboy Water Dept., and Claire Bampis, HNUS, March 13, 1992.
3. Telecon Note: Conversation between Mrs. Myers, Middlesex Water Company, ~~March 13, 1992~~ and Claire Bampis, HNUS, March 13, 1992.
4. Telecon Note: Conversation between Mr. Rich Sadowski, Elizabethtown Water Company, and Claire Bampis, HNUS, March 10, 1992.
5. Telecon Note: Conversation between Mr. William Lund, Edison Engineering Dept., and Claire Bampis, HNUS, March 13, 1992.
6. Telecon Note: Conversation between Mr. Turan Ramadan, Perth Amboy Water Dept., and Claire Bampis, HNUS, March 13, 1992.
7. Telecon Note, (#2): Conversation between Mr. Turan Ramadan, Perth Amboy Water Dept., and Claire Bampis, HNUS, March 13, 1992.
8. Telecon Note: Conversation between Mr. Joe Rudy, Sayreville Water Dept., and Diane Minnaugh, HNUS, October 24, 1991.
9. Telecon Note: Conversation between Mr. Gerry Garret, South Amboy Water Dept., and Diane Minnaugh, October 22, 1991.
10. Telecon Note: Conversation between Mr. Richard Muchanic, South Amboy Water Dept., and Maria Colley, ~~HNUS~~ NUS, Feb 21, 1990.
11. Telecon Note: Conversation between Mr. Joe Ritter, Middlesex Water Company, and Edmund Knyfd, Jr., NUS, September 25, 1990.

Continued

NUS 443A 58 1182

Potable Water Supply Wells Located Within 4 miles of the El Roth Site.

12. Telecon Note: Conversation between Mr. Frank Falco, Middlesex Water Company, and Sue Lencyk, NUS, February 9, 1990.

13. Telecon Note: Conversation between Mr. Guy Leighton, Woodbridge Twp. Engineering Office, and Edmund Krzyd, Jr., NUS, Sept 25, 1990.

14. Telecon Note: Conversation between Mr. Jay Elliot, Dept. of Health and Human Services, Edison, and Sue Lencyk, NUS, March 15, 1990.

15. Telecon Note: Conversation between Mr. Jay Elliot, Edison Dept. of Health and Human Services, and Sue Lencyk, NUS, March 19, 1990.

~~16. Telecon Note: Conversation between Mr. Jay Elliott, Edison Health Dept. and Sue Lencyk, NUS, March 19, 1990.~~ or

16. Telecon Note: Conversation between City Engineer, Township of Edison, and D. Lamond, NUS, June 19, 1986.

17. Telecon Note: Conversation between Mr. Garrett, S. Amboy Water Dept., and Pat Cantagalli, NUS, August 30, 1990.

18. Telecon Note: Conversation between Mrs. Cirsky, well owner in Fords, N.J., and Bruce Sanders, NUS, July 11, 1990.

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
J030	March 16, 1992	1040

DISTRIBUTION:

Page 1 of 2

EL Both file

BETWEEN:	OF:	PHONE:
Mr. Joe Rudy	Sayreville Water Dept.	(908) 390-7067

AND: Claire Barnes (NUS)

DISCUSSION:

Mr. Rudy said that the Sayreville Water Dept. has 2 plants in town. One is located at Bordentown Avenue + Gravesmill Road; the wellfield is located right behind the plant; it occupies a radius of about 4 acres and consists of 11 wells.

The other plant is located in the Morgan section of Sayreville Township, at Route 35 South - it's about 1/2 mile north of the border with Old Bridge, by Gordon Ave, about 1 block from Route 35. There are 5 wells at this plant; 3 are shallow and 2 are deep. The shallow wells draw from the Old Bridge aquifer, and are 125 to 130 feet deep, and screened at about 80 feet deep; 'R' well at about 90 feet and 'T' well at about 83 feet. The deep wells draw from the Farrington aquifer; their depth is about 280 feet; The water level, well 'S' is about 250 feet deep and screen is about 34 feet long.

Regarding the Old Bridge (shallow) wells, he said they are not to pump below depth of 100 feet.

~~ACTION ITEMS:~~

He said the supply is a loop system; the 2 water plants serve 2 sections, and also, the Dept. purchases 2 million gallons per day from Middlesex Water Co. He said that very seldom does Morgan well water go to the Bordentown section, because water pressure from the Middlesex Water Co. supply prevents this. He said that a total population of 38,000 is served. He estimates that the plant in the Morgan section

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
J030	March 16, 1992	1040

DISTRIBUTION:

EL Beth file

BETWEEN:	OF:	PHONE:
Mr. Joe Rudy	Sayreville Water Dept.	(908) 390-7067

AND: Claire Barusia (NUS)

DISCUSSION:

serves approximately one-third of this population, or 12,000 people. He said that in the summer (peak) season, the Morgan system supplies 3.2 MGD (million gallons per day), the Bordentown system supplies about 4 MGD and Middlesex Water Co. supplies 2 MGD. He said the relative amount supplied by Middlesex Water Co., a surface water supply, is higher in winter.

He said that Sayreville Water Dept. also uses about 1 MGD of surface water from recharge lagoons - pumped from the South River to lagoons - the lagoon water is mixed with well water.

ACTION ITEMS: Note: the water supply located in the Morgan section is located between 3 and 4 miles from the EL Beth site.

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
J030	March 13, 1992	1425

DISTRIBUTION:

E L Beth file

BETWEEN:	OF:	PHONE:
Kathy	South Amboy Water Dept.	(908) 721-1211

AND: Claire Barnes (NUS)

DISCUSSION:

Kathy said that currently, South Amboy is still buying its water from Perth Amboy. South Amboy is not using any of its own wells. The South Amboy water treatment plant would open for emergency use only.

She said that Mr. Garret will return in about 20 minutes, and asked that if he has further information, such as when the South Amboy Water Dept wells may be used again, he will return my call.

ACTION ITEMS:

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
J030	March 13, 1992	1618

DISTRIBUTION:

EL Beth file

BETWEEN:	OF:	PHONE:
Mrs. Myers	Middlesex Water Company	(908) 634-1500

AND: Claire Barnes (NUS)

DISCUSSION:

Mrs. Myers said that Middlesex Water Co. has no emergency supply wells in Edison or Woodbridge.

She said that the water company's wells are located in South Plainfield and at North Tingley and South Tingley Lanes in Edison.

ACTION ITEMS: Note that Middlesex Water Co. wells are not located within 4 miles of the EL Beth site.

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
J030	March 10, 1992	1510

DISTRIBUTION:

E.L. Beth file

BETWEEN:	OF:	PHONE:
Mr. Rich Sadowski	Elizabethtown Water Company	(908) 654-1234

AND: (NUS)

Claire Sample

DISCUSSION:

Mr. Sadowski said that Elizabethtown Water Company does not have any wells in the following towns: Edison, Woodbridge (in Port Reading, Sewaren, Hopelawn, Fords, Keasby), Sayreville and South Amboy.

ACTION ITEMS:

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
J030	March 13, 1992	1553

DISTRIBUTION:

EC Beth file

BETWEEN:	OF:	PHONE:
William Lund	Edison Engineering Dept. (Director)	(908) 287-0900

AND: Claire Barnes (NUS)

DISCUSSION:

Mr. Lund said that it has been many years since emergency supply wells in Edison were used.

ACTION ITEMS:

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
JO30	March 13, 1992	1450

DISTRIBUTION:

EL Beth file

BETWEEN:	OF:	PHONE:
Turan Ramadan	Perth Amboy Water Dept. (Superintendent)	(908) 442-2397

AND: Claire Bruno (NUS)

DISCUSSION:

I phoned to confirm the location of Perth Amboy water supply wells (public potable water supply):

He said that the City of Perth Amboy has wells near Tennent Pond in Old Bridge, which pump from the Old Bridge Sand; Well Nos. 5, 6 and 7 are at the north side of the pond, and Well No. 8 is southeast of the pond. Also, Perth Amboy has what are called collector wells (also called "Ranney" wells), near Deep Run in Old Bridge, about 4000 feet south of Tennent Pond - this also draws from the Old Bridge Sand. He said that the City of Perth Amboy has no emergency wells in Woodbridge. The Perth Amboy water system serves the City of Perth Amboy, and is shared with South Amboy.

Mr. Ramadan noted that there is a reservoir at Florida Grove Road. He asked that I phone back at about 4:00, as he must now go to a meeting; we can complete the discussion when I call back.

ACTION ITEMS:

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
J030	March 13, 1992	1605

DISTRIBUTION:

E L Beth File

BETWEEN:	OF:	PHONE:
Mr. Turan Ramadan	Perth Amboy Water Dept. (Superintendent)	(908) 442-2397

AND: Claire Barufio (NUS)

DISCUSSION:

(continuation of telecon at 1450 hrs on March 13, 1992)

Mr. Ramadan said that the City of Perth Amboy has a finished water reservoir located in Perth Amboy, at Florida Grove Road. (Mr. Ramadan said that it is 5 acres in size, and is the largest reservoir in the U.S.A.). The reservoir serves only Perth Amboy ~~and South Amboy~~. Water from the Perth Amboy public supply wells is treated, and, the reservoir water is from this system.

Also, there is a groundwater recharge reservoir at the Ranney well; he said that when the Ranney well is done it will be very large (88 acres) and it will be supplied by this reservoir.

ACTION ITEMS: Note that the City of Perth Amboy public water supply wells are located more than 4 miles from the E.L. Beth site (the wells are near, and south of, Tennent Pond in Old Bridge).

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
J008	October 24, 1991	1426

DISTRIBUTION:

South Amboy Gas Works

BETWEEN:	OF:	PHONE:
Joe Rudy	Sayreville Water Department	(908) 390-7067

AND: Diane Minsavage (NUS)

DISCUSSION:

I called Mr. Rudy to determine what municipal wells are in service and the population served by Sayreville Water Department. I told Mr. Rudy that I had plotted wells listed on a 1989 DEP printout, and had come up with two well-fields in use within 4 miles of the site. Mr. Rudy said that the Bordentown Water Plant, uses wells A through L (M is not in use), all of which are in service (E and G are having problems and will be redrilled shortly), the total volume from this well field is approximately 2.5 Mgal/day; the Morgan well field (wells P through T) is in service, (P and S tap into the Farrington and usually only one of the two is in use at a given time), this field produces approximately 2M gal/day. Sayreville also purchases 2M gal/day from Middlesex, and has four 11M gallon reserves. While water is not blended, Sayreville operates a circular system (interconnected) which serves approximately 38,000 people

DDM.

ACTION ITEMS:

The Bordentown wells are 3-4 miles from the site and serve 38.46% of Sayreville's customers; population served is 14,615.*

The Morgan wells are 1-2 miles from the site and serve 30.77% of Sayreville's customers; population served is 11,693.*

* These values were calculated based on pumpage

Note: Only 3 of the Morgan wells tap into the Old Bridge Sand aquifer; therefore the population served was recalculated ⇒ 8 770 people (75% of Morgan)

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
J008	October 22, 1991	1138

DISTRIBUTION:

South Amboy Gas Works

BETWEEN:	OF:	PHONE:
Jerry Garnet	South Amboy Water Department	(908) 721-1211

AND: Diane Minsavage (NUS)

DISCUSSION:

I called Mr. Garnet to ascertain the water service available in South Amboy. Mr. Garnet stated that while South Amboy has two shallow groundwater wells and a water treatment plant; however, they are currently not using the wells but are purchasing all of their water from Perth Amboy. The South Amboy Water Department serves approximately 8,000 people (7,800 plus "change").

DDM

ACTION ITEMS:

South Amboy wells "SAWD10" and "SAWD9A" are operational, although not in use.

NUS CORPORATION

TELECON NO

CONTROL NO:	DATE:	TIME:
02-9001-10	2/21/90	9:15 AM

DISTRIBUTION:
File - Celotex (A)

BETWEEN:	OF:	PHONE:
Richard Muchanic	S. Amboy Water Dept	(201) 721-121

AND:
Maria Coler

DISCUSSION: (NUS

I called Richard Muchanic back to get information on the two wells maintained by the S. Amboy Water Department. He gave me the following information:

1.) The wells tap the Oldbridge Aquifer Sands at 48 ft.
2.) The well permits numbers are 86-4012 and 86-4078
3.) The population served is 8500
4.) The wells are located at Lower Broadway and the Public Works Compound of S. Amboy
5.) The water from the two wells is pumped into a reservoir where it receives pretreatment (pH, disinfection) It is then pumped to water tower where it is mixed with water from Sayreville and Perth Amboy.
6.) In the case that the water from the wells is contaminated. Sayreville and Perth Amboy wells are the alternative sources of water.
7.) A third well is permitted for South Amboy. However this well hasn't been tapped in five years due to high levels of iron. These levels of iron are attributable to the composition of the aquifers
8.) Mr Muchanic also told me that he strictly

ACTION ITEMS:

NUS 067 REVISED 0381

adheres to the NJDEP mandate 208 which requires testing for 16 organics twice a year and inorganics (heavy metals, nitrates) every 2 years. The tests have so far come up negative. He said that his only worry is the possibility of salt water intrusion.

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
02-9008-04	9/25/90	1520

DISTRIBUTION: To File: NL Industries Titanium Pigment Plant

Re: Woodbridge Township Water Supply

BETWEEN:	OF:	PHONE:
Joe Ritter	Middlesex Water Co.	(201) 634-1500

AND: Edmund Knytz Jr. (NUS)

DISCUSSION:

Joe indicated that Woodbridge Township is served by wells and surface water. Areas of Woodbridge Twp north of Highway 27 are served by wells located near Spring Lake in South Plainfield. Areas south of Highway 27 are served by surface water withdrawal from the Delaware and Raritan Canal across from the Rutgers University campus. The 1980 census population for Woodbridge Township is approximately 90,100.

Edmund Knytz Jr.
9/25/90

ACTION ITEMS:

02-9002

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO:	DATE:	TIME:
02-9002-01 / NJDU$5	February 9, 1990	1305

DISTRIBUTION:

Revlon Inc.

BETWEEN:	OF:	PHONE:
Mr. Frank Falco	Middlesex Water Co.	(201) 634-1500

AND:

Sue Lenczyk

DISCUSSION:

I called Mr. Falco to confirm the locations of the Middlesex Water Co. supply wells.

He mentioned four well fields in South Plainfield: Spring Lake Street, Sprague Street, Maple Avenue, and Park Avenue; and two well fields in Edison: North Tingley Lane and South Tingley Lane.

In addition, there is the surface water intake along the Delaware and Raritan Canal.

ACTION ITEMS:

The information above supports the U.S.G.S. list of wells in Middlesex County but conflicts with info in the RCRA Facility Assessment prepared by the Bureau of Planning and Assessment, NJDEP, which states that the Middlesex Water Co. has a public supply well within 1.5 miles of the Revlon, Inc. site.

NUS 067 REVISED

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
02-9008-04	9/25/90	1510

DISTRIBUTION: To File: NL Industries Titanium Pigment Plant

Re: Drinking Water Supply for Woodbridge Township

BETWEEN:	OF:	PHONE:
Guy Leighton	Woodbridge Twp. - Engineering	(201) 388-9797

AND: Edmund Knyfd Jr. (NUS)

DISCUSSION:

Guy indicated that all the drinking water for Woodbridge Township is supplied by the Middlesex Water Company. He suggested calling them to get specific information about the location of the water supply.

Edmund Knyfd Jr.
9/25/90

ACTION ITEMS:

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NUS CORPORATION AND SUBSIDIARIES **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
02-9002-01 / NJDU	March 15, 1990	0815

DISTRIBUTION:
Revlon Inc.

BETWEEN:	OF:	PHONE:
Mr. Jay Elliot, chief Sanitary Inspector	Dept of Health and Human Resources Edison	(201) 287-0900 x 476

AND:
Sue Lenczyk (NUS)

DISCUSSION:
I asked Mr. Elliot about the computer sheets he had given me, listing the wells within a 3-mile radius of Revlon. I mentioned that some of the wells had the word "private" listed next to them, but that many of the wells had blanks next to them. He responded that the health department has information that wells are there, but it does not know for certain whether they are being used. They may be in use, they may not. To compile the computer sheets, the health department drew from different sources, including historical records kept by the NJDEP. Mr. Elliot said that the more information that is listed next to the well, the more likely that it is currently being used.

Mr. Elliot also informed me that they occasionally have requests to sample private wells for volatile organics. He said that they have yet to find a problem of contamination with volatile organics. He added that occasionally there seems to be a problem, but only with a newly drilled well. Those problems stemmed from improper methods of decontaminating equipment. When they resampled after equipment was properly decomed, the well samples came up clean.

ACTION ITEMS:

Sue Lenczyk 3/15/90

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NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO:	DATE:	TIME:
02-9002-01/NJDU	March 19, 1990	0850

DISTRIBUTION:
Revlon Inc. (Page 1 of 2)

BETWEEN:	OF:	PHONE:
Mr. Jay Elliot, Chief Sanitary Inspector	Edison Department of Health and Human Services	(201) 287-0900 x 426

AND:
Sue Lenczyk

DISCUSSION:
I asked Mr Elliot about the four public community wells listed on the computer printout of wells in Edison Township. He said that those wells are run by Edison Township and are not in use. I asked when they were last used, and he said "it has been quite some time." The wells are capped and available; they are not mothballed. During the water shortage a few years ago, the township had to develop a contingency plan in case of a more severe shortage. It was discovered that it would not be terribly difficult to get them back on line. However, as for now, they are in a field, the grass is mown around them, and they are not used.

I then inquired about the five public noncommunity wells. He said that the designation "public noncommunity" means a water supply that is not a public supply but is used by people other than just the residents. One belongs to the Roosevelt Hotel; another is used by Roosevelt Hospital. The one at the hospital is used daily. The hospital does use public supply from Middlesex Water Company, but in the mornings and evenings when water pressure is low due to heavy use, the 500-foot-deep well used by the hospital will kick in automatically. Two other wells belong

(continued on page 2)

ACTION ITEMS:

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(2)

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO:	DATE:	TIME:
02-9002-01/NJDU	March 19, 1990	0850

DISTRIBUTION:

Revlon Inc. (Page 2 of 2)

BETWEEN:	OF:	PHONE:
Mr. Jay Elliot	Edison Health Dept.	(201) 287-0900 x476

AND:

Sue Lenczyk

DISCUSSION:

to swim clubs and are used seasonally. Water from the wells is used for the pool, the concession stands, and the showers. There is another well used by a Baptist church (used on Wednesday nights and Sundays). One well is being added to this designation of public noncommunity: a house at the corner of Brunswick and Plainfield Avenues has been converted to a real estate office.

My final question to Mr. Elliot was whether the people drinking from private wells have the capability of having a hookup with the community supply. He said yes - in virtually every case. He said that at least 95 percent (and that is probably a low estimate) have the option to tie in with the municipal water system.

ACTION ITEMS:

NUS CORPORATION TELECON NOTE

CONTROL NO:	DATE:	TIME:
03-8512-01	6/19/86	1120

DISTRIBUTION: File (Heller Properties)

BETWEEN:	OF:	PHONE:
City Engineer	Township of Edison	(201) 287-0900

AND: D. LAMOND (NUS)

DISCUSSION:

Water supply for Edison. There are several public supply wells located in Edison however they are not utilized except in an emergency as backup supplies. Water ~~Co.~~ Dept in Edison just distributes water from the Elizabethtown Water Co. There are other wells in area (private wells) which are used for irrigation ~~and~~ or industry and monitoring.

ACTION ITEMS:

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
02-9001-10	August 30, 1990	2:40

DISTRIBUTION:

File - Celotex (A)

BETWEEN:	OF:	PHONE:
Mr. Garnett	S. Amboy Water Dept.	(201) 721-1211

AND: Bob Cantagalli (NUS)

DISCUSSION:

Mr Garnett informed me that J. McKean receives water from the South Amboy Water Company

ACTION ITEMS:

NUS 067 REVISED 0635

02-9004-

NUS CORPORATION AND SUBSIDIARIES — TELECON NOTE

CONTROL NO.: 02-9004-17

DATE: July 11, 1990

TIME: 4:10

DISTRIBUTION:

Arthur Kill Urban Industrial Park
$475NJGFIS

BETWEEN: Mrs. Ciraky

OF: 65 Jenson Ave. Fords, New Jersey

PHONE: (201) 738-0298

AND: Bruce Sanders (NUS)

DISCUSSION:

Spoke to Mrs. Ciraky concerning the potable groundwater well located on her property. She stated that the well has not been used for several years now. She said the well caved in and it has not been repaired

ACTION ITEMS:

REFERENCE NO. 17

p. 197

NUS CORPORATION AND SUBSIDIARIES — TELECON NOTE

CONTROL NO.:	DATE:	TIME:
9061	02/14/92	11:30

DISTRIBUTION:
- Tooley's Garage
- Staff

BETWEEN:	OF:	PHONE:
Dan Van Abs	NJDEPE, Bureau of Water Supply Planning	(609) 633-1179

AND: K. Campbell (NUS)

DISCUSSION:

Mr. Van Abs returned my call of 02/13/92, and provided the following information on Wellhead Protection Area (WHPA) delineation for the State of New Jersey:

- WHPAs are not yet delineated for the state. The Bureau of Water Supply Planning is working on a draft delineation (a multi-year process).

Mr. Van Abs will put HNEC on their mailing list to receive updates on WHPA regulations.

ACTION ITEMS:

K. Campbell 02/14/92

REFERENCE NO. 18

p. 199

federal register

Friday
December 14, 1990

Part II

Environmental Protection Agency

40 CFR Part 300

Hazard Ranking System; Final Rule

p. 200

TABLE 3-6.—HYDRAULIC CONDUCTIVITY OF GEOLOGIC MATERIALS

Type of material	Assigned hydraulic conductivity * (cm/sec)
Clay; low permeability till (compact unfractured till); shale, unfractured metamorphic and igneous rocks	10^{-9}
Loesses; silty clays; sediments that are predominantly silts; moderately permeable till (fine-grained, unconsolidated till, or compact till with some fractures); low permeability limestones and dolomites (no karst); low permeability sandstone; low permeability fractured igneous and metamorphic rocks	10^{-6}
Sands; sandy silts; sediments that are predominantly sand; highly permeable till (coarse-grained, unconsolidated or compact and highly fractured); peat; moderately permeable limestones and dolomites (no karst); moderately permeable sandstone; moderately permeable fractured igneous and metamorphic rocks	10^{-4}
Gravel; clean sand; highly permeable fractured igneous and metamorphic rocks; permeable basalt; karst limestones and dolomites	10^{-3}

* Do not round to nearest integer.

TABLE 3-7.—TRAVEL TIME FACTOR VALUES *

Hydraulic conductivity (cm/sec)	Thickness of lowest hydraulic conductivity layer(s)* (feet)			
	Greater than 3 to 5	Greater than 5 to 100	Greater than 100 to 500	Greater than 500
Greater than or equal to 10^{-3}	35	35	25	25
Less than 10^{-3} to 10^{-4}	35	25	15	15
Less than 10^{-4} to 10^{-5}	15	15	5	5
Less than 10^{-5}	5	5	1	1

* If depth to aquifer is 10 feet or less or if, for the interval being evaluated, all layers that underlie a portion of the sources at the site are karst, assign a value of 35.

* Consider only layers at least 3 feet thick. Do not consider layers or portions of layers within the first 10 feet of the depth to the aquifer.

Determine travel time only at locations within 2 miles of the sources at the site, except: if observed ground water contamination attributable to sources at the site extends more than 2 miles beyond these sources, use any location within the limits of this observed ground water contamination when evaluating the travel time factor for any aquifer that does not have an observed release. If the necessary subsurface geologic information is available at multiple locations, evaluate the travel time factor at each location. Use the location having the highest travel time factor value to assign the factor value for the aquifer. Enter this value in Table 3-1.

3.1.2.5 *Calculation of potential to release factor value.* Sum the factor values for net precipitation, depth to aquifer, and travel time, and multiply this sum by the factor value for containment. Assign this product as the potential to release factor value for the aquifer. Enter this value in Table 3-1.

3.1.3 *Calculation of likelihood of release factor category value.* If an observed release is established for an aquifer, assign the observed release factor value of 550 as the likelihood of release factor category value for that aquifer. Otherwise, assign the potential to release factor value for that aquifer as the likelihood of release value. Enter the value assigned in Table 3-1.

3.2 *Waste characteristics.* Evaluate the waste characteristics factor category for an aquifer based on two factors: toxicity/mobility and hazardous waste quantity. Evaluate only those hazardous substances available to migrate from the sources at the site to ground water. Such hazardous substances include:

- Hazardous substances that meet the criteria for an observed release to ground water.
- All hazardous substances associated with a source that has a ground water containment factor value greater than 0 (see sections 2.2.2, 2.2.3, and 3.1.2.1).

3.2.1 *Toxicity/mobility.* For each hazardous substance, assign a toxicity factor value, a mobility factor value, and a combined toxicity/mobility factor value as specified in the following sections. Select the toxicity/mobility factor value for the aquifer being evaluated as specified in section 3.2.1.3.

3.2.1.1 *Toxicity.* Assign a toxicity factor value to each hazardous substance as specified in Section 2.4.1.1.

3.2.1.2 *Mobility.* Assign a mobility factor value to each hazardous substance for the aquifer being evaluated as follows:

- For any hazardous substance that meets the criteria for an observed release by chemical analysis to one or more aquifers underlying the sources at the site, regardless of the aquifer being evaluated, assign a mobility factor value of 1.
- For any hazardous substance that does not meet the criteria for an observed release by chemical analysis to at least one of the aquifers, assign that hazardous substance a mobility factor value from Table 3-8 for the aquifer being evaluated, based on its water solubility and distribution coefficient (K_d).
- If the hazardous substance cannot be assigned a mobility factor value because data on its water solubility or distribution coefficient are not available, use other hazardous substances for which information is available in evaluating the pathway.

TABLE 3-8.—GROUND WATER MOBILITY FACTOR VALUES *

Water solubility (mg/l)	Distribution coefficient (K_d) (ml/g)			
	Karst *	≤ 10	> 10 to 1,000	> 1,000
Present as liquid *	1	1	0.01	0.0001
Greater than 100	1	1	0.01	0.0001
Greater than 1 to 100	0.2	0.2	0.002	2×10^{-6}
Greater than 0.01 to 1	[illegible]	0.002	[illegible]	[illegible]
Less than or equal to 0.01	2×10^{-6}	2×10^{-6}	[illegible]	2×10^{-6}

* Do not round to nearest integer.

* Use if the hazardous substance is present or deposited as a liquid.

* Use if the entire interval from the source to the aquifer being evaluated is karst.

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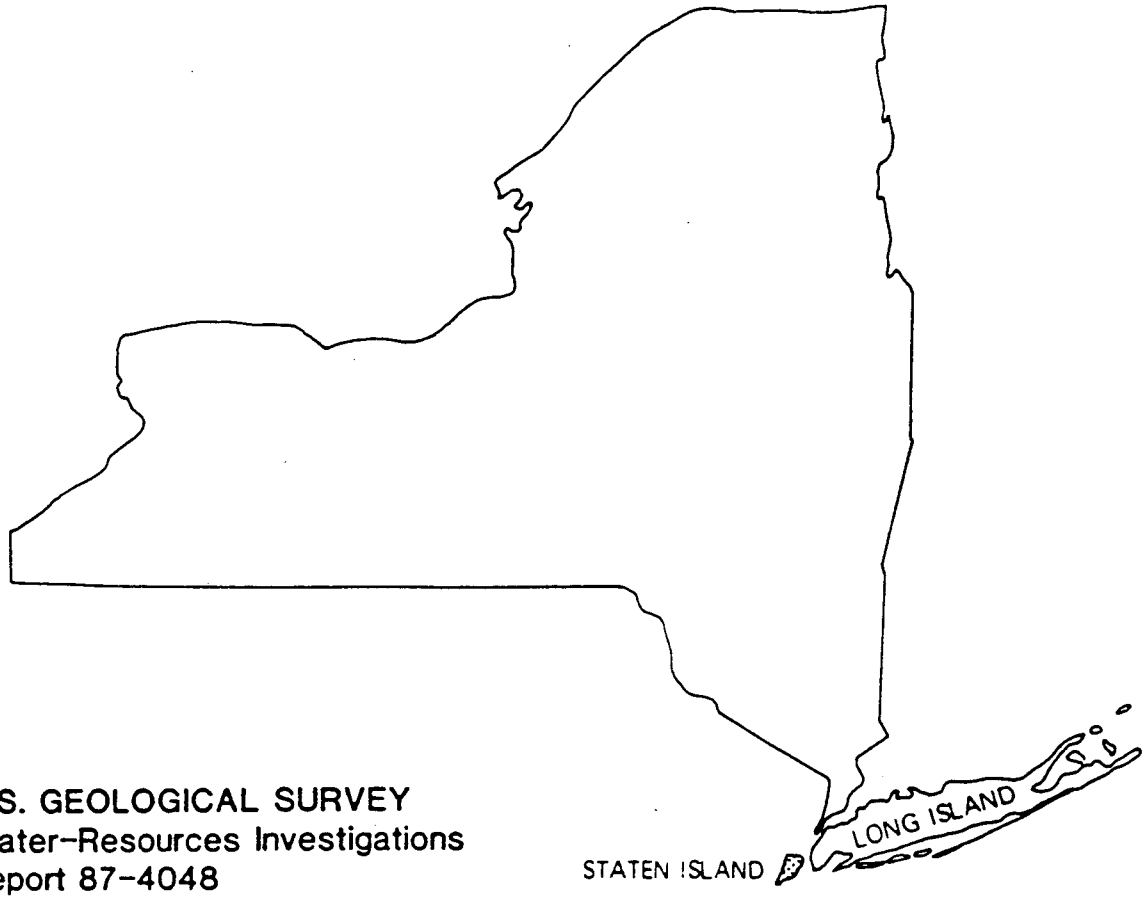
REFERENCE NO. 19

p.202

Geologic and Geohydrologic Reconnaissance of Staten Island, New York



U.S. GEOLOGICAL SURVEY
Water-Resources Investigations
Report 87-4048

Prepared in cooperation with the

NEW YORK STATE DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

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GEOLOGIC AND GEOHYDROLOGIC RECONNAISSANCE OF STATEN ISLAND, NEW YORK

by Julian Soren

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Syosset, New York

1988

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GEOLOGIC AND GEOHYDROLOGIC RECONNAISSANCE OF STATEN ISLAND, NEW YORK

by Julian Soren

ABSTRACT

Staten Island (Richmond County) is a mainly suburban borough of the City of New York in which considerable interest in ground water has grown as a result of protracted droughts that seriously reduced the City's water supply from its upstate surface-reservoir system in the 1960's and 1980's. Hundreds of residents and business installed wells, mainly for lawn and plant-nursery irrigation, filling swimming pools, and vehicle washing, because the City prohibited use of the public-water supply for such purposes during the droughts.

Fresh ground water is available from Upper Proterozoic to Lower Jurassic bedrock and from overlying unconsolidated sandy Upper Cretaceous and upper Pleistocene deposits. The principal source of fresh ground-water recharge is precipitation that infiltrates the land surface and percolates to the water table. Fresh ground water moves downward and laterally through the unconsolidated deposits and bedrock toward discharge points--streams and tidewater that surround the island and saline ground-water that underlies it at depth.

Four maps of Staten Island's geology and water-table levels provide information on ground-water availability and serve as a basis for future ground-water investigations.

Streamflow on Staten Island has not been noticeably reduced by current ground-water development, which indicates that the ground-water reservoir has not been significantly depleted and that considerably more ground water is available for use.

INTRODUCTION

Richmond County, commonly known as Staten Island, a borough of the City of New York, has had less hydrogeologic study than the City's other four boroughs because it is the least populated and most recently developed.

Public water supply for Staten Island has been provided entirely by New York City's surface-reservoir system in upstate New York since 1971. During 1917-70, from 96 to 67 percent of the water was from upstate reservoirs; the rest was supplied by several municipally owned wells on the island. The amount pumped locally depended on the adequacy of the upstate reservoirs' reserves during drought periods. Before 1917, water from individual wells, from municipal wells, and from privately owned water-company wells, in addition to small, local surface reservoirs, supplied the water needs of Staten Island's population, which was significantly less than the 116,500 stated in the U.S. Census of 1920.

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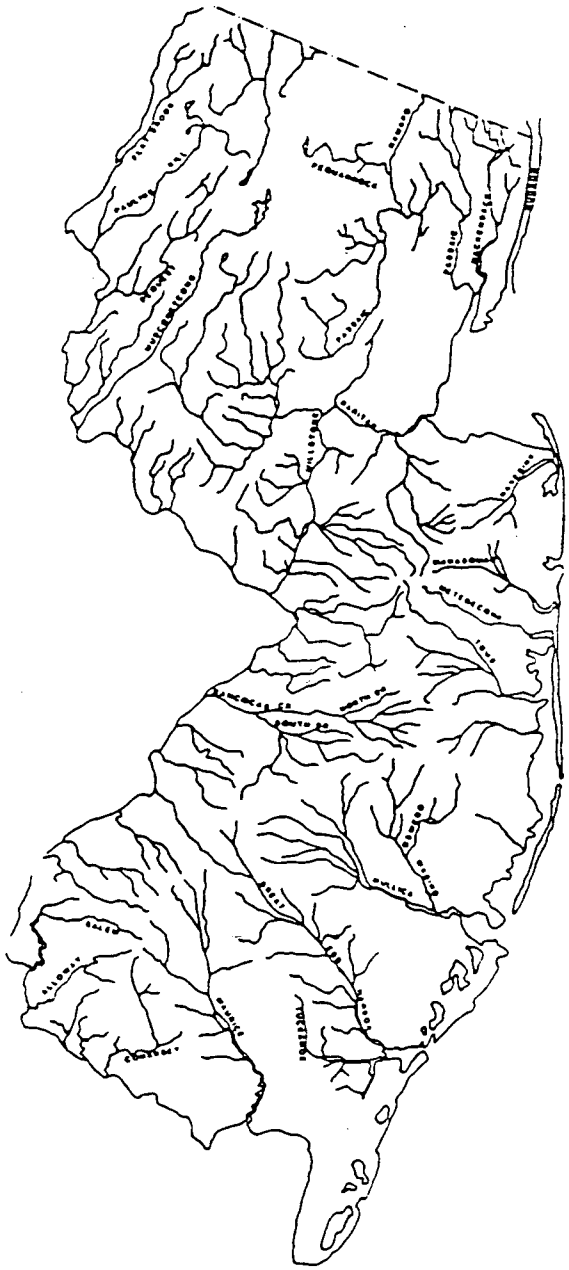
REFERENCE NO. 21

Surface Water Quality Standards

N.J.A.C. 7:9-4.1 et seq.



AUGUST 1989

New Jersey Department of Environmental Protection

Division of Water Resources

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National/State Parks and Wildlife Refuges and waters of exceptional recreational or ecological significance) as designated in N.J.A.C. 7:9-4.15(i).

"Persistent" means relatively resistant to degradation, generally having a half life of over 96 hours.

"Pinelands waters" means all waters within the boundaries of the Pineland Area, except those waters designated as FW1 in this subchapter, as established in the Pinelands Protection Act N.J.S.A. 13:18A-1 et seq., and shown on Plate 1 of the "Comprehensive Management Plan" adopted by the New Jersey Pinelands Commission in November 1980.

"PL" means the general surface water classification applied to Pinelands Waters.

"Primary contact recreation" means recreational activities that involve significant ingestion risks and includes, but is not limited to, wading, swimming, diving, surfing, and water skiing.

"Public hearing" means a legislative type hearing before a representative or representatives of the Department providing the opportunity for public comment, but does not include cross-examination.

"River mile" means the distance, measured in statute miles, between two locations on a stream, with the first location designated as mile zero. Mile zero for the Delaware River is located at the intersection of the centerline of the navigation channel and a line between the Cape May Light, New Jersey, and the tip of Cape Henlopen, Delaware.

"Saline waters" means waters having salinities generally greater than 3.5 parts per thousand at mean high tide.

"SC" means the general surface water classification applied to coastal saline waters.

"SE" means the general surface water classification applied to saline waters of estuaries.

"Secondary contact recreation" means recreational activities where the probability of water ingestion is minimal and includes, but is not limited to, boating and fishing.

"Shellfish" means those mollusks commonly known as clams, oysters, or mussels.

"Shellfish waters" means waters classified as Approved, Seasonally Approved, Special Restricted, Seasonally Special Restricted or Condemned that support or possess the potential to support shellfish which are within the Coastal Area Facility Review Act (C.A.F.R.A.) zone as delineated in 1973, (excluding: 1 - The Cohansey River upstream of Brown's Run; 2 - The Maurice River upstream of Route 548;

1. It is demonstrated to the satisfaction of the Department that the waters should be set aside to represent the natural aquatic environment and its associated biota; or

2. It is demonstrated to the satisfaction of the Department that a more restrictive use is necessary to protect a unique ecological system or threatened/endangered species.

(g) In those cases in which a thermal discharge is involved, the procedures for reclassifying segments for more restrictive uses shall be consistent with section 316 of the Federal Clean Water Act.

7:9-4.12 Designated uses of FW1, PL, FW2, SE1, SE2, SE3, and SC Waters

(a) In all FW1 waters the designated uses are:

1. Set aside for posterity to represent the natural aquatic environment and its associated biota;

2. Primary and secondary contact recreation;

3. Maintenance, migration and propagation of the natural and established aquatic biota; and

4. Any other reasonable uses.

(b) In all PL waters the designated uses are:

1. Cranberry bog water supply and other agricultural uses;

2. Maintenance, migration and propagation of the natural and established biota indigenous to this unique ecological system;

3. Public potable water supply after such treatment as required by law or regulations;

4. Primary and secondary contact recreation; and

5. Any other reasonable uses.

(c) In all FW2 waters the designated uses are:

1. Maintenance, migration and propagation of the natural and established biota;

2. Primary and secondary contact recreation;

3. Industrial and agricultural water supply;

4. Public potable water supply after such treatment as required by law or regulation; and

5. Any other reasonable uses.

(d) In all SE1 waters the designated uses are:

1. Shellfish harvesting in accordance with N.J.A.C. 7:12;

2. Maintenance, migration and propagation of the natural and established biota;

3. Primary and secondary contact recreation; and

4. Any other reasonable uses.

(e) In all SE2 waters the designated uses are:

1. Maintenance, migration and propagation of the natural and established biota;

2. Migration of diadromous fish;

3. Maintenance of wildlife;

4. Secondary contact recreation; and

5. Any other reasonable uses.

(f) In all SE3 waters the designated uses are:

1. Secondary contact recreation;

2. Maintenance and migration of fish populations;

3. Migration of diadromous fish;

4. Maintenance of wildlife; and

5. Any other reasonable uses.

(g) In all SC waters the designated uses are:

1. Shellfish harvesting in accordance with N.J.A.C. 7:12;

2. Primary and secondary contact recreation;

3. Maintenance, migration and propagation of the natural and established biota; and

4. Any other reasonable uses.

(e) The surface water classifications in Table 3 are for waters of the Passaic, Hackensack and New York Harbor Complex Basin:

TABLE 3

WATER BODY	CLASSIFICATION
ARTHUR KILL	
(Perth Amboy) - The Kill and its saline New Jersey tributaries between the Outerbridge Crossing and a line connecting Ferry Pt., Perth Amboy to Wards Pt., Staten Island, New York	SE2
(Elizabeth) - From an east-west line connecting Elizabethport with Bergen Pt., Bayonne to the Outerbridge Crossing	SE3
(Woodbridge) - All freshwater tributaries	FW2-NT
BEAR SWAMP BROOK (Mahwah) - Entire length	FW2-TP(C1)
BEAR SWAMP LAKE (Ringwood)	FW2-NT(C1)
BEAVER BROOK	
(Meriden) - From Splitrock Reservoir Dam downstream to Meriden Road Bridge	FW2-TM
(Denville) - Meriden Road Bridge to Rockaway River	FW2-NT
BEECH BROOK	
(West Milford) - From State line downstream to Wanaque River	FW2-TM
BELCHER CREEK (W. Milford) - Entire length	FW2-NT
BERRYS CREEK (Secaucus) - Entire length	FW2-NT/SE2
BLACK BROOK	
(Meyersville) - Entire length, except segment described below	FW2-NT
(Great Swamp) - Segment and tributaries within the Great Swamp National Wildlife Refuge	FW2-NT(C1)
BLUE MINE BROOK	
(Wanaque) - Entire length, except segment described below	FW2-TM
(Norvin Green State Forest) - That portion of the stream and any tributaries within the Norvin Green State Forest	FW2-TM(C1)
BRUSHWOOD POND (Ringwood)	FW2-TM(C1)
BUCKABEAR POND (Newfoundland) - Pond, its tributaries and connecting stream to Clinton Reservoir	FW2-NT(C1)
BURNT MEADOW BROOK (Stonetown) - Entire length	FW2-TP(C1)
CANISTEAR RESERVOIR (Vernon)	FW2-TM
CANISTEAR RESERVOIR TRIBUTARY (Vernon) - The southern branch of the eastern tributary to the Reservoir	FW1
CANOE BROOK (Chatham) - Entire length	FW2-NT

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Oceanport	
(Oceanport) - Creek downstream of line described above	SE1(C1)
PARKERS CREEK	
(Fort Monmouth) - Source to a line beginning on the easternmost extent of Horseneck Point and bearing approximately 000 degrees T (True North) to its terminus on Breezy Point on the Little Silver side (north) side of the creek.	FW2-NT/SE1
(Fort Monmouth) - Creek downstream of line described above	SE1(C1)
PEAPACK BROOK (Gladstone) - Entire length	FW2-TP(C1)
PETERS BROOK (Somerville) - Entire length	FW2-NT
PIGEON SWAMP (S. Brunswick) - All waters within the boundaries of Pigeon Swamp State Park	FW2-NT(C1)
PIKE RUN (Belle Meade) - Entire length	FW2-NT
PINE BROOK (Clarks Mills) - Entire length	FW2-NT
PINE BROOK (Cooks Mill) - Entire length	FW2-TM
PLEASANT RUN (Readington) - Entire length	FW2-NT
PRESCOTT BROOK (Stanton Station) - Entire length	FW2-TM
RAMANESSIN (HOP) BROOK (Holmdel) - Entire length	FW2-TM
RARITAN BAY - Entire drainage	FW2-NT/SE1
RARITAN RIVER	
NORTH BRANCH (Also see INDIA BROOK)	
(Pleasant Valley) - Source to, but not including, Ravine Lake	FW2-TP(C1)
(Far Hills) - Ravine Lake dam to Rt. 512 bridge	FW2-TM
(Bedminister) - Rt. 512 bridge to confluence with South Branch, Raritan River	FW2-NT
SOUTH BRANCH RARITAN RIVER	
(Mt. Olive) - Source to the dam that is 390 feet upstream of the Flanders-Drakestown Road bridge	FW2-NT(C1)
(Mt. Olive) - Dam to confluence with Turkey Brook	FW2-TM(C1)
(Naughright) - Confluence with Turkey Brook to confluence with Electric Brook	FW2-TP(C1)
(Clinton) - Confluence with Electric Brook to downstream end of Packers Island, except segment described separately, below	FW2-TM
(Ken Lockwood Gorge) - River and tributaries within Ken Lockwood Gorge Wildlife Management Area	FW2-TM(C1)
(Neshanic Sta.) - Downstream end of Packers Island to confluence with North Branch, Raritan River	FW2-NT
MAIN STEM RARITAN RIVER	
(Bound Brook) - From confluence of North	FW2-NT

and South Branches to Landing Lane bridge in New Brunswick and all freshwater tributaries downstream of Landing Lane bridge.	
(Sayreville) - Landing Lane bridge to Raritan Bay and all saline water tributaries	SE1
RINEHART BROOK (Hacklebarney) - Entire length	FW2-TP(C1)
ROCK BROOK (Montgomery) - Entire length	FW2-NT
ROCKAWAY CREEK	
NORTH BRANCH	
(Mountainville) - Source to Rt. 523 bridge	FW2-TP(C1)
(Whitehouse) - Rt. 523 bridge to confluence with South Branch	FW2-TM
SOUTH BRANCH (Whitehouse) - Entire length	FW2-TM
MAIN STEM (Whitehouse) - Confluence of North and South Branches to Lamington River	FW2-NT
ROUND VALLEY RESERVOIR (Clinton)	FW2-TM
ROYCE BROOK (Manville) - Entire length	FW2-NT
SHREWSBURY RIVER	
(Little Silver) - Source to Rt. 36 highway bridge	SE1(C1)
(Highlands) - Rt. 36 bridge to Sandy Hook bay	SE1
SIMONSON BROOK (Griggstown) - Entire length	FW2-NT
SIX MILE RUN	
(Franklin Church) - Entire length, except segment described below	FW2-NT
(Hillsborough) - Segment within the boundaries of Six Mile Run State Park	FW2-NT(C1)
SOUTH RIVER	
(Old Bridge) - Duhernal Lake to intake of the Sayreville Water Department	FW2-NT
(Sayreville) - Below the intake of the Sayreville Water Department	SE1
SPOOKY BROOK (Bound Brook)	FW2-NT
SPRUCE RUN	
(Glen Gardner) - Source to, but not including, Spruce Run Reservoir	FW2-TP(C1)
(Clinton) - Spruce Run Reservoir dam to Raritan River, South Branch	FW2-TM
SPRUCE RUN RESERVOIR (Union) - Reservoir and tributaries	FW2-TM(C1)
STONY BROOK (Washington) - Entire length	FW2-TP(C1)
STONY BROOK	
(Hopewell) - Entire length, except that segment described below	FW2-NT
(Syndertown) - Brook and tributaries within Amwell Lake Wildlife Management Area	FW2-NT(C1)
STONY BROOK (Watchung) - Entire length	FW2-NT
SUN VALLEY BROOK (Mt Olive) - Entire length	FW2-TP(C1)
SWIMMING RIVER	
(Red Bank) - Source to the intake of the	FW2-NT

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REFERENCE NO. 22

LIMITS

th Washington Street, flush with ground, between curb and

side of Garfield Fire Station, 11 feet northeast of northwest

along east boundary of Alpine Cemetery in Perth Amboy, 42
e 628 PAY, 8.4 feet west of west edge of west sidewalk along

venue, located on northeast corner near curb and 0.45 foot

35 and Brace Avenue, set in brick wall of City Stable at east
, stamped 389-D, set vertically.

440, level with curb.

APPROXIMATE SCALE

600 0 600 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
PERTH AMBOY,
NEW JERSEY
MIDDLESEX COUNTY

ONLY PANEL PRINTED

COMMUNITY-PANEL NUMBER
340272 0001 C

MAP REVISED:
May 1, 1984

Federal Emergency Management Agency

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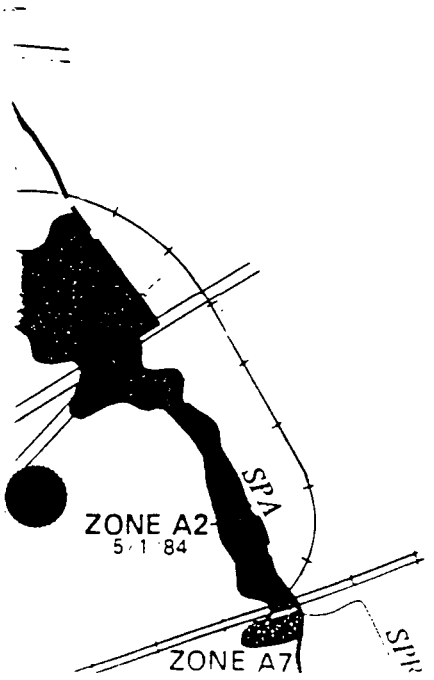


KEY TO MAP

500-Year Flood Boundary	
100-Year Flood Boundary	
Zone Designations* With Date of Identification e.g., 12/2/74	ZONE B / ZONE B
100-Year Flood Boundary	
500-Year Flood Boundary	
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

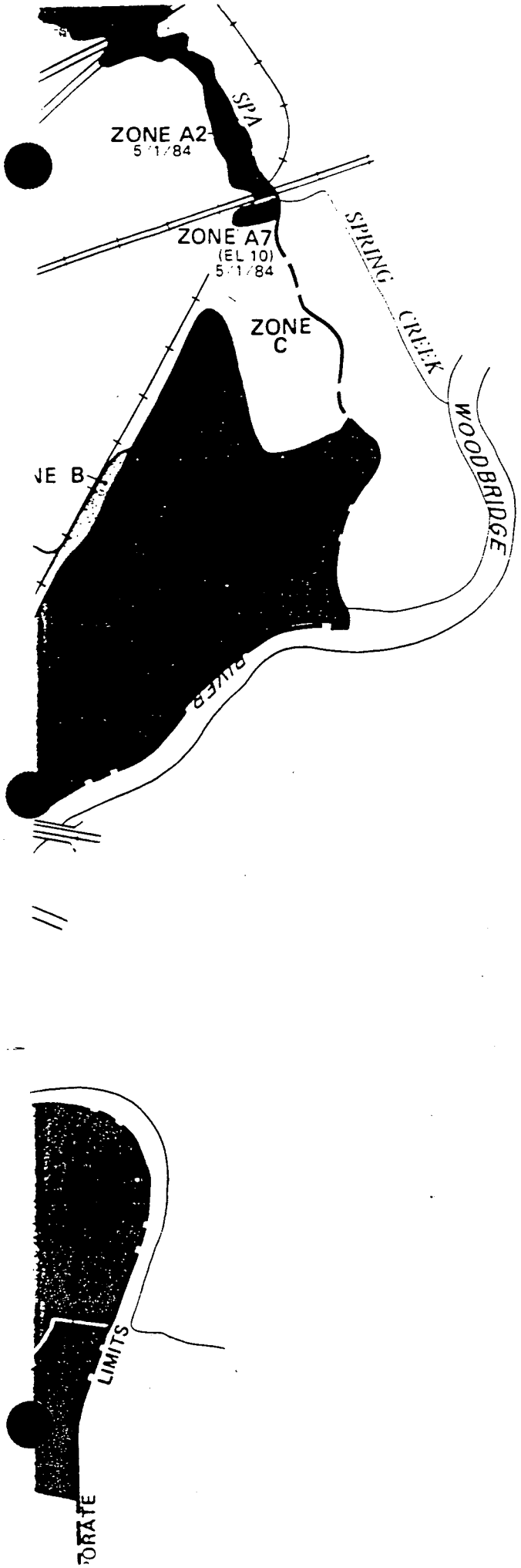
*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance and flood plain management purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas. The coastal flooding elevations shown may differ significantly from those developed by the National Weather Service for hurricane evacuation planning.



may be protected by flood control structures.

This map is for flood insurance and flood plain management purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas. The coastal flooding elevations shown may differ significantly from those developed by the National Weather Service for hurricane evacuation planning.

Coastal base flood elevations shown on this map include the effects of wave action.

Coastal base flood elevations apply only landward of the shoreline shown on this map.

INITIAL IDENTIFICATION:
JUNE 21, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
JUNE 4, 1976

FLOOD INSURANCE RATE MAP EFFECTIVE:
DECEMBER 18, 1979

FLOOD INSURANCE RATE MAP REVISIONS:
May 1, 1984-to add base flood elevations, to change special flood hazard areas, to add the effects of wave action

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

APPROXIMATE SCALE
600 0 600 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

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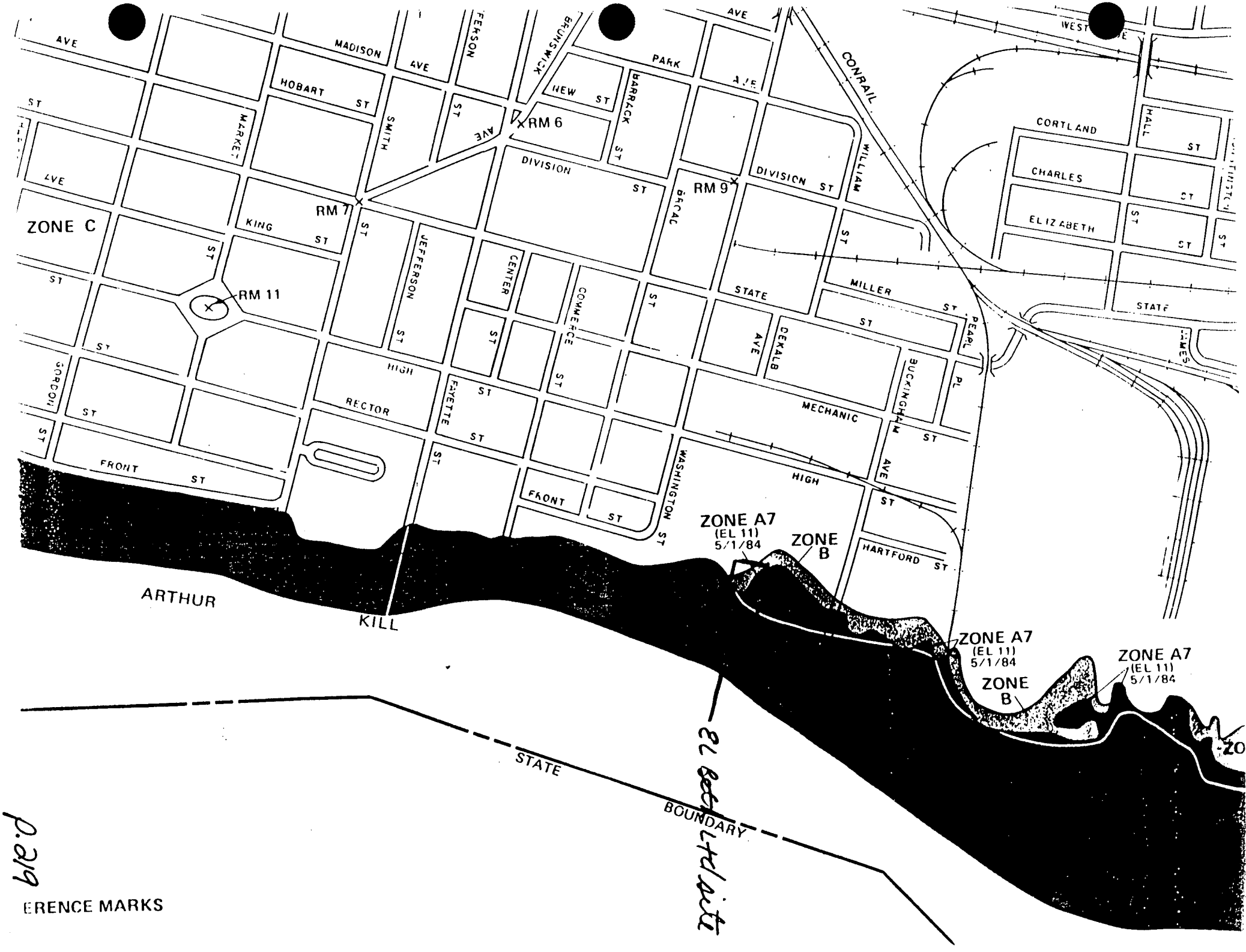
FLOOD INSURANCE RATE MAP



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ERENCE MARKS

REFERENCE NO. 23

REFERENCE NO. 24

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NUS CORPORATION
SUPERFUND DIVISION

PROJECT NOTES

TO: EL Beth Ltd file

DATE: March 27, 1992

FROM: Claire Barnes

COPIES: —

SUBJECT: Sensitive Environments Located Along the 15-mile Surface Water Route Downstream of the EL Beth Site, Perth Amboy, New Jersey. (References noted below).

~~REFERENCE:~~

- Correspondence sent by the U.S. Department of the Interior Fish and Wildlife Service to HNUS on March 11, 1992 reports that a federally-listed endangered bird species is documented as nesting and as having successfully fledged young at the Arthur Kill. Additionally, this species is documented to be using emergent wetlands located along the Raritan River. This letter also documents a federally (Priority) protected wetland area.
- Based upon Atlantic Coast Ecological Inventory Mapping, Newark Sheet, the Shortnose Sturgeon, a N.J. state-listed endangered species, is found in coastal waters depicted in the Newark Sheet. It may, therefore, be present at the Arthur Kill, as well as at the surface waters farther downstream.

  This mapping also indicates the presence of the Great Blue Heron at Sandy Hook Bay; the breeding population of this species is considered endangered or threatened in New Jersey.
- Wetlands located along the 15-mile surface water route downstream of the EL Beth site include, according to the U.S. Fish and Wildlife Service National Wetlands Inventory Mapping:

  a) At Raritan Bay: Estuarine Intertidal Emergent wetland, 0.85 mile; Estuarine Intertidal Scrub/Shrub (Broad leaved deciduous)/Emergent wetland, 0.60 mile; Palustrine Scrub/Shrub (Broad leaved deciduous)/Emergent wetlands, 0.22 mile.

NUS 443A 58 1182

b) At Sandy Hook Bay:
Estuarine Intertidal Scrub/Shrub (Broad leaved deciduous)/Emergent, 0.72 mile.
· Estuarine Intertidal Emergent wetland, 1.01 mile.

· Estuarine Intertidal Aquatic Bed wetland, 0.52 mile.

c) At the Raritan River
· Estuarine Intertidal Emergent wetland, 2.13 miles
· Federally protected (Priority) wetlands: approximately 2 miles
d) At Arthur Kill, upstream of E.L. Beth site (tidal area)
· Estuarine intertidal Emergent wetland, 0.21 mile

Total wetland footage along the E.L. Beth 15-mile surface water route (sum of above values) is 6.26 miles.

NUS 4438 58 1182

ENDANGERED AND THREATENED WILDLIFE OF NEW JERSEY

Endangered Species are those whose prospects for survival in New Jersey are in immediate danger because of a loss or change in habitat, over-exploitation, predation, competition, disease, disturbance or contamination. Assistance is needed to prevent future extinction in New Jersey.

Threatened Species are those who may become endangered if conditions surrounding them begin to or continue to deteriorate.

BIRDS

Endangered

Pied-billed Grebe,* *Podilymbus podiceps*
Bald Eagle, *Haliaeetus leucocephalus***
Northern Harrier,* *Circus cyaneus*
Cooper's Hawk, *Accipiter cooperii*
Red-shouldered Hawk, *Buteo lineatus* (Breeding)
Peregrine Falcon, *Falco peregrinus***
Piping Plover, *Charadrius melodus***
Upland Sandpiper, *Bartramia longicauda*
Roseate Tern, *Sterna dougallii*
Least Tern, *Sterna antillarum*
Black Skimmer, *Rynchops niger*
Short-eared Owl,* *Asio flammeus*
Sedge Wren, *Cistothorus platensis*
Loggerhead Shrike, *Lanius ludovicianus*
Vesper Sparrow, *Pooecetes gramineus*
Henslow's Sparrow, *Ammodramus henslowii*

Threatened

American Bittern*, *Botaurus lentiginosos*
Great Blue Heron*, *Ardea herodias*
Little Blue Heron, *Egretta caerulea**
Yellow-crowned Night Heron, *Nyctanassa violaceus*
Osprey, *Pandion haliaetus*
Northern Goshawk, *Accipiter gentilis*
Red-shouldered Hawk, *Buteo lineatus* (Non-breeding)
Black Rail, *Laterallus jamaicensis*
Long-eared Owl, *Asio otus*
Barred Owl, *Strix varia*
Red-headed Woodpecker, *Melanerpes erythrocephalus*
Cliff Swallow,* *Hirundo pyrrhonota*
Savannah Sparrow, *Passerculus sandwichensis*
Ipswich Sparrow, *Passerculus sandwichensis princeps*
Grasshopper Sparrow, *Ammodramus savannarum*
Bobolink, *Dolichonyx oryzivorus*

*Only breeding population considered endangered or threatened
**Federally endangered or threatened

REPTILES

Endangered

Bog Turtle, *Clemmys muhlenbergi*
Atlantic Hawksbill, *Eretmochelys imbricata***
Atlantic Loggerhead, *Caretta caretta***
Atlantic Ridley, *Lepidochelys kempi***
Atlantic Leatherback, *Dermochelys coriacea***
Corn Snake, *Elaphe g. guttata*
Timber Rattlesnake, *Crotalus h. horridus*

Threatened

Wood Turtle, *Clemmys insculpta*
Atlantic Green Turtle, *Chelonia mydas***
Northern Pine Snake, *Pituophis m. melanoleucus*

**Federally endangered or threatened

ENDANGERED AND NONGAME SPECIES PROGRAM

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
DIVISION OF FISH, GAME AND WILDLIFE

AMPHIBIANS

Endangered

Tremblay's Salamander, *Ambystoma tremblayi*
Blue-spotted Salamander, *Ambystoma laterale*
Eastern Tiger Salamander, *Ambystoma t. tigrinum*
Pine Barrens Treefrog, *Hyla andersonii*
Southern Gray Treefrog, *Hyla chrysoscelis*

Threatened

Long-tailed Salamander, *Eurycea longicauda*
Eastern Mud Salamander, *Pseudotriton montanus*

MAMMALS

Endangered

Bobcat, *Lynx rufus*
Eastern Woodrat, *Neotoma floridana*
Sperm Whale *Physeter, macrocephalus***
Fin Whale, *Balaenoptera physalus***
Sei Whale, *Balaenoptera borealis***
Blue Whale, *Balaenoptera musculus***
Humpback Whale, *Megaptera novaeangliae***
Black Right Whale, *Balaena glacialis***

INVERTEBRATES

Endangered

Mitchell's Satyr (butterfly), *Neonympha m. mitchellii***
Northeastern Beach Tiger Beetle, *Cicindela d. dorsalis*
American Burying Beetle, *Nicrophorus americanus***
Dwarf Wedge Mussel, *Alasmidonta heterodon***

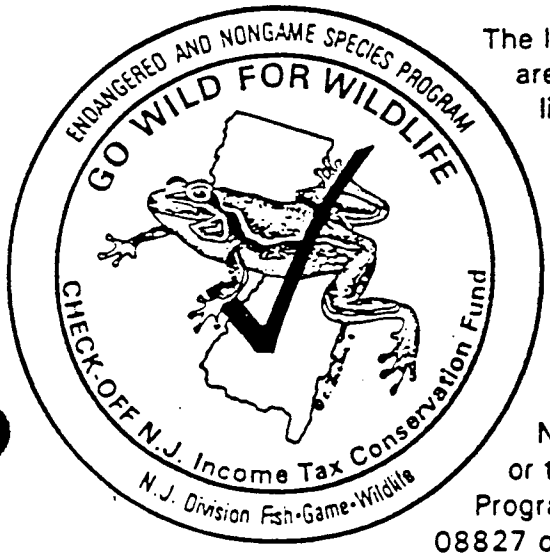
**Federally endangered

FISH

Endangered

Shortnose Sturgeon, *Acipenser brevirostrum***

List revisions: March 29, 1979
January 17, 1984
May 6, 1985
July 20, 1987
June 3, 1991



The lists of New Jersey's endangered and nongame wildlife species are maintained by the DEP&E's Division of Fish, Game and Wildlife's, Endangered and Nongame Species Program. These lists are used to determine protection and management actions necessary to insure the survival of the State's endangered and nongame wildlife. This work is made possible only through voluntary contributions received through the Wildlife Check-off on the New Jersey State Tax Form. The Wildlife Check-off is the only major funding source for the protection and management of the State's endangered and nongame wildlife resource. For more information about the Endangered and Nongame Species Program or to report a sighting of endangered or threatened wildlife contact: Endangered and Nongame Species Program, Northern District Office, Box 383 R.D. 1, Hampton, N.J. 08827 or call (908) 735-8975.

in RED(F) or (S) indicates species protected by Federal or State Legislation (see text)

SYMBOL	SPECIES
	PLANTS (301-350)
	301 Eastern hemlock
	302 Spleenwort (S)
	303 Spider lily (S)
	304 Pond bush (S)
	305 Watermilfoil (S)
	306 Hooded pitcher plant (S)
	307 Tree
	308 Prickly pear cactus (S)
	309 Trailing arbutus (S)
	310 Eastern bumelia
	311 Pitcher plant
	312 Baldcypress
	313 Redbay
	314 Seaside alder
	315 Box huckleberry
	316 Purple fringeless orchid
	317 Pink lady's slipper
	318 Ebony spleenwort (S)
	319 Orchids (S)
	320 Golden club (S)
	321 Florida beargrass
	322 East-coast coontie
	323 Fall-flowering ixia
	324 Jackson-vine
	325 Spoon-flower
	326 Curtiss milkweed
	327 Sea lavender
	328 Hand fern
	329 Needle palm
	330 Yellow squirrel-banana
	331 Beach creeper
	332 Florida coontie
	333 Four-petal pawpaw
	334 Bird's nest spleenwort
	335 Burrowing four-o'clock
	336 Beach star
	337 Silver palm
	338 Dancing lady orchid
	339 Tamarindillo
	340 Fuch's bromeliad
	341 Everglades peperomia
	342 Buccaneer palm
	343 Slender spleenwort
	344 Pineland jacquemontia
	345 Mahogany mistletoe
	346 Florida thatch
	347 Twisted air plant
	348 Long's bittercress
	349 Venus's flytrap
	INVERTEBRATES (351-400)
	351 Monarch butterfly
	352 Zebra butterfly
	BIRDS (401-600)
	SHOREBIRDS (401-430)
	401 Shorebirds
	402 Terns
	403 Gulls
	404 Forster's tern
	405 Arctic tern
	406 Least tern (S)
	407 Roseate tern (S)
	408 Common tern
	409 Great black-backed gull
	410 Herring gull
	411 Laughing gull
	412 Black skimmer (S)
	413 Turnstones
	414 Plovers
	415 Piping plover
	416 American oystercatcher (S)
	WADING BIRDS (431-460)
	431 Wading birds
	432 Herons
	433 Egrets
	434 Rails
	435 Ibises
	436 Bitterns
	437 Great blue heron (S)
	438 Wood ibis (S)
	439 Anhinga
	440 Little blue heron (S)
	441 Yellow-crowned night heron (S)
	442 Black-crowned night heron
	443 Florida sandhill crane (S)
	444 Louisiana heron (S)
	445 Limpkin (S)
	446 Roseate spoonbill (S)
	447 Snowy egret (S)
	448 Magnificent frigate-bird (S)
	449 Reddish egret (S)
	450 Clapper rail
	451 King rail
	452 Virginia rail
	453 Sora rail
	WATERFOWL (461-500)
	461 Waterfowl
	462 Swans
	463 Geese
	464 Dabbling ducks
	465 Diving ducks
	466 Common eider
	467 Harlequin duck
	468 Wood duck
	469 Fulvous tree duck
	470 Loons

Newark

N. J.—N. Y.—PA.

1:250 000-scale map of

Atlantic Coast Ecological Inventory

NUS CORP.

** REFERENCE MATERIAL **
DO NOT FOLD, DRAW ON, MUTILATE IN ANY WAY. COPIES CAN BE MADE IN DRAFTING.
DATE: 6/22/89

Produced by
U. S. FISH AND WILDLIFE SERVICE
1980

AQUATIC ORGANISMS

Shown in BLUE: species with special status shown in RED(F) or (S) indicates species protected by Federal or State Legislation (see text)

SYMBOL	SPECIES
	PLANTS (1-50)
	1 Irish moss
	2 Rockweed
	INVERTEBRATES (51-100)
	51 Crabs
	52 Mussels
	53 Oysters
	54 Scallops
	55 Clams
	56 Worms
	57 Shrimp
	58 American lobster
	59 Blue crab
	60 Eastern oyster
	61 European oyster
	62 Bay scallop
	63 Deep-sea scallop
	64 Calico scallop
	65 Surf clam
	66 Hard clam
	67 Soft shell clam

15 $ 4.95

p. 227

NUS CORPORATION
SUPERFUND DIVISION

PROJECT NOTES

TO: EL Beth Project file

DATE: 3/31/92

FROM: Claire Barnes

COPIES: —

SUBJECT: Clarification of species' status as referenced in Atlantic Coast Ecological Inventory.

~~REFERENCE~~: Es

The Atlantic Coast Ecological Inventory (Newark Map) lists the American shad as threatened in New Jersey; this reference is dated 1980. A more recent reference issued by the NJ Dept. of Environmental Protection and Energy (last revision 1991) does not include the American shad. Because the more current reference indicates the species is not listed as state endangered or threatened, it is not included in scoring.

NUS 443A 58 1182

NOTES

SPECIES WITH SPECIAL STATUS

Shortnose sturgeon (110) is found in coastal waters depicted on the Newark sheet and migrates up the Hudson River.

American shad (116) is threatened in New Jersey.

Bald eagle and peregrine falcon (505, 507) migrate along coastal areas depicted on the Newark sheet.

AQUATIC ORGANISMS

Due to scale limitations, only representative estuarine and riverine systems are shown.

Species that can be found in the ocean waters off New Jersey depicted on the Newark sheet include:

110g, 116g, 57cdf, 58abcdf, 59de, 65abcdf, 111g, 113g, 115g, 117cd, 129cdfg, 130cdf, 138acdf, 139d, 140cd, 142adf, 147bcdf, 149df, 154cdf, 157f, 158a, 160cdf, 173cdf, 177cdf, 178f, 180ad, 181cd.

Generally includes the following species:

116g, 59abcdef, 111g, 112cd, 113g, 115g, 117cd, 128cdg, 129cdfg, 138acdf, 139df, 140cdf, 142f, 147bcdf, 149bdf, 157f, 158abf, 160cdf, 177cdf, 178f, 180ad.

Generally includes the following species:

116g, 59bcf, 112cd, 113g, 115g, 117bc, 128bcfg, 129cdfg, 138bcf, 139bd, 140bcdf, 147b, 149b, 158b, 160bcdf, 167b, 180abd.

Generally includes the following species:

116g, 59cf, 112bcdf, 113abcfg, 115abcdf, 117b, 128abcdfg, 129bcfg, 138b, 139b, 140b, 147b, 160b, 180bd.

Species of importance in a particular river, creek, or sound are denoted on the map.

TERRESTRIAL ORGANISMS

Waterfowl (461), particularly geese and ducks, concentrate along the Delaware River, the Atlantic coast, and Lower New York, Raritan, and Sandy Hook Bays depicted on the Newark sheet.

435 Ibises
436 Bitterns
437 Great blue heron (S)
438 Wood ibis (S)
439 Anhinga
440 Little blue heron (S)
441 Yellow-crowned night heron (S)
442 Black-crowned night heron
443 Florida sandhill crane (S)
444 Louisiana heron (S)
445 Limpkin (S)
446 Roseate spoonbill (S)
447 Snowy egret (S)
448 Magnificent frigate-bird (S)
449 Reddish egret (S)
450 Clapper rail
451 King rail
452 Virginia rail
453 Sora rail

WATERFOWL (461-500)

461 Waterfowl
462 Swans
463 Geese
464 Dabbling ducks
465 Diving ducks
466 Common eider
467 Harlequin duck
468 Wood duck
469 Fulvous tree duck
470 Loons
471 Grebes
472 Brant geese
473 Snow goose
474 Gadwall
475 Black duck

RAPTORS (501-530)

501 Raptors
502 Owls
503 Kites
504 Hawks
505 Bald eagle (F)
506 Osprey (S)
507 Peregrine falcon (F)
508 Cooper's hawk (S)
509 Swallow-tailed kite
510 Marsh hawk (S)
511 Southeastern American kestrel (S)
512 Florida burrowing owl (S)

SEABIRDS (531-550)

531 Seabirds
532 Petrels, shearwaters, and albatroses
533 Pelican and allies
534 Alcids
535 Brown pelican (F)
536 Black guillemot
537 Leach's petrel
538 Razorbill
539 Common puffin
540 Double-crested cormorant
541 Gannet
542 Wilson's petrel
543 Northern phalarope
544 Audubon's shearwater
545 Greater shearwater
546 Shearwaters
547 Petrels
548 Jaegers
549 White pelican

SONGBIRDS AND OTHERS (551-600)

551 Songbirds and others
552 Red-cockaded woodpecker (F)
553 Chachalaca
554 Bachman's warbler (F)
555 Wild turkey
556 American woodcock
557 Pileated woodpecker
558 Swainson's warbler
559 Ruffed grouse
560 Bobwhite
561 Mourning dove
562 Warblers
563 Ring-necked pheasant
564 Bank swallow
565 Dusky seaside sparrow (F)
566 White-crowned pigeon (S)

REPTILES AND AMPHIBIANS (601-700)

601 Eastern narrow-mouthed toad (S)
602 Eastern indigo snake (F)
603 American alligator (F)
604 Northern diamondback terrapin
605 Amphibians
606 Greater siren
607 Bog turtle (S)
608 Gopher tortoise (S)
609 Eastern tiger salamander (S)
610 Northern fence lizard
611 Five-lined skink
612 Map turtle
613 Plymouth red-bellied turtle (F)
614 Eastern diamondback rattlesnake
615 Carolina gopher frog
616 Florida gopher frog (S)
617 Atlantic salt marsh watersnake (F)
618 American crocodile (F)
619 Florida Keys mole skink (S)
620 Florida black-headed snake (S)
621 Pine barrens tree frog (S)
622 Northern pine snake (S)
623 Corn snake (S)
624 [illegible]

AQUATIC ORGANISMS

Shown in Blue: species with special status under the RED Act. (S) indicates species protected by Federal or State regulation (see text)

SYMBOL	SPECIES
	PLANTS (1-50)
	1 Irish moss
	2 Rockweed
	INVERTEBRATES (51-100)
	51 Crabs
	52 Mussels
	53 Oysters
	54 Sea cucumbers
	55 Clams
	56 Worms
	57 Shrimp
	58 American lobster
	59 Blue crab
	60 Eastern oyster
	61 European oyster
	62 Bay scallop
	63 Deep-sea scallop
	64 Calico scallop
	65 Surf clam
	66 Hard clam
	67 Soft shell clam
	68 Brackish-water clam
	69 Bloodworm
	70 Sandworm
	71 White shrimp
	72 Brown shrimp
	73 Northern shrimp
	74 Rock crab
	75 Jonah crab
	76 Whelk
	77 Ocean quahog
	78 Pink shrimp
	79 Stone crab
	80 Spiny lobster
	FISH (101-200)
	101 Sharks, skates, rays
	102 Herring
	103 Salmon and trout
	104 Catfish
	105 Cod
	106 Sunfish and bass
	107 Drum
	108 Flatfish
	109 Longnose gar
	110 Shortnose sturgeon (F)
	111 Atlantic sturgeon (S)
	112 American eel
	113 Blueback herring
	114 Hickory shad
	115 Alewife
	116 American shad (S)
	117 Atlantic menhaden
	118 Atlantic herring
	119 Gizzard shad
	120 Tarpon
	121 Atlantic salmon
	122 White catfish
	123 Channel catfish
	124 Yellow bullhead
	125 Brown bullhead
	126 Flat bullhead
	127 Sea catfish
	128 White perch
	129 Striped bass
	130 Black sea bass
	131 Redbreast sunfish
	132 Marmouth
	133 Bluefish
	134 Largemouth bass
	135 Black crappie
	136 Spadefish
	137 Spotted seatrout
	138 Weakfish
	139 Spot
	140 Atlantic croaker
	141 Southern kingfish
	142 Northern kingfish
	143 Gulf kingfish
	144 Red drum
	145 Star drum
	146 Black drum
	147 Summer flounder
	148 Southern flounder
	149 Winter flounder
	150 Rainbow smelt
	151 Atlantic tomcod
	152 Threadfin shad
	153 Carp
	154 Atlantic mackerel
	155 Chain pickerel
	156 White bass
	157 Northern pupfish
	158 Silver perch
	159 Florida pompano
	160 Bluefish
	161 Spanish mackerel
	162 Cobia
	163 Mullet
	164 White catfish
	165 Redear sunfish
	166 Smallmouth bass
	167 Yellow perch
	168 Pumpkinseed

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543 Northern phalarope
544 Audubon's shearwater
545 Greater shearwater
546 Shearwaters
547 Petrels
548 Jaegers
549 White pelican

SONGBIRDS AND OTHERS (551-600)

551 Songbirds and others
552 Red-cockaded woodpecker (F)
553 Chachalaca
554 Bachman's warbler (F)
555 Wild turkey
556 American woodcock
557 Pileated woodpecker
558 Swainson's warbler
559 Ruffed grouse
560 Bobwhite
561 Mourning dove
562 Warblers
563 Ring-necked pheasant
564 Bank swallow
565 Dusky seaside sparrow (F)
566 White-crowned pigeon (S)

REPTILES AND AMPHIBIANS (601-700)

601 Eastern narrow-mouthed toad (S)
602 Eastern indigo snake (F)
603 American alligator (F)
604 Northern diamondback terrapin
605 Amphibians
606 Greater siren
607 Bog turtle (S)
608 Gopher tortoise (S)
609 Eastern tiger salamander (S)
610 Northern fence lizard
611 Five-lined skink
612 Map turtle
613 Plymouth red-bellied turtle (F)
614 Eastern diamondback rattlesnake
615 Carolina gopher frog
616 Florida gopher frog (S)
617 Atlantic salt marsh watersnake (F)
618 American crocodile (F)
619 Florida Keys mole skink (S)
620 Florida black-headed snake (S)
621 Pine barrens tree frog (S)
622 Northern pine snake (S)
623 Corn snake (S)
624 Timber rattlesnake (S)
625 Southern gray tree frog (S)

MAMMALS (701-800)

701 Beaver
702 Whitetail deer
703 European fallow deer
704 Blackbeard Island deer
705 Opossum
706 Marsh rabbit
707 Rice rat
708 Raccoon
709 St. Simon Island raccoon
710 Mink
711 River otter (F)
712 Feral hog
713 Feral cow
714 Cumberland Island pocket gopher
715 Anastasia Island cotton mouse
716 Aquatic furbearers
717 Black bear (S)
718 Bobcat
719 Eastern gray squirrel
720 Eastern fox squirrel
721 Eastern cottontail
722 Delmarva fox squirrel (F)
723 Muskrat
724 Red fox
725 Bats
726 Gray fox
727 Striped skunk
728 Nutria
729 Longtail weasel
730 Colonial pocket gopher (S)
731 Wild ponies
732 Sika deer
733 Beach meadow vole
734 Block Island meadow vole
735 Pallid beach mouse (S)
736 Sherman's fox squirrel (S)
737 Florida mouse (S)
738 Florida panther (F)
739 Goff's pocket gopher (S)
740 Key Largo wood rat (S)
741 Lower keys cotton rat (S)
742 Key Largo cotton mouse (S)

HABITAT USE

Shown in RED for species with special status, BLUE for aquatic organisms and BROWN for terrestrial organisms

a Spawning ground
b Nursery
c Commercial harvesting area
d Adult concentration
e Overwintering area
f Sport fishing/hunting area
g Migratory area
h Nesting area
i Unusual distribution or specimen

119 Gizzard shad
120 Tarpon
121 Atlantic salmon
122 White catfish
123 Channel catfish
124 Yellow bullhead
125 Brown bullhead
126 Flat bullhead
127 Sea catfish
128 White perch
129 Striped bass
130 Black sea bass
131 Redbreast sunfish
132 Warmouth
133 Bluegill
134 Largemouth bass
135 Black crappie
136 Sheepshead
137 Spotted seatrout
138 Weakfish
139 Spot
140 Atlantic croaker
141 Southern kingfish
142 Northern kingfish
143 Gulf kingfish
144 Red drum
145 Star drum
146 Black drum
147 Summer flounder
148 Southern flounder
149 Winter flounder
150 Rainbow smelt
151 Atlantic tomcod
152 Threadfin shad
153 Carp
154 Atlantic mackerel
155 Chain pickerel
156 White bass
157 Northern puffer
158 Silver perch
159 Florida pompano
160 Bluefish
161 Spanish mackerel
162 Cobia
163 Mullet
164 White crappie
165 Redear sunfish
166 Smallmouth bass
167 Yellow perch
168 Pumpkinseed
169 Atlantic halibut
170 Atlantic cod
171 Pollock
172 Haddock
173 Hake
174 Bluefin tuna
175 Walleye
176 Northern pike
177 Scup
178 Tautog
179 Atlantic spadefish
180 Bay anchovy
181 Butterfish
182 Little tunny
183 Atlantic bonito
184 Brown trout
185 Cunner
186 Yellowtail flounder
187 Gulf flounder
188 Pinfish
189 King mackerel
190 Pigfish
191 White grunt
192 Tripletail
193 Ladyfish
194 Snook
195 Jack
196 Snapper
197 Grouper
198 Sailfish
199 Great barracuda
200 Maryland darter (F)

REPTILES AND AMPHIBIANS (201-250)

201 Green sea turtle (F)
202 Loggerhead sea turtle (F)
203 Hawksbill turtle (F)
204 Atlantic ridley turtle (F)
205 Leatherback turtle (F)

MAMMALS (251-300)

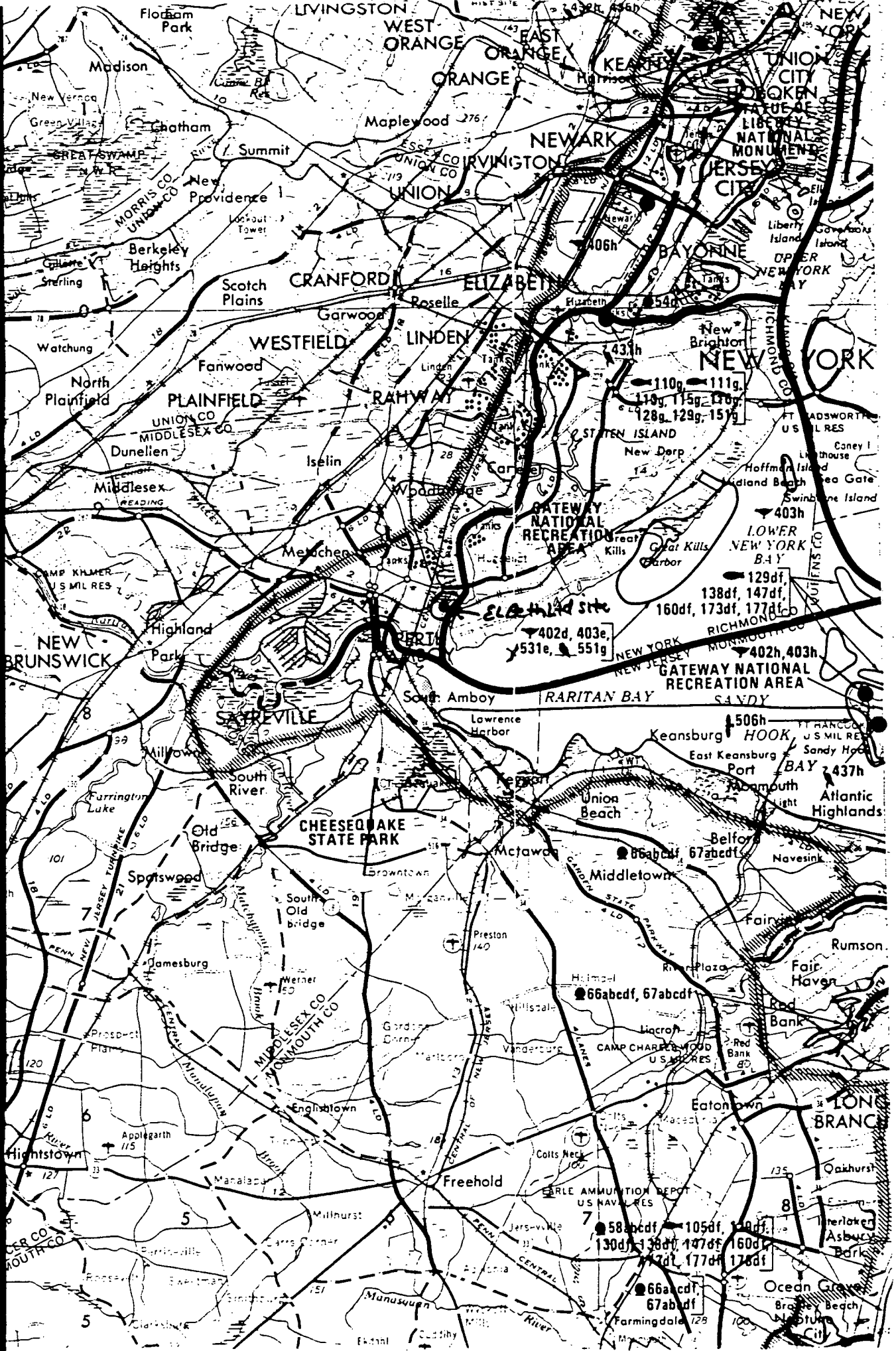
251 Florida manatee (F)
252 Atlantic bottlenose dolphin
253 Pigmy sperm whale
254 Short-finned pilot whale
255 Harbor seal
256 Gray seal
257 Right whale (F)
258 Atlantic spotted dolphin

High salinity estuarine habitat (generally 16.5 to 30 parts per thousand); arrows used for wide estuaries

Mid salinity estuarine habitat (generally 5 to 16.5 parts per thousand)

Low salinity estuarine habitat (generally 0.5 to 5 parts per thousand); and tidal freshwater

Non-tidal freshwater riverine and creek habitat



LIVINGSTON
WEST ORANGE
EAST ORANGE
ORANGE
KEARNY
UNION CITY
HOBOKEN
STATUE OF LIBERTY NATIONAL MONUMENT
JERSEY CITY
NEWARK
IRVINGTON
UNION
Maplewood
Summit
Chatham
Madison
Florham Park
New Providence
Berkeley Heights
Scotch Plains
CRANFORD
ELIZABETH
BAYONNE
UPPER NEW YORK BAY
Roselle
Garwood
WESTFIELD
LINDEN
Watchung
Fanwood
North Plainfield
PLAINFIELD
RAHWAY
New Brighton
NEW YORK
STATEN ISLAND
New Dorp
Dunellen
Iselin
Middlesex
Woodbridge
GATEWAY NATIONAL RECREATION AREA
Great Kills
Great Kills Harbor
LOWER NEW YORK BAY
Metuchen
Highland Park
NEW BRUNSWICK
PERTH AMBOY
South Amboy
RARITAN BAY
SANDY HOOK BAY
Lawrence Harbor
Keansburg
East Keansburg
Port Monmouth
Atlantic Highlands
SAYREVILLE
Milltown
South River
Farrington Lake
Old Bridge
CHEESEQUAKE STATE PARK
Union Beach
Belford
Navesink
Spotswood
Browntown
Middletown
South Old Bridge
Preston
Jamesburg
Rumson
Fair Haven
Red Bank
Lincroft
CAMP CHARLES WOOD U S MIL RES
Englishtown
Eatontown
LONG BRANCH
Applegarth
Hightstown
Freehold
Colts Neck
EARLE AMMUNITION DEPOT U S NAVAL RES
Oakhurst
Millhurst
Jerseyville
Asbury Park
Ocean Grove
Farmingdale
Manasquan River
Manalapan Brook
MIDDLESEX CO
MONMOUTH CO
UNION CO
MORRIS CO
ESSEX CO
RICHMOND CO
NEW YORK
NEW JERSEY
MONMOUTH CO
GATEWAY NATIONAL RECREATION AREA
406h
54d
431h
110g, 111g, 113g, 115g, 116g, 128g, 129g, 151g
403h
129df, 138df, 147df, 160df, 173df, 177df
402d, 403e, 531e, 551g
402h, 403h
506h
437h
66abcdf, 67abcdf
58abcdf, 105df, 130df, 138df, 147df, 160df, 173df, 177df, 178df
66abcdf, 67abcdf

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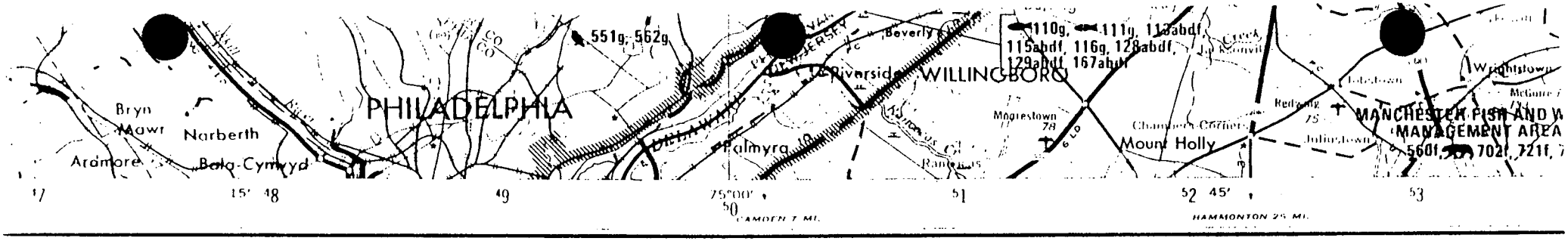

Scale 1:250,000

5 0 5 10 15 20 Statute Miles

5 0 5 10 15 20 25 30 Kilometers

5 0 5 10 15 Nautical Miles

TRANSVERSE MERCATOR PROJECTION

BLACK NUMBERED LINES INDICATE THE 10,000 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 18

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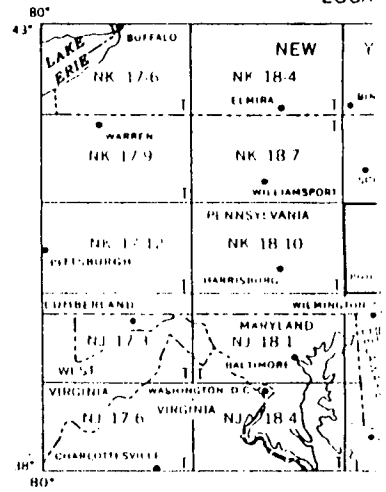
LOCA



T - Topographic map
T/B - Topographic/Bathymetric map
B - Bathymetric map
E - Ecological inventory map
E* - Includes portion of Albany

p. 233

REFERENCE NO. 25

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
J004	November 18, 1991	1615

DISTRIBUTION:

Front Street Works file, J004

BETWEEN:	OF:	PHONE:
Mr. Robert Soldwedel	NJ Department of Environmental Protection and Energy - Fisheries Div.	(609) 292-1599

AND: (NUS)

Claire Barnes

DISCUSSION:

Mr. Soldwedel said that there is a statewide advisory on reducing consumer risk from fish contaminated with toxic chemicals such as PCBs, dioxin or chlordane. At the Newark Bay complex, there is a prohibition on the sale and consumption of all fish from the tidal Passaic River, and a prohibition on the sale or consumption of striped bass, blue claw crabs, and american eels, from the entire Newark Bay complex, which includes Newark Bay, Passaic River up to Dundee Dam, the Arthur Kill and the Kill van Kull, and also, the Hackensack River up to Oradell Dam.

ACTION ITEMS:

REFERENCE NO. 26

p. 236

The RECORD

FEBRUARY 9, 1992

State circulates warnings on consuming certain fish

DON ECKER

OUTDOORS

New Jersey state officials have issued some advisories and prohibitions regarding certain species of fish that may contain toxic chemicals and suggest methods of preparation to reduce exposure to contamination.

For the purposes of these alerts, the term "limited consumption" means not more than one meal per week of such fish, and persons of high risk — such as pregnant women, nursing mothers, women of child-bearing age, and young children — should not eat any such fish taken from designated regions. "Very limited consumption" restricts consumption to no more than one meal per month.

All sales of striped bass are prohibited. Limited consumption of all American eels is advised, especially in the Northeast region.

Otherwise, by region:

Newark Bay Complex (Newark Bay, Passaic River up to Dundee Dam, Hackensack River up to Oradell Dam, Arthur Kill, and Kill Van Kull and all tributaries) — sale or consumption of all fish from the tidal Passaic River, sale or consumption of striped bass and blue crabs, and sale of American eels from the entire complex are prohibited.

New Jersey waters of the Hudson River (up to the New Jersey-New York border, approximately four miles north of Alpine, and Upper New York Bay) — very limited consumption of striped bass, and limited consumption of white perch, white catfish, and bluefish is advised. The sale of American eels from these waters is prohibited.

Though the Lower New York Bay is not part of New Jersey waters, anglers fishing the lower bay, the upper part of New York Bay, and the Hudson River in New York waters are advised to follow New York state guidelines, which are similar to New Jersey's.

Raritan Bay Complex (New Jersey portion of Sandy Hook and Raritan bays and the tidal portion of the Raritan River upstream of the Route 1 bridge and New Brunswick) — limited consumption of striped bass, large bluefish (greater than 6 pounds or 24 inches), white catfish, and white perch.

Coastal New Jersey, including offshore state waters — limited consumption of striped bass and large bluefish.

Camden Area (including Strawbridge Lake, North and South branches of Pennsauken Creek, Cooper River and drainage, Cooper River Lake, Stewart Lake, Newton Lake) — sale and consumption of all fish prohibited.

Delaware River (between Interstate 276 bridge and tributary Birch Creek, Logan Township, Gloucester County) — Advisory against consumption of channel catfish. Sale of this species is prohibited.

The following steps are strongly recommended to reduce exposure to contamination in fish: Remove belly-flaps, backstrap, and lateral-line tissue before cooking. Broil on a raised rack, boil in water, remove skin before cooking or canning. Discard all oils and fat, and liquids that contain them. Avoid coatings that hold oils and fats.

Blue crabs: Remove and discard hepatopancreas (tomalley, green gland, mustard) before cooking.

For more detailed information, write Bruce Ruppel, CN 409, Trenton, N.J. 08652.

* * *

The New Jersey Sportfishing Expo will be at the Morristown Armory, Western Avenue, Morristown, Feb. 15 and 16. Displays will include the newest fishing boats, accessories, and tackle. Seminar speakers include Al Ristori on salt water, Joe Humphreys on trout, Capt. Mike DiPalma on fishing Lake Ontario, and J.B. Kasper on fishing for Delaware River shad and bass.

There will be pro teams from Berkley/Trilene, Yankee Baits, and Zebco/Quantum to answer questions about bass fishing and tackle, and seminars for trout and bass beginners. Times are 9 a.m. to 8 p.m. Saturday and 10 a.m. to 6 p.m. Sunday. Admission is $6. Children under 10 are admitted free. Door prizes will be awarded throughout the day. Phone (908) 876-5357 for more details.

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REFERENCE NO. 27

NUS CORPORATION
SUPERFUND DIVISION

PROJECT NOTES

TO: EL Beth Ltd file

DATE: March 27, 1992

FROM: Claire Bangia

COPIES: —

SUBJECT: Lot and block number, and property acreage, EL Beth site, Perth Amboy, New Jersey.

~~REFERENCE:~~

Reference: noted below

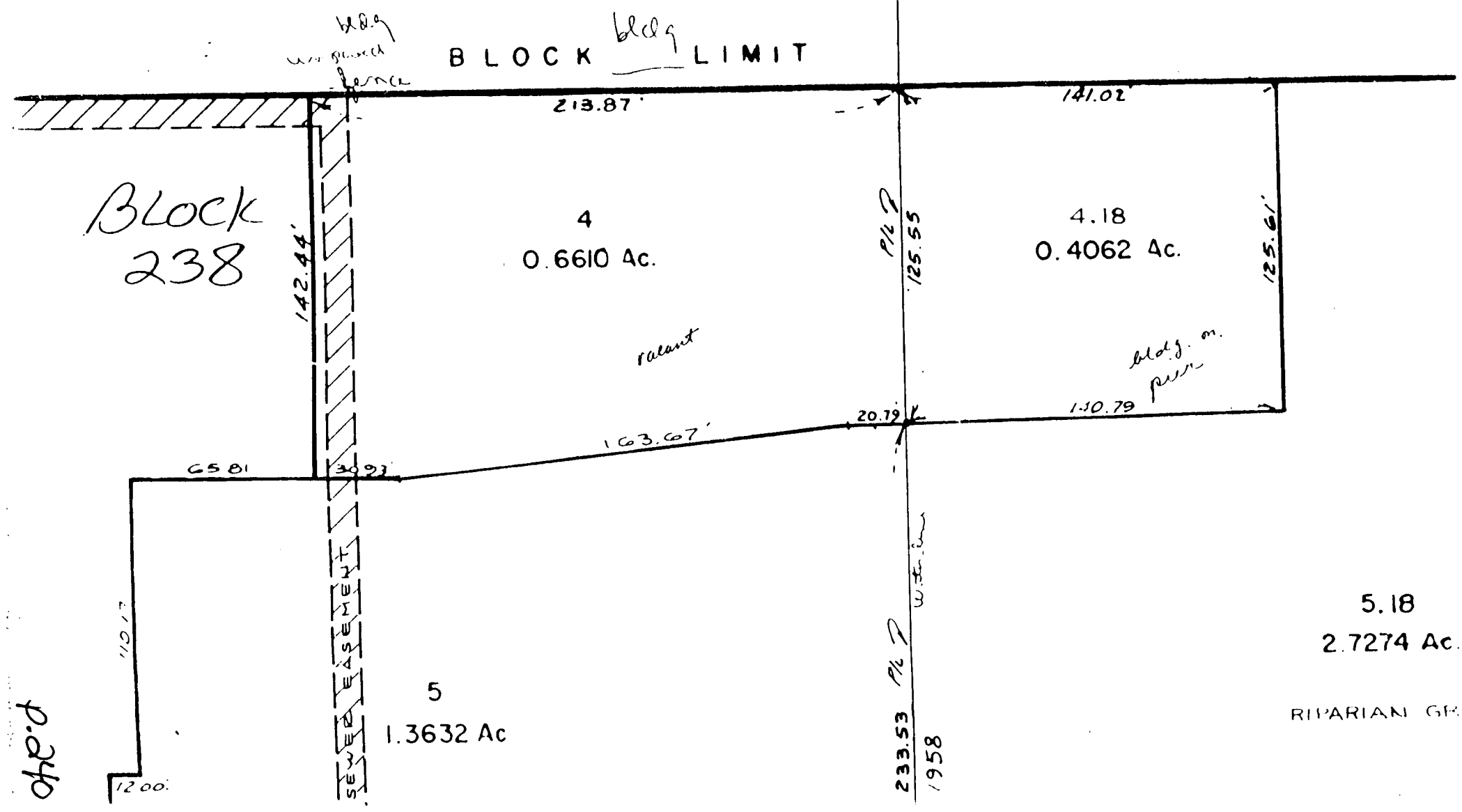
Per discussion with the Perth Amboy Tax Assessor's office, the property formerly E.L. Beth Ltd (now in the name of Jack and Robert Silverman) occupies lot Nos. 4 and 4.18 of Block 238 in Perth Amboy. As the clerk recalls, EL Beth used "500 High Street" as a mailing address, although another property is listed in the tax book as 500 High Street. (During the Halliburton NUS on-site reconnaissance on March 4, 1992 this was clarified; the EL Beth site, set back off of the road, is reached through the gate entrance at 500 High Street).

The tax map (Block 238) gives acreage values of 0.6610 acre for Lot 4, and 0.4062 acre for Lot 4.18.

NUS 443A 58 1182

SHEET № 44

Scale: 1" = 50'



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NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO.:	DATE:	TIME:
J030	March 24, 1992	1320

DISTRIBUTION:

EL Beth file

Page 1 of 3

BETWEEN:	OF:	PHONE:
Tom Haborak, Sr.	Perth Amboy Fire Department (Director)	(908) 826-1111

AND: Claire Francis (NUS)

DISCUSSION:

I explained to Mr. Haborak that I was calling to inquire about the May, 1981 fire at EL Beth property and also about the July 1980 fire at Revere Marine property, in Perth Amboy. Mr. Haborak referred to his files as we spoke:

I asked about the cause of the May 1981 fire at EL Beth property; he said the fire at EL Beth occurred on Monday, May 18, 1981 and is recorded as a "Structure fire". Regarding the cause of the fire, he said "Ignition factor, combustibles too close to heat". I asked if any hazardous materials of concern were present - he said his file does not indicate any wastes; he said there are no special notes of any hazardous materials or quantities of materials. In regard to the cause of the fire, he said "Kilns overheated and set pilings on fire". He said the fire was confined to 500 High Street; the fire did not extend to the General Cable Complex. I asked about the pier at EL Beth property; Mr. Haborak said it is not a pier, but rather, it is a building on pilings over the water; it had a concrete slab floor and the wood pilings beneath were set on fire, he said.

ACTION ITEMS:

Mr. Haborak read the EL Beth file sheet to me:

May 18, 1981, Monday. Time of alarm 2:56 PM and fire was out on May 20 at 1125 PM. EL Beth 500 High Street. Alarm by telephone. Structure fire had 4 engines and

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

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J030	March 24, 1992	1320

DISTRIBUTION: EL Beth file

BETWEEN:	OF:	PHONE:
Tom Haborak, Sr.	Beth Amboy Fire Department (Director)	(908) 826-1111

AND: Claire Barutis (NUS)

DISCUSSION: (Continued)

one truck there; got mutual aid. About 100 firefighters.
Area of origin: crawl space. Level of fire origin: below ground.
Termination stage: flame (when broke out)
Equipment involved in ignition: Kilns
Form of heat ignition: Overheated Kilns
Type of material ignited: wood pilings
Ignition factor: Combustibles too close to heat.

I asked Mr. Haborak if there are any statements in the file concerning amount of waste present, and he said 'no'.

I asked about the 1980 'Duane Marine' fire. Mr. Haborak said he calls it the General Cable fire. He referred to the file and said: July 7, 1980, fire started at General Cable, at 42 Washington Street (which is at the corner of Washington and Rector Streets), and it spread to Duane Marine. He said it spread to the entire block. I asked if EL Beth was possibly affected; he said it could have been, since they're all in the same area. He said the building at High and Buckingham Streets is General Cable - the building extended to the water; EL Beth is situated between Duane Marine and General Cable. He said the fire ran from Front Street, up Washington Street to High Street and fallen down High Street to the corner

ACTION ITEMS:

NUS CORPORATION AND SUBSIDIARIES — TELECON NOTE

CONTROL NO.:	DATE:	TIME:
J030	March 24, 1992	1320

DISTRIBUTION: EL Beth file

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BETWEEN:	OF:	PHONE:
Tom Halbrak, Sr.	Beth Cimbay fire Department (Director)	(908) 826-1111

AND: Claire Bamfo (NUS)

DISCUSSION: (continued)

of High and Buckingham - the fire did not get into the building at High and Buckingham - it stopped there. The fire had started in the middle of the block and went west, east and north. He said that nothing is stated about chemicals at EL Beth property in the 1980 fire report. He said the General Cable (Duane Marine) fire was a week-long fire, lasting from Monday to Saturday. I asked if there is any file reference to chemicals present during the 1980 fire, and he said nothing is stated.

Mr. Halbrak said that the Middlesex County Prosecutor's Office, former arson task force, investigated the 1980 and 1981 fires, and that they might have information as well.

ACTION ITEMS:

NUS CORPORATION AND SUBSIDIARIES

TELECON NOTE

CONTROL NO.:	DATE:	TIME:
J030	March 25, 1992	1250

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EL Beth file

BETWEEN:	OF:	PHONE:
Investigator Ritz	Middlesex County Prosecutor's Office	(908) 745-3300

AND: Claire Barnes (NUS)

DISCUSSION:

Mr. Ritz returned my call. First, he said that according to his information, the EL Beth property is a church. (I then told him it was a foundry). He said that his reports are strictly first origin and cause reports, and that he wouldn't have hazardous materials information. He is referring to computer information as we speak, because the physical file is archived, he said. He said that the EL Beth fire is listed as an accidental fire. He read to me: "High and Washington Street, May 18, 1981, victim listed as EL Beth".

I later asked him about the July 1980 fire on the same block. He said that he doesn't know offhand if it entered the EL Beth property. He said it burned from High Street all the way to the river. I noted to him, however that reportedly, the fire didn't extend to the very northernmost part of the block, so maybe it did not enter the EL Beth property; also, since the one — was in use in 1981, it apparently wasn't affected by the 1980 fire - therefore, I did not ask him to check further on the extent of the 1980 fire.

ACTION ITEMS:

NUS 067 REVISED 0685

REFERENCE NO. 29

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CONTROL NO.:	DATE:	TIME:
J030	February 24, 1992	~1355

DISTRIBUTION:

EL Beth file

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BETWEEN:	OF:	PHONE:
Carol Surgena, Esq	Jones and Day	(212) 326-8355

AND: Claire Barnes (NUS)

DISCUSSION:

The address to which I can send letter to Mr. Robert Silverman and Mr. Jack Silverman regarding on-site reconnaissance is: 23 Audubon Court, Short Hills, New Jersey 07078.

Ms. Surgena and I discussed the site. She said it's right on the edge of Arthur Kill. The manufacturing plant was on a wooden pier that extended over the Kill. She said about one acre of the property is on land. She said the owner said that most of the property is concrete paved. A garage is present. The manufacturing facility is about 11,000 to 12,000 sq. feet. "They applied for and received Part A RCRA permit as a storage facility in the late 1970's, about 1979" she said. "They bought the operating company that was present at the location. In 1979 to 1980 they stored certain hazardous wastes on site for more than 90 days, and so acquired a Part A RCRA permit." She said "the waste was listed as acid waste; it was ammonium chloride in solid form - she said it was molten when skimmed, and it solidified in drums. She said a solder manufacturing operated there. She said metals were molten in vats for recovery. Ammonium chloride was skimmed off of the surface and was stored in 55 gallon drums, on the land portion of the property, on a concrete slab. Part of the storage area

ACTION ITEMS:

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NUS CORPORATION AND SUBSIDIARIES — TELECON NOTE

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E L Beth file

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BETWEEN:	OF:	PHONE:
Carol Surgens, Esq	Jones and Day	(212) 326-8355

AND:

Claire Bauxis (NUS)

DISCUSSION: (continued)

was in a garage, with a concrete floor. She said materials were stored 90 days or less. She said that after 1980, the site no longer stored ammonium chloride, because they no longer used the ammonium chloride process - it was just used in 1979 and 1980. She said that regarding other wastes, they'll explain further. May have had lube oil, classed as hazardous in New Jersey but not by federal law. May have been drums of baghouse dust. No underground tanks are present at the site. To the extent of her client's knowledge, there are now no drums present. She said that they "ceased operations and moved, and then in 1981 the fire occurred and the facility burned down". She said that what's left are: concrete land surface, part of a pier, ruins of the building on pier. She said, regarding the pier and ruins, it is totally at our own risk to walk

~~ACTION ITEMS:~~

is — there, as it's very, very unsafe. I told her we will not walk there. I asked if the pier is fenced off, and she said she's not sure. She said some fencing is present, but that she's not sure how much. She said the area is subject to vandalism. I asked if formerly there were underground tanks; she said she's not sure but the owners can discuss it further. (continued)

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NUS CORPORATION AND SUBSIDIARIES — TELECON NOTE

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EL Beth file

BETWEEN:	OF:	PHONE:
Carol Surgens, Esq	Jones and Day	(212) 326-8355

AND:

Claire Barnes (NUS)

DISCUSSION: (continued)

She said that one of the baghouses might still be present. She believes that only a residue of dust may remain, and possibly some scrap metal. Drums were removed.

Regarding planned HNUS on-site reconnaissance, she said they prefer that decon water from recon be drummed and removed, rather than disposed of on site; they're concerned about environmental (legal) complications. But, she said, the site is mostly paved.

She said the site is adjacent to Duane Marine site, and N.J. DEP has been to Duane Marine, investigating; Duane Marine was a very large industrial operation, and had a fire.

Regarding EL Beth property, utilities had been in pipes, buried in the ground, and in some places, where utilities were removed, it is dug up, and looks like trenching.

We established that the on-site reconnaissance at the EL Beth property in Perth Amboy will be on March 4th, at 9:30 AM, and that we'll meet at the property entrance. She will inquire if the property owners have any documents to provide.

ACTION ITEMS:

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toxicity of less than 50 milligrams per kilogram, an inhalation LC 50 toxicity (rat) of less than 2 milligrams per liter, or a dermal LD 50 toxicity (rabbit) of less than 200 milligrams per kilogram or is otherwise capable of causing or significantly contributing to an increase in serious irreversible, or incapacitating reversible, illness. (Waste listed in accordance with these criteria will be designated Acute Hazardous Waste.)

(3) It contains any of the toxic constituents listed in Appendix VIII unless, after considering any of the following factors, the Administrator concludes that the waste is not capable of posing a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed:

(i) The nature of the toxicity presented by the constituent.

(ii) The concentration of the constituent in the waste.

(iii) The potential of the constituent or any toxic degradation product of the constituent to migrate from the waste into the environment under the types of improper management considered in paragraph (a)(3)(vii) of this section.

(iv) The persistence of the constituent or any toxic degradation product of the constituent.

(v) The potential for the constituent or any toxic degradation product of the constituent to degrade into nonharmful constituents and the rate of degradation.

(vi) The degree to which the constituent or any degradation product of the constituent bioaccumulates in ecosystems.

(vii) The plausible types of improper management to which the waste could be subjected.

(viii) The quantities of the waste generated at individual generation sites or on a regional or national basis.

(ix) The nature and severity of the human health and environmental damage that has occurred as a result of the improper management of wastes containing the constituent.

(x) Action taken by other governmental agencies or regulatory programs based on the health or environmental hazard posed by the waste or waste constituent.

(xi) Such other factors as may be appropriate.

Substances will be listed on Appendix VIII only if they have been shown in scientific studies to have toxic, carcinogenic, mutagenic or teratogenic effects on humans or other life forms.

(Wastes listed in accordance with these criteria will be designated Toxic wastes.)

(b) The Administrator may list classes or types of solid waste as hazardous waste if he has reason to believe that individual wastes, within the class or type of waste, typically or frequently are hazardous under the definition of hazardous waste found in section 1004(5) of the Act.

(c) The Administrator will use the criteria for listing specified in this section to establish the exclusion limits referred to in § 261.5(c).

Subpart C—Characteristics of Hazardous Waste

§ 261.20 General.

(a) A solid waste, as defined in § 261.2, which is not excluded from regulation as a hazardous waste under § 261.4(b), is a hazardous waste if it exhibits any of the characteristics identified in this subpart.

[*Comment*: § 262.11 of this chapter sets forth the generator's responsibility to determine whether his waste exhibits one or more of the characteristics identified in this subpart]

(b) A hazardous waste which is identified by a characteristic in this subpart, but is not listed as a hazardous waste in Subpart D, is assigned the EPA Hazardous Waste Number set forth in the respective characteristic in this subpart. This number must be used in complying with the notification requirements of section 3010 of the Act and certain recordkeeping and reporting requirements under Parts 262 through 265, 268, and Part 270 of this chapter.

(c) For purposes of this subpart, the Administrator will consider a sample obtained using any of the applicable sampling methods specified in Appendix I to be a representative sample within the meaning of Part 260 of this chapter.

[*Comment*: Since the Appendix I sampling methods are not being formally adopted by the Administrator, a person who desires to employ an alternative sampling method is not required to demonstrate the equivalency of his method under the procedures set forth in §§ 260.20 and 260.21.]

[45 FR 33119, May 19, 1980, as amended at 48 FR 14294, Apr. 1, 1983; 51 FR 40636, Nov. 7, 1986]

§ 261.21 Characteristic of ignitability.

(a) A solid waste exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties:

(1) It is a liquid, other than an aqueous solution containing less than 24 percent alcohol by volume and has flash point less than 60°C (140°F), as determined by a Pensky-Martens Closed Cup Tester, using the test method specified in ASTM Standard D-93-79 or D-93-80 (incorporated by reference, see § 260.11), or a Setaflash Closed Cup Tester, using the test method specified in ASTM Standard D-3278-78 (incorporated by reference, see § 260.11), or as determined by an equivalent test method approved by the Administrator under procedures set forth in §§ 260.20 and 260.21.

(2) It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.

(3) It is an ignitable compressed gas as defined in 49 CFR 173.300 and as determined by the test methods described in that regulation or equivalent test methods approved by the Administrator under §§ 260.20 and 260.21.

(4) It is an oxidizer as defined in 49 CFR 173.151.

(b) A solid waste that exhibits the characteristic of ignitability, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number of D001.

[45 FR 33119, May 19, 1980, as amended at 46 FR 35247, July 7, 1981]

§ 261.22 Characteristic of corrosivity.

(a) A solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties:

(1) It is aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5, as determined by a pH meter using either an EPA test method or an equivalent test method approved by the Administrator under the procedures set forth in §§ 260.20 and 260.21. The EPA test method for pH is specified as Method 5.2 in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11).

(2) It is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55°C (130°F) as determined by the test method specified in NACE (National Association of Corrosion Engineers) Standard TM-01-69 as standardized in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11) or an equivalent test method approved by the Administrator under the procedures set forth in §§ 260.20 and 260.21.

(b) A solid waste that exhibits the characteristic of corrosivity, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number of D002.

[45 FR 33119, May 19, 1980, as amended at 46 FR 35247, July 7, 1981]

§ 261.23 Characteristic of reactivity.

(a) A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has *any* of the following properties:

(1) It is normally unstable and readily undergoes violent change without detonating.

(2) It reacts violently with water.

(3) It forms potentially explosive mixtures with water.

(4) When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

(5) It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can gener-

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Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
F024	Wastes, including but not limited to, distillation residues, heavy ends, tars, and reactor clean-out wastes from the production of chlorinated aliphatic hydrocarbons, having carbon content from one to five, utilizing free radical catalyzed processes. [This listing does not include light ends, spent filters and filter aids, spent desiccants, wastewater, wastewater treatment sludges, spent catalysts, and wastes listed in § 261.32.].	(T)
F020	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- or tetrachlorophenol, or of intermediates used to produce their pesticide derivatives. (This listing does not include wastes from the production of Hexachlorophene from highly purified 2,4,5-trichlorophenol.).	(H)
F021	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of pentachlorophenol, or of intermediates used to produce its derivatives.	(H)
F022	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzenes under alkaline conditions.	(H)
F023	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- and tetrachlorophenols. (This listing does not include wastes from equipment used only for the production or use of Hexachlorophene from highly purified 2,4,5 trichlorophenol.).	(H)
F026	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzene under alkaline conditions.	(H)
F027	Discarded unused formulations containing tri-, tetra-, or pentachlorophenol or discarded unused formulations containing compounds derived from these chlorophenols. (This listing does not include formulations containing Hexachlorophene synthesized from prepurified 2,4,5-trichlorophenol as the sole component.).	(H)
F028	Residues resulting from the incineration or thermal treatment of soil contaminated with EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, and F027.	(T)

*(I,T) should be used to specify mixtures containing ignitable and toxic constituents.

[46 FR 4617, Jan. 16, 1981, as amended at 46 FR 27477, May 20, 1981; 49 FR 5312, Feb. 10, 1984; 49 FR 37070, Sept. 21, 1984; 50 FR 665, Jan. 4, 1985; 50 FR 2000, Jan. 14, 1985; 50 FR 53319, Dec. 31, 1985; 51 FR 2702, Jan. 21, 1986; 51 FR 6541, Feb. 25, 1986]

§ 261.32 Hazardous wastes from specific sources.

The following solid wastes are listed hazardous wastes from specific sources unless they are excluded under §§ 260.20 and 260.22 and listed in Appendix IX.

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
Wood preservation: K001	Bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol.	(T)
Inorganic pigments:		
K002	Wastewater treatment sludge from the production of chrome yellow and orange pigments.	(T)
K003	Wastewater treatment sludge from the production of molybdate orange pigments	(T)
K004	Wastewater treatment sludge from the production of zinc yellow pigments	(T)
K005	Wastewater treatment sludge from the production of chrome green pigments	(T)
K006	Wastewater treatment sludge from the production of chrome oxide green pigments (anhydrous and hydrated).	(T)
K007	Wastewater treatment sludge from the production of iron blue pigments	(T)
K008	Oven residue from the production of chrome oxide green pigments	(T)
Organic chemicals:		
K009	Distillation bottoms from the production of acetaldehyde from ethylene	(T)
K010	Distillation side cuts from the production of acetaldehyde from ethylene	(T)
K011	Bottom stream from the wastewater stripper in the production of acrylonitrile	(R, T)
K013	Bottom stream from the acetonitrile column in the production of acrylonitrile	(R, T)
K014	Bottoms from the acetonitrile purification column in the production of acrylonitrile	(T)
K015	Still bottoms from the distillation of benzyl chloride	(T)

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
K016	Heavy ends or distillation residues from the production of carbon tetrachloride	(T)
K017	Heavy ends (still bottoms) from the purification column in the production of epichlorohydrin.	(T)
K018	Heavy ends from the fractionation column in ethyl chloride production	(T)
K019	Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production.	(T)
K020	Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production.	(T)
K021	Aqueous spent antimony catalyst waste from fluoromethanes production	(T)
K022	Distillation bottom tars from the production of phenol/acetone from cumene	(T)
K023	Distillation light ends from the production of phthalic anhydride from naphthalene	(T)
K024	Distillation bottoms from the production of phthalic anhydride from naphthalene	(T)
K093	Distillation light ends from the production of phthalic anhydride from ortho-xylene	(T)
K094	Distillation bottoms from the production of phthalic anhydride from ortho-xylene	(T)
K025	Distillation bottoms from the production of nitrobenzene by the nitration of benzene	(T)
K026	Stripping still tails from the production of methy ethyl pyridines	(T)
K027	Centrifuge and distillation residues from toluene diisocyanate production	(R, T)
K028	Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane.	(T)
K029	Waste from the product steam stripper in the production of 1,1,1-trichloroethane	(T)
K095	Distillation bottoms from the production of 1,1,1-trichloroethane	(T)
K096	Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane.	(T)
K030	Column bottoms or heavy ends from the combined production of trichloroethylene and perchloroethylene.	(T)
K083	Distillation bottoms from aniline production	(T)
K103	Process residues from aniline extraction from the production of aniline	(T)
K104	Combined wastewater streams generated from nitrobenzene/aniline production	(T)
K085	Distillation or fractionation column bottoms from the production of chlorobenzenes	(T)
K105	Separated aqueous stream from the reactor product washing step in the production of chlorobenzenes.	(T)
K111	Product washwaters from the production of dinitrotoluene via nitration of toluene	(C,T)
K112	Reaction by-product water from the drying column in the production of toluenediamine via hydrogenation of dinitrotoluene.	(T)
K113	Condensed liquid light ends from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene.	(T)
K114	Vicinals from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene.	(T)
K115	Heavy ends from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene.	(T)
K116	Organic condensate from the solvent recovery column in the production of toluene diisocyanate via phosgenation of toluenediamine.	(T)
K117	Wastewater from the reactor vent gas scrubber in the production of ethylene dibromide via bromination of ethene.	(T)
K118	Spent adsorbent solids from purification of ethylene dibromide in the production of ethylene dibromide via bromination of ethene.	(T)
K136	Still bottoms from the purification of ethylene dibromide in the production of ethylene dibromide via bromination of ethene.	(T)
Inorganic chemicals:		
K071	Brine purification muds from the mercury cell process in chlorine production, where separately prepurified brine is not used.	(T)
K073	Chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production.	(T)
K106	Wastewater treatment sludge from the mercury cell process in chlorine production	(T)
Pesticides:		
K031	By-product salts generated in the production of MSMA and cacodylic acid	(T)
K032	Wastewater treatment sludge from the production of chlordane	(T)
K033	Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane.	(T)
K034	Filter solids from the filtration of hexachlorocyclopentadiene in the production of chlordane.	(T)
K097	Vacuum stripper discharge from the chlordane chlorinator in the production of chlordane.	(T)
K035	Wastewater treatment sludges generated in the production of creosote	(T)
K036	Still bottoms from toluene reclamation distillation in the production of disulfoton	(T)
K037	Wastewater treatment sludges from the production of disulfoton	(T)
K038	Wastewater from the washing and stripping of phorate production	(T)
K039	Filter cake from the filtration of diethylphosphorodithioic acid in the production of phorate.	(T)
K040	Wastewater treatment sludge from the production of phorate	(T)
K041	Wastewater treatment sludge from the production of toxaphene	(T)
K098	Untreated process wastewater from the production of toxaphene	(T)

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
K042	Heavy ends or distillation residues from the distillation of tetrachlorobenzene in the production of 2,4,5-T.	(T)
K043	2,6-Dichlorophenol waste from the production of 2,4-D	(T)
K099	Untreated wastewater from the production of 2,4-D	(T)
K123	Process wastewater (including supernates, filtrates, and washwaters) from the production of ethylenebisdithiocarbamic acid and its salt.	(T)
K124	Reactor vent scrubber water from the production of ethylenebisdithiocarbamic acid and its salts.	(C, T)
K125	Filtration, evaporation, and centrifugation solids from the production of ethylenebisdithiocarbamic acid and its salts.	(T)
K126	Baghouse dust and floor sweepings in milling and packaging operations from the production or formulation of ethylenebisdithiocarbamic acid and its salts.	(T)
Explosives:		
K044	Wastewater treatment sludges from the manufacturing and processing of explosives	(R)
K045	Spent carbon from the treatment of wastewater containing explosives	(R)
K046	Wastewater treatment sludges from the manufacturing, formulation and loading of lead-based initiating compounds.	(T)
K047	Pink/red water from TNT operations	(R)
Petroleum refining:		
K048	Dissolved air flotation (DAF) float from the petroleum refining industry	(T)
K049	Slop oil emulsion solids from the petroleum refining industry	(T)
K050	Heat exchanger bundle cleaning sludge from the petroleum refining industry	(T)
K051	API separator sludge from the petroleum refining industry	(T)
K052	Tank bottoms (leaded) from the petroleum refining industry	(T)
Iron and steel:		
K061	Emission control dust/sludge from the primary production of steel in electric furnaces.	(T)
K062	Spent pickle liquor generated by steel finishing operations of facilities within the iron and steel industry (SIC Codes 331 and 332).	(C,T)
Secondary lead:		
K069	Emission control dust/sludge from secondary lead smelting	(T)
K100	Waste leaching solution from acid leaching of emission control dust/sludge from secondary lead smelting.	(T)
Veterinary pharmaceuticals:		
K084	Wastewater treatment sludges generated during the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.	(T)
K101	Distillation tar residues from the distillation of aniline-based compounds in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.	(T)
K102	Residue from the use of activated carbon for decolorization in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.	(T)
Ink formulation: K086	Solvent washes and sludges, caustic washes and sludges, or water washes and sludges from cleaning tubs and equipment used in the formulation of ink from pigments, driers, soaps, and stabilizers containing chromium and lead.	(T)
Coking:		
K060	Ammonia still lime sludge from coking operations	(T)
K087	Decanter tank tar sludge from coking operations	(T)

[46 FR 4618, Jan. 16, 1981, as amended at 46 FR 27476-27477, May 20, 1981; 49 FR 37070, Sept. 21, 1984; 50 FR 42942, Oct. 23, 1985; 51 FR 5330, Feb. 13, 1986; 51 FR 19322, May 28, 1986; 51 FR 33612, Sept. 22, 1986; 51 FR 37729, Oct. 24, 1986; 52 FR 28698, Aug. 3, 1987]

§ 261.33 Discarded commercial chemical products, off-specification species, container residues, and spill residues thereof.

The following materials or items are hazardous wastes if and when they are discarded or intended to be discarded as described in § 261.2(a)(2)(i), when they are mixed with waste oil or used oil or other material and applied to the land for dust suppression or road treatment, when they are otherwise applied to the land in lieu of their original intended use or when they are contained in products that are applied to the land in lieu of their original intended use, or when, in lieu of their original intended use, they are produced for use as (or as a component of) a fuel, distributed for use as a fuel, or burned as a fuel.

(a) Any commercial chemical product, or manufacturing chemical intermediate having the generic name listed in paragraph (e) or (f) of this section.

(b) Any off-specification commercial chemical product or manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in paragraph (e) or (f) of this section.

(c) Any residue remaining in a container or in an inner liner removed from a container that has held any commercial chemical product or manufacturing chemical intermediate having the generic name listed in paragraph (e) of this section, unless the container is empty as defined in § 261.7(b)(3) of the chapter.

[Comment: Unless the residue is being beneficially used or reused, or legitimately recycled or reclaimed; or being accumulated, stored, transported or treated prior to such use, re-use, recycling or reclamation, EPA considers the residue to be intended for discard, and thus, a hazardous waste. An example of a legitimate re-use of the residue would be where the residue remains in the container and the container is used to hold the same commercial chemical product or manufacturing chemical intermediate it previously held. An example of the discard of the residue would be where the drum is sent to a drum reconditioner who reconditions the drum but discards the residue.]

(d) Any residue or contaminated soil, water or other debris resulting from the cleanup of a spill into or on any land or water of any commercial chemical product or manufacturing chemical intermediate having the generic name listed in paragraph (e) or (f) of this section, or any residue or contaminated soil, water or other debris resulting from the cleanup of a spill, into or on any land or water, of any off-specification chemical product and manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in paragraph (e) or (f) of this section.

[Comment: The phrase "commercial chemical product or manufacturing chemical intermediate having the generic name listed in . . ." refers to a chemical substance which is manufactured or formulated for commercial or manufacturing use which consists of the commercially pure grade of the chemical, any technical grades of the chemical that are produced or marketed, and all formulations in which the chemical is the sole active ingredient. It does not refer to a material, such as a manufacturing process waste, that contains any of the substances listed in paragraph (e) or (f). Where a manufacturing process waste is deemed to be a hazardous waste because it contains a substance listed in paragraph (e) or (f), such waste will be listed in either § 261.31 or § 261.32 or will be identified as a hazardous waste by the characteristics set forth in Subpart C of this part.]

(e) The commercial chemical products, manufacturing chemical intermediates or off-specification commercial chemical products or manufacturing chemical intermediates referred to in paragraphs (a) through (d) of this section, are identified as acute hazardous wastes (H) and are subject to be the small quantity exclusion defined in § 261.5(e).

[Comment: For the convenience of the regulated community the primary hazardous properties of these materials have been indicated by the letters T (Toxicity), and R (Reactivity). Absence of a letter indicates that the compound only is listed for acute toxicity.]

These wastes and their corresponding EPA Hazardous Waste Numbers are:

Hazardous waste No.	Chemical abstracts No.	Substance
P023	107-20-0	Acetaldehyde, chloro-
P002	591-08-2	Acetamide, N-(aminothioxomethyl)-
P057	640-19-7	Acetamide, 2-fluoro-
P058	62-74-8	Acetic acid, fluoro-, sodium salt
P002	591-08-2	1-Acetyl-2-thiourea
P003	107-02-8	Acrolein
P070	116-06-3	Aldicarb
P004	309-00-2	Aldrin
P005	107-18-6	Allyl alcohol
P006	20859-73-8	Aluminum phosphide (R,T)
P007	2763-96-4	5-(Aminomethyl)-3-isoxazolol
P008	504-24-5	4-Aminopyridine
P009	131-74-8	Ammonium picrate (R)

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TABLE 3—SAMPLING AND ANALYSIS METHODS CONTAINED IN SW-846—Continued

Title	First edition		Second edition	
	Section No.	Method No.	Section No.	Method No.
Sample Analysis Request Sheet	2.0-9		1.3.5	
Sample Delivery to Laboratory	2.0-10		1.3.6	
Shipping of Samples	2.0-10		1.3.7	
Receipt and Logging of Sample	2.0-12		1.3.8	
Assignment of Sample for Analysis	2.0-13		1.3.9	
Sampling Methodology	3.0		1.4	
Containers	3.2-2		1.4.1	
Tanks	3.2-2		1.4.2	
Waste Piles	3.2-2		1.4.3	
Landfills and Lagoons	3.2-2		1.4.4	
Waste Evaluation Procedures			2.0	
Characteristics of Hazardous Waste			2.1	
Ignitability	4.0		2.1.1	
Pensky-Martens Closed-Cup Method	4.1		2.1.1	1010
Setaflash Closed-Cup Method	4.1		2.1.1	1020
Corrosivity	5.0		2.1.2	
Corrosivity Toward Steel	5.3		2.1.2	1110
Reactivity	6.0		2.1.3	
Extraction Procedure Toxicity	7.0		2.1.4	
Extraction Procedure Toxicity Test	7.1, 7.2, 7.5			
Method and Structural Integrity Test	7.4		2.1.4	1310
Sample Workup Techniques			4.0	
Inorganic Techniques	8.49		4.1	
Acid Digestion for Flame AAS	[1]		4.1	3010
Acid Digestion for Furnace AAS	[1]		4.1	3020
Acid Digestion of Oil, Grease, or Wax	8.49-9		4.1	3030
Dissolution Procedure for Oil, Grease or Wax	8.49-8			
Alkaline Digestion	8.0	8.458	4.1	3060
Organic Techniques	8.0		4.2	
Separatory Funnel Liquid-Liquid Extraction	9.0	9.1	4.2	3510
Continuous Liquid-Liquid Extraction	9.0	9.01	4.2	3520
Acid-Base Cleanup Extraction	8.0	8.84	4.2	3530
Soxhlet Extraction	8.0	8.86	4.2	3540
Sonication Extraction	8.0	8.85	4.2	3550
Sample Introduction Techniques			5.0	
Headspace	8.0	8.82	5.0	5020
Purge-and-Trap	8.0	8.83	5.0	5030
Inorganic Analytical Methods	8.0		7.0	
Antimony, Flame AAS	8.0	8.50	7.0	7470
Antimony, Furnace AAS	8.0	8.50	7.0	7471
Arsenic, Flame AAS	8.0	8.51	7.0	7060
Arsenic, Furnace AAS	8.0	8.51	7.0	7061
Barium, Flame AAS	8.0	8.52	7.0	7080
Barium, Furnace AAS	8.0	8.52	7.0	7081
Cadmium, Flame AAS	8.0	8.53	7.0	7130
Cadmium, Furnace AAS	8.0	8.53	7.0	7131
Chromium, Flame AAS	8.0	8.54	7.0	7090
Chromium, Furnace AAS	8.0	8.54	7.0	7191
Chromium, Hexavalent, Coprecipitation	8.0	8.545	7.0	7195
Chromium, Hexavalent, Colorimetric	8.0	8.546	7.0	7196
Chromium, Hexavalent, Chelation	8.0	8.547	7.0	7197
Lead, Flame AAS	8.0	8.55	7.0	7420
Lead, Furnace AAS	8.0	8.55	7.0	7421
Mercury, Cold Vapor, Liquid	8.0	8.57	7.0	7470
Mercury, Cold Vapor, Solid	8.0	8.57	7.0	7471
Nickel, Flame AAS	8.0	8.58	7.0	7520
Nickel, Furnace AAS	8.0	8.58	7.0	7521
Selenium, Flame AAS	8.0	8.59	7.0	7740
Selenium, Gaseous Hydride AAS	8.0	8.59	7.0	7741
Silver, Flame AAS	8.0	8.60	7.0	7760
Silver, Furnace AAS	8.0	8.60	7.0	7761
Organic Analytical Methods	8.0		8.0	
Gas Chromatographic Methods	8.0		8.1	
Halogenated Volatile Organics	8.0	8.01	8.1	8010
Nonhalogenated Volatile Organics	8.0	8.01	8.1	8015
Aromatic Volatile Organics	8.0	8.02	8.1	8020
Acrolein, Acrylonitrile, Acetonitrile	8.0	8.03	8.1	8030
Phenols	8.0	8.04	8.1	8040

TABLE 3—SAMPLING AND ANALYSIS METHODS CONTAINED IN SW-846—Continued

Title	First edition		Second edition	
	Section No.	Method No.	Section No.	Method No.
Phthalate Esters	8.0	8.06	8.1	8060
Organochlorine Pesticides and PCBs	8.0	8.08	8.1	8080
Nitroaromatics and Cyclic Ketones	8.0	8.09	8.1	8090
Polynuclear Aromatic Hydrocarbons	8.0	8.10	8.1	8100
Chlorinated Hydrocarbons	8.0	8.12	8.1	8120
Organophosphorus Pesticides	8.0	8.22	8.1	8140
Chlorinated Herbicides	8.0	8.40	8.1	8150
Gas Chromatographic/Mass Spectroscopy Methods (GC/MS)	8.0		8.2	
GC/MS Volatiles	8.0	8.24	8.2	8240
GC/MS Semi-Volatiles, Packed Column	8.0	8.25	8.2	8250
GC/MS Semi-Volatiles, Capillary	8.0	8.27	8.2	8270
Analysis of Chlorinated Dioxins and Dibenzofurans			8.2	8280
High Performance Liquid Chromatographic Methods (HPLC)	8.0		8.3	
Polynuclear Aromatic Hydrocarbons	8.0	8.10	8.3	8310
Miscellaneous Analytical Methods	8.0		9.0	
Cyanide; Total and Amenable to Chlorination	8.0	8.55	9.0	9010
Total Organic Halogen (TOX)	8.0	8.66	9.0	9020
Sulfides	8.0	8.67	9.0	9030
pH Measurement	5.0	5.2	9.0	9040
Quality Control/Quality Assurance	10.0		10.1	
Introduction	10.0		10.1	
Program Design	10.0		10.2	
Sampling	10.0		10.3	
Analysis	10.0		10.4	
Data Handling	10.0		10.5	

[1] See specific metal.

[48 FR 15257, Apr. 8, 1983, as amended at 50 FR 2000, Jan. 14, 1985; 50 FR 42942, Oct. 23, 1985; 51 FR 5330, Feb. 13, 1986; 51 FR 6541, Feb. 25, 1986; 51 FR 37729, Oct. 24, 1986]

APPENDIX IV—[RESERVED FOR RADIOACTIVE WASTE TEST METHODS]

APPENDIX V—[RESERVED FOR INFECTIOUS WASTE TREATMENT SPECIFICATIONS]

APPENDIX VI—[RESERVED FOR ETIOLOGIC AGENTS]

APPENDIX VII—BASIS FOR LISTING HAZARDOUS WASTE

EPA hazardous waste No.	Hazardous constituents for which listed
F001	Tetrachloroethylene, methylene chloride trichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride, chlorinated fluorocarbons.
F002	Tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trichlfluoroethane, ortho-dichlorobenzene, trichlorofluoromethane.
F003	N.A.
F004	Cresols and cresylic acid, nitrobenzene.
F005	Toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, 2-ethoxyethanol, benzene, 2-nitropropane.
F006	Cadmium, hexavalent chromium, nickel, cyanide (complexed).
F007	Cyanide (salts).
F008	Cyanide (salts).
F009	Cyanide (salts).
F010	Cyanide (salts).
F011	Cyanide (salts).
F012	Cyanide (complexed).
F019	Hexavalent chromium, cyanide (complexed).
F020	Tetra- and pentachlorodibenzo-p-dioxins; tetra and pentachlorodi-benzofurans; tri- and tetrachlorophenols and their chlorophenoxy derivative acids, esters, ethers, amine and other salts.
F021	Penta- and hexachlorodibenzo-p-dioxins; penta- and hexachlorodibenzofurans; pentachlorophenol and its derivatives.
F022	Tetra-, penta-, and hexachlorodibenzo-p-dioxins; tetra-, penta-, and hexachlorodibenzofurans.
F023	Tetra-, and pentachlorodibenzo-p-dioxins; tetra- and pentachlorodibenzofurans; tri- and tetrachlorophenols and their chlorophenoxy derivative acids, esters, ethers, amine and other salts.

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EPA hazardous waste No.	Hazardous constituents for which listed
F024	Chloromethane, dichloromethane, trichloromethane, carbon tetrachloride, chloroethylene, 1,1-dichloroethane, 1,2-dichloroethane, trans-1-2-dichloroethylene, 1,1-dichloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethylene, 1,1,1,2-tetra-chloroethane, 1,1,2,2-tetrachloroethane, tetrachloroethylene, pentachloroethane, hexachloroethane, allyl chloride (3-chloropropene), dichloropropane, dichloropropene, 2-chloro-1,3-butadiene, hexachloro-1,3-butadiene, hexachlorocyclopentadiene, hexachlorocyclohexane, benzene, chlorbenzene, dichlorobenzenes, 1,2,4-trichlorobenzene, tetrachlorobenzene, pentachlorobenzene, hexachlorobenzene, toluene, naphthalene.
K026	Tetra-, penta-, and hexachlorodibenzo-*p*-dioxins; tetra-, penta-, and hexachlorodibenzofurans.
F027	Tetra-, penta-, and hexachlorodibenzo-*p*-dioxins; tetra-, penta-, and hexachlorodibenzofurans; tri-, tetra-, and pentachlorophenols and their chlorophenoxy derivative acids, esters, ethers, amine and other salts.
F028	Tetra-, penta-, and hexachlorodibenzo-*p*-dioxins; tetra-, penta-, and hexachlorodibenzofurans; tri-, tetra-, and pentachlorophenols and their chlorophenoxy derivative acids, esters, ethers, amine and other salts.
K001	Pentachlorophenol, phenol, 2-chlorophenol, p-chloro-m-cresol, 2,4-dimethylphenyl, 2,4-dinitrophenol, trichlorophenols, tetrachlorophenols, 2,4-dinitrophenol, creosote, chrysene, naphthalene, fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benz(a)anthracene, dibenz(a)anthracene, acenaphthalene.
K002	Hexavalent chromium, lead
K003	Hexavalent chromium, lead.
K004	Hexavalent chromium.
K005	Hexavalent chromium, lead.
K006	Hexavalent chromium.
K007	Cyanide (complexed), hexavalent chromium.
K008	Hexavalent chromium.
K009	Chloroform, formaldehyde, methylene chloride, methyl chloride, paraldehyde, formic acid.
K010	Chloroform, formaldehyde, methylene chloride, methyl chloride, paraldehyde, formic acid, chloroacetaldehyde.
K011	Acrylonitrile, acetonitrile, hydrocyanic acid.
K013	Hydrocyanic acid, acrylonitrile, acetonitrile.
K014	Acetonitrile, acrylamide.
K015	Benzyl chloride, chlorobenzene, toluene, benzotrichloride.
K016	Hexachlorobenzene, hexachlorobutadiene, carbon tetrachloride, hexachloroethane, perchloroethylene.
K017	Epichlorohydrin, chloroethers [bis(chloromethyl) ether and bis (2-chloroethyl) ethers], trichloropropane, dichloropropanols.
K018	1,2-dichloroethane, trichloroethylene, hexachlorobutadiene, hexachlorobenzene.
K019	Ethylene dichloride, 1,1,1-trichloroethane, 1,1,2-trichloroethane, tetrachloroethanes (1,1,2,2-tetrachloroethane and 1,1,1,2-tetrachloroethane), trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform, vinyl chloride, vinylidene chloride.
K020	Ethylene dichloride, 1,1,1-trichloroethane, 1,1,2-trichloroethane, tetrachloroethanes (1,1,2,2-tetrachloroethane and 1,1,1,2-tetrachloroethane), trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform, vinyl chloride, vinylidene chloride.
K021	Antimony, carbon tetrachloride, chloroform.
K022	Phenol, tars (polycyclic aromatic hydrocarbons).
K023	Phthalic anhydride, maleic anhydride.
K024	Phthalic anhydride, 1,4-naphthoquinone.
K025	Meta-dinitrobenzene, 2,4-dinitrotoluene.
K026	Paraldehyde, pyridines, 2-picoline.
K027	Toluene diisocyanate, toluene-2, 4-diamine.
K028	1,1,1-trichloroethane, vinyl chloride.
K029	1,2-dichloroethane, 1,1,1-trichloroethane, vinyl chloride, vinylidene chloride, chloroform.
K030	Hexachlorobenzene, hexachlorobutadiene, hexachloroethane, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, ethylene dichloride.
K031	Arsenic.
K032	Hexachlorocyclopentadiene.
K033	Hexachlorocyclopentadiene.
K034	Hexachlorocyclopentadiene.
K035	Creosote, chrysene, naphthalene, fluoranthene benzo(b) fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd) pyrene, benzo(a)anthracene, dibenzo(a)anthracene, acenaphthalene.
K036	Toluene, phosphorodithioic and phosphorothioic acid esters.
K037	Toluene, phosphorodithioic and phosphorothioic acid esters.
K038	Phorate, formaldehyde, phosphorodithioic and phosphorothioic acid esters.
K039	Phosphorodithioic and phosphorothioic acid esters.
K040	Phorate, formaldehyde, phosphorodithioic and phosphorothioic acid esters.
K041	Toxaphene.
K042	Hexachlorobenzene, ortho-dichlorobenzene.
K043	2,4-dichlorophenol, 2,6-dichlorophenol, 2,4,6-trichlorophenol.
K044	N.A.
K045	N.A.
K046	Lead.
K047	N.A.
K048	Hexavalent chromium, lead.
K049	Hexavalent chromium, lead.
K050	Hexavalent chromium.
K051	Hexavalent chromium, lead.
K052	Lead.
K060	Cyanide, napthalene, phenolic compounds, arsenic.
K061	Hexavalent chromium, lead, cadmium.
K062	Hexavalent chromium, lead.
K069	Hexavalent chromium, lead, cadmium.
K071	Mercury.
K073	Chloroform, carbon tetrachloride, hexachloroethane, trichloroethane, tetrachloroethylene, dichloroethylene, 1,1,2,2-tetrachloroethane.
K083	Aniline, diphenylamine, nitrobenzene, phenylenediamine.
K084	Arsenic.
K085	Benzene, dichlorobenzenes, trichlorobenzenes, tetrachlorobenzenes, pentachlorobenzene, hexachlorobenzene, benzyl chloride.
K086	Lead, hexavalent chromium.
K087	Phenol, naphthalene.
K093	Phthalic anhydride, maleic anhydride.
K094	Phthalic anhydride.

EPA hazardous waste No.	Hazardous constituents for which listed
K095	1,1,2-trichloroethane, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane.
K096	1,2-dichloroethane, 1,1,1-trichloroethane, 1,1,2-trichloroethane.
K097	Chlordane, heptachlor.
K098	Toxaphene.
K099	2,4-dichlorophenol, 2,4,6-trichlorophenol.
K100	Hexavalent chromium, lead, cadmium.
K101	Arsenic.
K102	Arsenic.
K103	Aniline, nitrobenzene, phenylenediamine.
K104	Aniline, benzene, diphenylamine, nitrobenzene, phenylenediamine.
K105	Benzene, monochlorobenzene, dichlorobenzenes, 2,4,6-trichlorophenol.
K106	Mercury.
K111	2,4-Dinitrotoluene.
K112	2,4-Toluenediamine, *o*-toluidine, *p*-toluidine, aniline.
K113	2,4-Toluenediamine, *o*-toluidine, *p*-toluidine, aniline.
K114	2,4-Toluenediamine, *o*-toluidine, *p*-toluidine.
K115	2,4-Toluenediamine.
K116	Carbon tetrachloride, tetrachloroethylene, chloroform, phosgene.
K117	Ethylene dibromide.
K118	Ethylene dibromide.
K123	Ethylene thiourea.
K124	Ethylene thiourea.
K125	Ethylene thiourea.
K126	Ethylene thiourea.
K136	Ethylene dibromide.

N.A.—Waste is hazardous because it fails the test for the characteristic of ignitability, corrosivity, or reactivity.

[46 FR 4619, Jan. 16, 1981, as amended at 46 FR 27477, May 20, 1981; 49 FR 5312, Feb. 10, 1984; 50 FR 2000, Jan. 14, 1985; 50 FR 42942, Oct. 23, 1985; 51 FR 5330, Feb. 13, 1986; 51 FR 6541, Feb. 25, 1986; 51 FR 37729, Oct. 24, 1986]

APPENDIX VIII—HAZARDOUS CONSTITUENTS

Common name	Chemical abstracts name	Chemical abstracts No.	Hazardous waste No.
Acetonitrile	Same	75-05-8	U003
Acetophenone	Ethanone, 1-phenyl-	98-86-2	U004
2-Acetylaminefluorene	Acetamide, N-9H-fluoren-2-yl-	53-96-3	U005
Acetyl chloride	Same	75-36-5	U006
1-Acetyl-2-thiourea	Acetamide, N-(aminothioxomethyl)-	591-08-2	P002
Acrolein	2-Propenal	107-02-8	P003
Acrylamide	2-Propenamide	79-06-1	U007
Acrylonitrile	2-Propenenitrile	107-13-1	U009
Aflatoxins	Same	1402-68-2	
Aldicarb	Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime.	116-06-3	P070
Aldrin	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-10-hexachloro-1,4,4a,5,8,8a-hexahydro-,(1alpha,4alpha,4abeta,5alpha,8alpha,8abeta)-.	309-00-2	P004
Allyl alcohol	2-Propen-1-ol	107-18-6	P005
Aluminum phosphide	Same	20859-73-8	P006
4-Aminobiphenyl	[1,1'-Biphenyl]-4-amine	92-67-1	
5-(Aminomethyl)-3-isoxazolol	3(2H)-Isoxazolone, 5-(aminomethyl)-	2763-96-4	P007
4-Aminopyridine	4-Pyridinamine	504-24-5	P008
Amitrole	1H-1,2,4-Triazol-3-amine	61-82-5	U011
Ammonium vanadate	Vanadic acid, ammonium salt	7803-55-6	P119
Aniline	Benzenamine	62-53-3	U012
Antimony	Same	7440-36-0	
Antimony compounds, N.O.S.[1]			
Aramite	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester.	140-57-8	
Arsenic	Same	7440-38-2	
Arsenic compounds, N.O.S.[1]			
Arsenic acid	Arsenic acid H_3AsO_4	7778-39-4	P010
Arsenic pentoxide	Arsenic oxide As_2O_5	1303-28-2	P011
Arsenic trioxide	Arsenic oxide As_2O_3	1327-53-3	P012
Auramine	Benzenamine, 4,4'-carbonimidoylbis[N,N-dimethyl-	492-80-8	U014
Azaserine	L-Serine, diazoacetate (ester)	115-02-6	U015

REFERENCE NO. 31

GSC-TR8645

GRAPHICAL EXPOSURE MODELING SYSTEM

(GEMS)

USER'S GUIDE

VOLUME 2. MODELING

Prepared for:

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

Prepared by:

GENERAL SCIENCES CORPORATION
8401 Corporate Drive
Landover, Maryland 20785

Submitted: December 1, 1986

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E.L. BETH LTD.

LATITUDE 40:30:46 LONGITUDE 74:15:34 1980 POPULATION

Mile→	0-0.25	0.25-0.5	0.5-1.0	1.0-2.0	2.0-3.0	3.0-4.0	SECTOR TOTALS
KM	0.00- 0.4	0.4- 0.8	0.8- 1.6	1.6- 3.2	3.2- 4.8	4.8- 6.4	
S 1	279	4567	19400	19821	25530	43847	113444
RING TOTALS	279	4567	19400	19821	25530	43847	113444

REFERENCE NO. 32

SEQUENCE: REGION, STATE, SITE NAME

EVENTS: ALL

EPA ID NO.	SITE NAME / STREET / CITY / COUNTY CODE AND NAME	STATE	ZIP / CONG DIST.	OPRBLE UNIT	EVENT TYPE	EVENT QUAL	ACTUAL START DATE	ACTUAL COMPL DATE	CURRENT EVENT LEAD
NJD067464923	C L PETH LTD			00	DS1			11/01/91	EPA (FUND)
	500 HIGH STREET								
	PERTH AMBOY	NJ	08861						
	023 MIDDLESEX		NJ-06						
NJD980505077	E. RUTHERFORD JOINT SEWAGE T. P.			00	DS1			05/31/85	STATE(FUND)
	FOOT OF BOROUGH AVENUE				PA1	LOWER PRIORITY	08/22/90	09/24/90	STATE(FUND)
	EAST RUTHERFORD	NJ	07073		SI1	LOWER PRIORITY	02/05/87	03/31/87	STATE(FUND)
	003 BERGEN		NJ-09						
NJD930771604	E.I. DUPONT DE NEMOURS			00	DS1			05/01/85	STATE(FUND)
	CANNONBALL RD				PA1	LOWER PRIORITY	05/01/85	06/01/85	STATE(FUND)
	POMPTON LAKES	NJ	07442		SI1	HIGHER PRIORITY	06/30/89	09/27/89	EPA (FUND)
	031 PASSAIC		NJ-08						
NJD000820159	E.I. DUPONT DE NEMOURS			00	DS1			06/01/81	EPA (FUND)
	WASHINGTON RD				PA1	LOWER PRIORITY	07/29/87	08/21/87	STATE(FUND)
	SAYREVILLE	NJ	08859		SI1	HIGHER PRIORITY	06/30/89	09/27/89	EPA (FUND)
	023 MIDDLESEX		NJ-15						
NJD002165965	E.I. DUPONT DE NEMOURS			00	DS1			06/01/81	EPA (FUND)
	SOUTH WOOD AVENUE				PA1	LOWER PRIORITY		09/01/84	STATE(FUND)
	LINDEN	NJ	07036		SI1	NO FURTHER REMDL ACT PLND	08/15/85	09/13/85	EPA (FUND)
	039 UNION		NJ-15						
NJD002305420	E.I. DUPONT DE NEMOURS			00	DS1			04/01/79	OTHER
	P.O. BOX 152 (DUPONT ROAD)				PA1	NO FURTHER REMDL ACT PLND		09/01/84	STATE(FUND)
	CARNEYS POINT	NJ	08069		PA2	NO FURTHER REMDL ACT PLND		03/08/89	STATE(FUND)
	033 SALEM		NJ-02		SI1	HIGHER PRIORITY	10/01/90	12/17/90	EPA (FUND)
NJD002365730	E.I. DUPONT DE NEMOURS			00	DS1			12/01/79	EPA (FUND)
	CHAMBERS WORKS /RTE 130				PA1	LOWER PRIORITY		03/01/80	EPA (FUND)
	DEEPWATER	NJ	08023		SI1	DEFERRED TO RCRA OR NRC	12/01/79	05/01/80	EPA (FUND)
	033 SALEM		NJ-02						
NJD002444024	E.I. DUPONT DE NEMOURS			00	DS1			06/01/81	EPA (FUND)
	CHEESEQUAKE RD				PA1	LOWER PRIORITY	07/29/87	08/06/87	STATE(FUND)
	SAYREVILLE	NJ	08859		SI1	HIGHER PRIORITY	11/01/89	12/31/89	EPA (FUND)
	023 MIDDLESEX		NJ-15						

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EPA ID NO.	SITE NAME / STREET / CITY / COUNTY CODE AND NAME	STATE / ZIP / CONG DIST.	OPRBLE UNIT	EVENT TYPE	EVENT QUAL	ACTUAL START DATE	ACTUAL COMPL DATE	CURRENT EVENT LEAD
NJD981654131 (CONTINUED)	DOVER MUNICIPAL WELL 4		(00)	SI2	HIGHER PRIORITY	07/01/80	08/01/82	STATE(FUND)
			01	CO1		03/01/87		STATE ONLY
NJD980771570	DOVER TOWNSHIP LANDFILL		00	DS1			04/10/84	STATE(FUND)
	BAY & CHURCH STREETS			PA1	LOWER PRIORITY		09/01/84	STATE(FUND)
	DOVER TWP	NJ 08753		SI1	HIGHER PRIORITY	10/01/84	11/01/84	STATE(FUND)
	029 OCEAN	NJ-02						
NJD095628686	DOWELL SCHLUMBERGER INCORPORATED		00	DS1			04/10/84	STATE(FUND)
	MAPLE & JONES BLVD.			PA1	LOWER PRIORITY	05/01/85	06/01/85	STATE(FUND)
	MOUNT HOLLY	NJ 08060		SI1	NO FURTHER REMOL ACT PLND	09/22/87	09/22/87	EPA (FUND)
	005 BURLINGTON	NJ-06						
NJD053518536	DREW CHEM CORP		00	DS1			11/01/91	EPA (FUND)
	1106 HARRISON AVE							
	KEARNY	NJ 07032						
	017 HUDSON	NJ-11						
NJD001217496	DREW CHEMICAL CORPORATION/PVO		00	DS1			04/10/84	STATE(FUND)
	1 DREW CHEMICAL PLAZA			PA1	LOWER PRIORITY	05/01/85	05/31/85	STATE(FUND)
	BOONTON	NJ 07005		SI1	NO FURTHER REMOL ACT PLND	10/01/90	12/31/90	STATE(FUND)
	027 MORRIS	NJ-13						
NJD001095503	DREW METALEX CORPORATION		00	DS1			06/06/89	EPA (FUND)
	WATERWORKS ROAD			PA1	DEFERRED TO RCRA OR NRC		09/27/89	EPA (FUND)
	OLD BRIDGE	NJ 08857						
	023 MIDDLESEX	NJ-03						
NJD054526553	DUANE MARINE		00	RV1	STABILIZATION	07/03/84	04/28/87	RESP. PARTY
	26 WASHINGTON ST			IR2		07/03/84	04/28/87	EPA (FUND)
	PERTH AMBOY	NJ 08861		RV3	STABILIZATION	11/29/84	12/16/84	EPA (FUND)
	023 MIDDLESEX	NJ-15		DS1			05/01/79	EPA (FUND)
				PA1	HIGHER PRIORITY	05/04/87	05/11/87	EPA (FUND)
				SI1	DEFERRED TO RCRA OR NRC	06/30/89	09/29/89	STATE(FUND)
				OH1			09/28/84	EPA (FUND)
NJD001078819	DUBOIS CHEMICALS		00	DS1			01/01/80	EPA (FUND)
	UNION AVE & DUBOIS			PA1	LOWER PRIORITY		02/01/80	EPA (FUND)
	EAST RUTHERFORD	NJ 07073		SI1	NO FURTHER REMOL ACT PLND	12/01/79	02/01/80	EPA (FUND)
	003 BERGEN	NJ-09						

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CERCLIS DATA BASE DATE: 02/28/92 ** PROD VERSION **

VERSION 2.00
RUN DATE: 03/02/92
RUN TIME: 13:43:03

CERCLIS DATA BASE TIME: 16:51:49
LEVEL: REGION 02
SELECTION: INTEGRATED

U.S. EPA SUPERFUND PROGRAM
** C E R C L I S **
LIST-4: SITE ALIAS LOCATION LISTING

SEQUENCE: REG, ST, SITE NAME
REGION: 02

EPA ID	SITE/ALIAS NAME / STREET / CITY / COUNTY NAME	STATE / COUNTY	ZIP / CODE	ALIAS SEQ. #	NAME / SOURCE	FED / FAC	CONG / DIST.
NJD002355774 (CONTINUED)	DYNASIL CORP OF AMERICA			01			
	CAMDEN	NJ					
NJD067484923	E L BETH LTD					N	NJ-06
	500 HIGH STREET						
	PERTH AMBOY	NJ	08861				
	MIDDLESEX	023					
NJD980505077	E. RUTHERFORD JOINT SEWAGE T. P.				EPA	N	NJ-09
	FOOT OF BOROUGH AVENUE						
	EAST RUTHERFORD	NJ	07073				
	BERGEN	003					
	EAST RUTHERFORD PLANT			01			
NJD980771604	E.I. DUPONT DE NEMOURS				EPA	N	NJ-08
	CANNONBALL RD						
	POMPTON LAKES	NJ	07442				
	PASSAIC	031					
NJD000820159	E.I. DUPONT DE NEMOURS				EPA	N	NJ-15
	WASHINGTON RD						
	SAYREVILLE	NJ	08859				
	MIDDLESEX	023					
	DUPONT			01			
	F & F PLANT BURNING GROUND			03			
	PARLIN F & F			04			

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CERCLIS DATA BASE DATE: 02/28/92 ** PROD VERSION ** VERSION 2.00

CERCLIS DATA BASE TIME: 16:51:49 U.S. EPA SUPERFUND PROGRAM RUN DATE: 03/02/92

LEVEL: REGION 02 ** C E R C L I S ** RUN TIME: 13:43:03

SELECTION: INTEGRATED LIST-4: SITE ALIAS LOCATION LISTING

SEQUENCE: REG. ST. SITE NAME

REGION: 02

EPA ID	SITE/ALIAS NAME STREET CITY COUNTY NAME	STATE COUNTY	ZIP CODE	ALIAS SEQ.	NAME SOURCE	FED FAC	CONG DIST.
NJD[illegible]	DUANE MARINE 26 WASHINGTON ST PERTH AMBOY MIDDLESEX	NJ 023	08861		STS	N	NJ-15
	DUANE MARINE MIDDLESEX	NJ		01			
NJD[illegible]	DUBOIS CHEMICALS UNION AVE & DUBOIS EAST RUTHERFORD BERGEN	NJ 003	07073		STS	N	NJ-09
NJD[illegible]	DUCK ISLAND SANITARY LF LAMBERTON RD HAMILTON TWP MERCER	NJ 021	08619		STS	N	NJ-04
	DUCK ISLAND RT. 29 TRENTON	NJ	08611	01			
	INTERSTATE WASTE REMOVAL			02			
NJD[illegible]	DUFFIELD AVENUE DUFFIELD AVENUE JERSEY CITY HUDSON	NJ 017	07306			U	NJ-14
	DUFFIELD AVENUE HUDSON	NJ		01			
NJD[illegible]	DUPACOND PRODUCTS COMPANY [illegible] NOTTINGHAM WAY					N	NJ-04

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REFERENCE NO. 33

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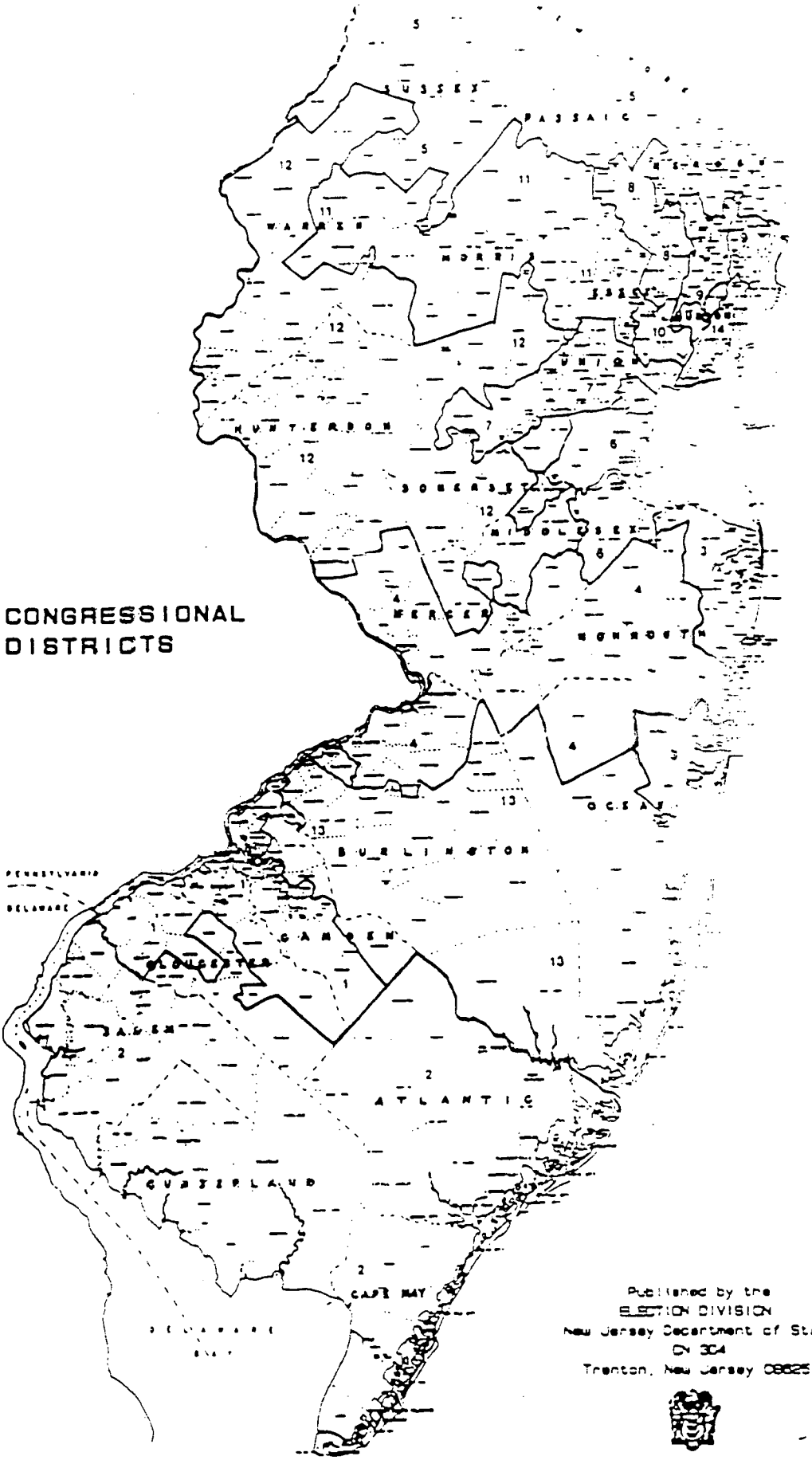
CONGRESSIONAL DISTRICTS



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CN 304
Trenton, New Jersey 08625

Thomas H. Kean
Governor

Jane Burgio
Secretary of State

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CONGRESSIONAL DISTRICTS

DISTRICT ONE: Part of **Burlington County** (Maple Shade Twp., Palmyra Borough, Riverton Borough), **Part of Camden County** (Audubon Park Borough, Barrington Borough, Bellmawr Borough, Berlin Borough, Berlin Twp., Brooklawn Borough, Camden City, Chesilhurst Borough, Clementon Borough, Collingswood Borough, Gibbsboro Borough, Gloucester City, Gloucester Twp., Haddon Twp., Hi-Nella Borough, Laurel Springs Borough, Lawnside Borough, Lindenwold Borough, Magnolia Borough, Mount Ephraim Borough, Oaklyn Borough, Pennsauken Twp., Pine Hill Borough, Pine Valley Borough, Runnemede Borough, Somerdale Borough, Stratford Borough, Tavistock Borough, Winslow Twp. and Woodlynne Borough), and **Part of Gloucester County** (Clayton Borough, Deptford Twp., East Greenwich Twp., Greenwich Twp., Harrison Twp., Logan Twp., Monroe Twp., National Park Borough, Paulsboro Borough, Swedesboro Borough, Washington Twp., Wenonah Borough, West Deptford Twp., Westville Borough, Woodbury City, Woodbury Hts. Borough and Woolwich Twp.).

DISTRICT TWO: Atlantic County, Cape May County, Cumberland County, Salem County and **Part of Gloucester County** (Elk Twp., Franklin Twp., Glassboro Borough, Mantua Twp., Newfield Borough, Pitman Borough and South Harrison Twp.).

DISTRICT THREE: Part Of **Monmouth County** (Allenhurst Borough, Asbury Park City, Atlantic Highlands, Borough, Avon-by-the-Sea Borough, Belmar Borough, Bradley Beach Borough, Deal Borough, Eatontown Borough, Fair Haven Borough, Hazlet Twp., Highlands Borough, Interlaken Borough, Keansburg Borough, Keyport Borough, Little Silver Borough, Loch Arbour Village, Long Branch City, Manasquan Borough, Middletown Twp., Monmouth Beach Boro, Neptune City Borough, Neptune Twp., Oceanport Borough, Ocean Twp., Red Bank Borough, Rumson Borough, Sea Bright Borough, Sea Girt Borough, Shrewsbury Borough, Shrewsbury Twp., Spring Lake Borough, Spring Lake Heights Borough, South Belmar Borough, Tinton Falls Borough, Union Beach Borough and West Long Branch Borough) and **Part of Ocean County** (Bay Head Borough, Brick Twp., Dover Twp., Island Heights Borough, Lakewood Twp., Lavallette Borough, Mantoloking Borough, Point Pleasant Beach Borough, Point Pleasant Borough, Seaside Heights Borough and South Toms River Borough).

DISTRICT FOUR: Part of **Burlington County** (Bordentown City, Bordentown Twp., Burlington City, Burlington Twp., Chesterfield Twp., Eastampton Twp., Fieldsboro Borough, Florence Twp., Mansfield Twp., Springfield Twp. and Westampton Twp.), **Part of Mercer County** (East Windsor Twp., Ewing Twp., Hamilton Twp., Hightstown Borough, Hopewell Borough, Hopewell Twp., Lawrence Twp., Pennington Borough, Trenton City and Washington Twp.), **Part of Middlesex County** (Jamesburg Borough, Monroe Twp. and Plainsboro Twp.), **Part of Monmouth County** (Allentown Borough, Brielle Borough, Colts Neck Twp., Englishtown Borough, Farmingdale Borough, Freehold Borough, Freehold Twp., Holmdel Twp., Howell Twp., Manalapan Twp., Marlboro Twp., Millstone Twp., Roosevelt Borough, Upper Freehold Twp. and Wall Twp.), and **Part of Ocean County** (Jackson Twp.).

DISTRICT FIVE: Part of **Bergen County** (Allendale Borough, Alpine Borough, Bergenfield Borough, Closter Borough, Cresskill Borough, Demarest Borough, Dumont Borough, Emerson Borough, Glen Rock Borough, Harrington Park Borough, Haworth Borough, Hillsdale Borough, Ho-Ho-Kus Borough, Mahwah Twp., Midland Park Borough, Montvale Borough, Northvale Borough, Norwood Borough, Oakland Borough, Old Tappan Borough, Oradell Borough, Paramus Borough, Park Ridge Borough, Ramsey Borough, Ridgewood Village, River Vale Twp., Rochelle Park Twp., Rockleigh Borough, Saddle River Borough, Tenafly Borough, Upper Saddle River Borough, Waldwick Borough, Washington Twp., Westwood Borough, Woodcliff Lake Borough and Wyckoff Twp.), **Part of Passaic County** (Bloomingdale Borough, Haledon Borough, Hawthorne Borough, North Haledon Borough, Ringwood Borough, Wanaque Borough and West Milford Twp.), and **Part of Sussex County** (Andover Borough, Andover Twp., Branchville Borough, Frankford Twp., Franklin Borough, Fredon Twp., Hamburg Borough, Hardyston Twp., Hopatcong Borough, Lafayette Twp., Montague Twp., Newton Town, Ogdensburg Borough, Sandyston Twp., Sparta Twp., Stanhope Borough, Sussex Borough, Vernon Twp., Walpack Twp. and Wantage Twp.).

DISTRICT SIX: Part of **Middlesex County** (Carteret Borough, Edison Twp., Highland Park Borough, Metuchen Borough, New Brunswick City, North Brunswick Twp., Old Bridge Twp., Perth Amboy City, Sayreville Borough, South Amboy City, South River Borough and Woodbridge Twp.), **Part of Monmouth County** (Aberdeen Twp. and Matawan Borough), and **Part of Union County** (Linden City, Rahway City and Roselle Borough).

DISTRICT SEVEN: Part of **Essex County** (Millburn Twp.), **Part of Middlesex County** (Dunellen Borough and Middlesex Borough), **Part of Somerset County** (Bound Brook Borough, Bridgewater Twp., Green Brook Twp., Manville Borough, North Plainfield Borough, Warren Twp. and Watchung Borough), and **Part of Union County** (Berkeley Heights Twp., Clark Twp., Cranford Twp., Elizabeth City, Fanwood Borough, Garwood Borough, Kenilworth Borough, Mountainside Borough, New Providence Borough, Plainfield City, Roselle Park Borough, Scotch Plains Twp., Springfield Twp., Summit City, Union Twp., Westfield Town and Winfield Twp.).

DISTRICT EIGHT: Part of **Bergen County** (Franklin Lakes Borough), **Part of Essex County** (Part of Belleville Town, Bloomfield Town, Glen Ridge Borough, Montclair Town and Nutley Town), **Part of Morris County** (Riverdale Borough) and **Part of Passaic County** (Clifton City, Little Falls Twp., Passaic City, Paterson City, Pompton Lakes Borough, Prospect Park Borough, Totowa Borough, Wayne Twp. and West Paterson Borough).

DISTRICT NINE: Part of **Bergen County** (Bogota Borough, Carlstadt Borough, Cliffside Park Borough, East Rutherford Borough, Edgewater Borough, Elmwood Park Borough, Englewood City, Englewood Cliffs Borough, Fair Lawn Borough, Fairview Borough, Fort Lee Borough, Garfield City, Hackensack City, Hasbrouck Heights Borough, Leonia Borough, Little Ferry Borough, Lodi Borough, Lyndhurst Twp., Maywood Borough, Moonachie Borough, New Milford Borough, North Arlington Borough, Palisades Park Borough, Ridgefield Borough, Ridgefield Park Village, River Edge Borough, Rutherford Borough, Saddle Brook Twp., South Hackensack Twp., Teaneck Twp., Teterboro Borough, Wallington Borough and Wood-Ridge Borough), and **Part of Hudson County** (East Newark Borough, Part of Kearny Town, and Secaucus Town).

DISTRICT TEN: Part of **Essex County** (Part of Belleville Town, East Orange City, Irvington Town, Newark City and Orange City) and **Part of Union County** (Hillside Township).

DISTRICT ELEVEN: Part of **Essex County** (Caldwell Borough, Cedar Grove Twp., Essex Fells Borough, Fairfield Borough, Livingston Twp., Maplewood Twp., North Caldwell Borough, Roseland Borough, South Orange Village, Verona Borough, West Caldwell Borough and West Orange Town), **Part of Morris County** (Boonton Town, Boonton Twp., Butler Borough, Chatham Borough, Chester Borough, Chester Twp., Denville Twp., Dover Town, East Hanover Twp., Florham Park Borough, Hanover Twp., Jefferson Twp., Kinnelon Borough, Lincoln Park Borough, Madison Borough, Mendham Borough, Mendham Twp., Mine Hill Twp., Montville Twp., Mountain Lakes Borough, Mount Arlington Borough, Mount Olive Twp., Netcong Borough, Parsippany-Troy Hills Twp., Pequannock Twp., Randolph Twp., Rockaway Borough, Rockaway Twp., Roxbury Twp., Victory Gardens Borough and Wharton Borough), **Part of Sussex County** (Byram Twp. and Green Twp.), and **Part of Warren County** (Allamuchy Twp., Frelinghuysen Twp., Independence Twp. and Liberty Twp.).

DISTRICT TWELVE: Hunterdon County, **Part of Mercer County** (Princeton Borough, Princeton Twp. and West Windsor Twp.), **Part of Middlesex County** (Cranbury Twp., East Brunswick Twp., Helmetta Borough, Milltown Borough, Piscataway Twp., South Brunswick Twp., South Plainfield Borough and Spotswood Borough), **Part of Morris County** (Chatham Twp., Harding Twp., Morris Plains Borough, Morristown Town, Morris Twp., Passaic Twp. and Washington Twp.), **Part of Somerset County** (Bedminster Twp., Bernards Twp., Bernardsville Borough, Branchburg Twp., Far Hills Borough, Franklin Twp., Hillsborough Twp., Millstone Borough, Montgomery Twp., Peapack-Gladstone Borough, Raritan Borough, Rocky Hill Borough, Somerville Borough and South Bound Brook Borough), **Part of Sussex County** (Hampton Twp. and Stillwater Twp.), and **Part of Warren County** (Alpha Borough, Belvidere Town, Blairstown Twp., Franklin Twp., Greenwich Twp., Hackettstown Town, Hardwick Twp., Harmony Twp., Hope Twp., Knowlton Twp., Lopatcong Twp., Mansfield Twp., Oxford Twp., Pahaquarry Twp., Phillipsburg Town, Pohatcong Twp., Washington Borough, Washington Twp. and White Twp.).

DISTRICT THIRTEEN: Part of **Burlington County** (Bass River Twp., Beverly City, Cinnaminson Twp., Delanco Twp., Delran Twp., Edgewater Park Twp., Evesham Twp., Hainesport Twp., Lumberton Twp., Medford Lakes Borough, Medford Twp., Moorestown Twp., Mount Holly Twp., Mount Laurel Twp., New Hanover Twp., North Hanover Twp., Pemberton Borough, Pemberton Twp., Riverside Twp., Shamong Twp., Southampton Twp., Tabernacle Twp., Washington Twp., Willingboro Twp., Woodland Twp. and Wrightstown Borough), **Part of Camden County** (Audubon Borough, Cherry Hill Twp., Haddonfield Borough, Haddon Heights Borough, Merchantville Borough, Voorhees Twp. and Waterford Twp.), and **Part of Ocean County** (Barnegat Light Borough, Barnegat Twp., Beach Haven Borough, Beachwood Borough, Berkeley Twp., Eagleswood Twp., Harvey Cedars Borough, Lacey Twp., Lakehurst Borough, Little Egg Harbor Twp., Long Beach Twp., Manchester Twp., Ocean Gate Borough, Ocean Township, Pine Beach Borough, Plumsted Twp., Seaside Park Borough, Ship Bottom Borough, Stafford Twp., Surf City Borough and Tuckerton Borough).

DISTRICT FOURTEEN: Part of **Hudson County** (Bayonne City, Guttenberg Town, Harrison Town, Hoboken City, Jersey City, Part of Kearny Town, North Bergen Twp., Union City, Weehawken Twp. and West New York Town).

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CN 304 Trenton, New Jersey 08625

January 1987

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ATTACHMENT 3

SITE ASSESSMENT PHASES

1. PRELIMINARY ASSESSMENT/RCRA PRELIMINARY ASSESSMENT

   - Quick, Low Cost Review of Readily Accessible Records and Reports
   - Undertaken to Determine the Existence of a Problem and the Need for Further Action at a Site by Characterizing:
     - Magnitude of the Hazard
     - Source and Nature of the Release or Potential Release
     - Identity of Potentially Responsible Party(s) (PRP)
   - Does Not Include On-Site Visits or Sample Collection

2. SITE INSPECTION

   - The Purpose of the Site Inspection is to:
     - Determine the Necessity of Further Action
     - Further Define and Characterize the Problem
     - Provide Data for the Hazard Ranking System (HRS) Scoring and Compute Initial Score
   - The Site Inspection Involves an On-Site Visit and Sampling (10+/- Samples)
   - A Site Inspection is not an Extent of Contamination Study
   - A Site Inspection Avoids Use of More Sophisticated Analysis
     - Geophysical Survey

3. SITE INSPECTION PRIORITIZATION

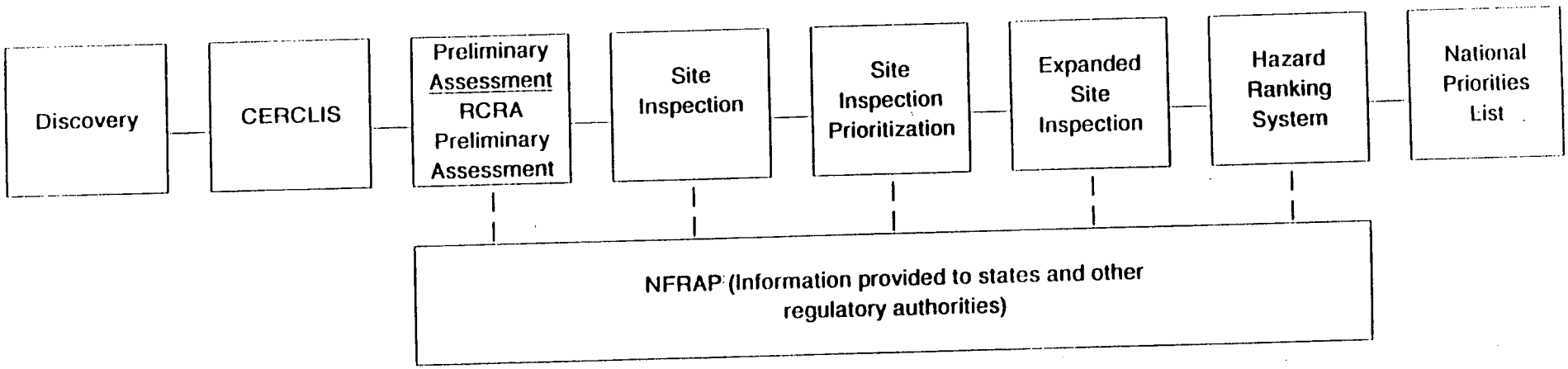
   - Quick, Low Cost Review of Readily Accessible Records and Reports
   - Undertaken to Determine the Validity and Update Background Conditions Under the New HRS Model, and the Need for Further Action at a Site by Characterizing:
     - Magnitude of the Hazard
     - Source and Nature of the Release or Potential Release
   - Included On-Site Visits or Sample Collection
     - Analyze Samples/Limited Analytical Resources
     - Account for Significant Safety Hazards On-Site

4. EXPANDED SITE INSPECTION

   A Follow-Up Inspection May Be Recommended After the SI To:

   - Gather Additional Data Necessary to Strengthen or Substantiate the Initial HRS Score
     - Geophysical Surveys
     - Installation of Groundwater Monitoring Wells
     - Additional Sampling

SITE ASSESSMENT PHASES



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Review of Analytical Data

If previous analytical data are available, they should be reviewed for information which supports the design of the sampling and analysis program, tests site hypotheses, and documents the site score. The SI investigator should review all previous analytical data. While analytical data collected for other purposes may not meet SI objectives, site-specific analytical data are generally helpful in better understanding the nature of the problem at the site, regardless of data sources or data quality. The depth of the review depends on the overall quality and quantity of data, the intended use of the data, and whether they are representative of current site conditions and comparable to SI data. Determining whether available data can be applied as SI-generated data requires the professional judgement of an experienced reviewer. Both validated and non-validated analytical data may be available. Previous SI data will be validated and of CLP-quality. Non-validated data may contain false positives and false negatives, as well as quantitation, transcription, and calculation errors. If data of unknown or questionable quality are used for decision-making, the investigator should review all available information to assess the level of certainty associated with the data. If these data are used for HRS documentation, data validation may be necessary. The investigator may be able to determine the general quality of the data set by reviewing QC data. False positives can occur when blanks are contaminated or spike recoveries are very high. False negatives can occur if spike recoveries are very low. If hazardous substances are found in one duplicate but not the other, results may be false positive or negative.

REFERENCE NO. 4

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14 March 2000, Tuesday

09:00 START members K. Curran & K. Domeman arrived at the E L Beth Ltd site, Perth Amboy, Middlesex County, New Jersey. Began conducting an on-site reconnaissance of the site. The site is bordered to the west by Gregory Metal Fabricators Inc, to the north by Vira Manufacturing, to the east by the Arthur Kill, and to the South by an abandoned Cerclis site (Quare Marine). The site is partially fenced but there a several holes in the fence. The site consists of a parcel of land and a pier. Background information indicats that a fire occured in May 1981. This fire destroyed the factory that was located on the pier. The pier currently consists of mainly rubble. The factory stack can still be seen.

0905 Photo #1 (E) - View of fire-damaged factory and pier.

09:07 Photo #2 (ESE) - View of fire-damaged factory and pier.

0910 photo #3 (SE) - Rubble from fire-damaged factory. Holes in pier seen in background.

0912 photo #4 fire-damaged factory on pier. Rubble (E) in foreground.

0915 photo #5 (SSW) Storm Sewer

0917 Photo #6 (SSW) Storm Sewer

0920 photo #7 (S) View of southern portion of property. Rubble in foreground. Graffiti is seen indicating access by outsiders.

0922 photo #8 (SSW) Drum imprints on blacktop. ✗

0925 photo #9 (W) View towards adjacent lot. Hole in fence on southern portion of property.

0930 photo #10 (WNW) Abandoned garage with rubble and graffit.

0935 photo #12 (N) View of adjacent lot. Culvert in background. No residences schools, or day-care facilities are within 200 feet of the site. In order to access the site, you must drive through the Gregory Metal Fabricators, Inc property / parking lot. The pier area looks to be dangerous due to the rubble and holes in the pier. Run-off would be expected to go directly to the Arthur Kill. The site is abandoned however access by outsiders is clearly visible through graffiti left behind. An approximately 2 foot culvert separates the site from Vira Mfg. on the northern portion of the property in addition to a fence.

0940 Finished on-site reconnaissance.

0923 ✗ photo #9 (N) View of drum staging

ramp. Abandoned garage and graffiti
Seen in background.

REFERENCE NO. 5

NJSDC-PH90-2

NJSDC 1990 CENSUS PUBLICATION

HOUSING UNITS AND HOUSEHOLD POPULATION NEW JERSEY, COUNTIES AND MUNICIPALITIES: 1990

State of New Jersey
Jim Florio, Governor

Department of Labor
Raymond L. Bramucci, Commissioner

Division of Labor Market and Demographic Research
New Jersey State Data Center
CN 388
Trenton, New Jersey 08625-0388

March 1991

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Table 2. Housing Units, Households, and Persons in Households and Group Quarters: 1990 (Cont.)
New Jersey Municipalities by Counties

The population counts set forth herein are subject to possible correction for undercount or overcount. The United States Department of Commerce is considering whether to correct these counts and will publish corrected counts, if any, not later than July 15, 1991.

MIDDLESEX County Municipalities	(1) Total Housing Units	(2) Vacant Housing Units	(3) Total Persons	(4) Persons in Group Quarters	(5) Total Households (1)-(2)	(6) Persons in Households (3)-(4)	(7) Persons per Household (6)/(5)
MIDDLESEX COUNTY	250,174	11,341	671,780	23,669	238,833	648,111	2.71
Carteret borough	6,811	210	19,025	64	6,601	18,961	2.87
Cranbury township	922	49	2,500	40	873	2,460	2.82
Dunellen borough	2,496	73	6,528	77	2,423	6,451	2.66
East Brunswick township	15,395	474	43,548	7	14,921	43,541	2.92
Edison township	32,832	1,061	88,680	1,949	31,771	86,731	2.73
Helmetta borough	522	73	1,211	0	449	1,211	2.70
Highland Park borough	6,106	327	13,279	0	5,779	13,279	2.30
Jamesburg borough	2,064	86	5,294	52	1,978	5,242	2.65
Metuchen borough	5,097	161	12,804	43	4,936	12,761	2.59
Middlesex borough	4,920	188	13,055	0	4,732	13,055	2.76
Milltown borough	2,553	57	6,968	0	2,496	6,968	2.79
Monroe township	10,303	1,012	22,255	830	9,291	21,425	2.31
New Brunswick city	13,556	845	41,711	7,425	12,711	34,286	2.70
North Brunswick township	12,186	631	31,287	1,803	11,555	29,484	2.55
Old Bridge township	21,116	1,132	56,475	270	19,984	56,205	2.81
Perth Amboy city	15,017	810	41,967	619	14,207	41,348	2.91
Piscataway township	14,575	542	47,089	6,584	14,033	40,505	2.89
Plainsboro township	7,752	929	14,213	0	6,823	14,213	2.08
Sayreville borough	13,347	598	34,986	255	12,749	34,731	2.72

continued ...

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Table 2. Housing Units, Households, and Persons in Households and Group Quarters: 1990 (Cont.)
New Jersey Municipalities by Counties

The population counts set forth herein are subject to possible correction for undercount or overcount. The United States Department of Commerce is considering whether to correct these counts and will publish corrected counts, if any, not later than July 15, 1991.

MIDDLESEX County Municipalities	(1) Total Housing Units	(2) Vacant Housing Units	(3) Total Persons	(4) Persons in Group Quarters	(5) Total Households (1)-(2)	(6) Persons in Households (3)-(4)	(7) Persons per Household (6)/(5)
South Amboy city	3,057	119	7,863	24	2,938	7,839	2.67
South Brunswick township	9,962	554	25,792	50	9,408	25,742	2.74
South Plainfield borough	6,823	118	20,489	180	6,705	20,309	3.03
South River borough	5,269	185	13,692	22	5,084	13,670	2.69
Spotswood borough	2,995	82	7,983	0	2,913	7,983	2.74
Woodbridge township	34,498	1,025	93,086	3,375	33,473	89,711	2.68

Source: 1990 Census of Population and Housing.

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REFERENCE NO. 6

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM **PROJECT NOTE**

TO:
E L Beth Ltd site file

DATE:
6/29/00

FROM:
Kelley Curran

SUBJECT:
Population Summary

REFERENCE:
The following population summary is based on the report received from Frost Associates (attached).

This project note was prepared to summarize the population within a 4-mile radius of the E L Beth Ltd site. A portion lies in New Jersey and a portion lies in New York. All values were rounded to the nearest ten.

Distance Ring (miles)	New Jersey	New York	Total
0 to 1/4	700	20	720
1/4 to ½	4360	670	5030
½ to 1	17180	3780	20960
1 to 2	21080	3890	24970
2 to 3	22470	7380	29850
3 to 4	38160	17120	55280
Total:	**103950**	**32860**	**136810**

Total population for the 4-mile radius is approximately 136,810.

FROST ASSOCIATES

88 Founders Village, Clinton, CT 06413
(860) 669-5859 FAX (860) 669-5869

March 5, 2000

To: Roy F. Weston Inc - Region II START
1090 King Georges Post Road, Suite 201
Edison, NJ

Attn: Harry Allen

NEW JERSEY PORTION

Fr: Frost Associates
Founders Village
Clinton, Conn 06413

Tel: (203) 669-5859
Fax: (860) 669-5859

Sub: E. L. Beth Limited
Perth Amboy, NJ

CERCLIS:

Job: 6517

Site Longitude:	74-15-34	74.259453
Site Latitude :	40-30-48	40.513329

The CENTRACTS report below identifies the population, households, and private water wells of each Block Group that lies within, or partially within, the 4, 3, 2, 1, .5, and .25, mile "rings" of the latitude and longitude coordinates above. A CENTRACTS report may have up to six radii of any length and 1500 block groups.

CENTRACTS uses the 1990 Block Group population and Block Group house count data found in the Census Bureau's 1990 STF-1A files. The sources of water supply data are from The Bureau's 1990 STF-3A files. The boundary line coordinates of the Block Groups were extracted from the Census Bureau's 1990 TIGER/Line Files.

CENTRACTS reports are created with programs written by Frost Associates, 88 Founders Village, Clinton Conn 06413. The code was written using Microsoft's Quick-Basic Ver. 4.5.

Latitude and Longitude coordinates identifying a site are entered in degrees and decimal degrees. One or more county files holding Block Group boundary lines are selected for use by CENTRACTS by determining whether the site coordinates fall within the minimum and maximum Lat\Lon coordinates of each county in the state.

Each Block Group line segment has Lat\Lon coordinates representing the "From" and "To" ends of that line. All coordinates from the selected county files are read and converted from degrees, decimal degrees to X\Y miles from the site location. Each line segment is then examined whether it lies within or partially within the maximum ring from the site.

The unique Block Group ID numbers of each line segment that lie within the maximum ring are retained. All Block Group boundary lines matching the Block Group numbers are then extracted from the respective county files to obtain all sides of the included Block Groups. Boundary records are then sorted in adjacent side order to determine the shape and area of each Block Group polygon.

A method to solve for the area of a polygon is to take one-half the sum of the products obtained by multiplying each X-coordinate by the difference between the adjacent Y-coordinates. For a polygon with coordinates at adjacent angles A, B, C, D, and E. The formula can be expressed:

Area = 1/2{Xa(Ye-Yb)+ Xb(Ya-Yb)+ Xc(Yb-Yd)+ Xd(Yc-Ye)+ Xe(Yd-Ya)}

For each ring, the selected Block Groups will be inside, outside, or intersected by the ring. When a polygon is intersected, the partial Block Group area within that ring is calculated using the method described below.

When a ring intersects a Block Group, the intersect points are solved and plotted at the points where the ring enters and exits the shape. The chord line, a line within the circle connecting the intersect points is determined. This chord line is used to calculate the segment area, the half moon shape between the chord line and the ring, and the sub-polygon created by the chord line and the Block Group boundaries that lie outside the ring.

The segment area is subtracted from the sub-polygon area to determine the area of the sub-polygon outside the ring. The area outside the ring is then subtracted from the area of the entire polygon to arrive at the inside area. This inside area is then divided by the tract's total area to determine the percentage of area within the ring. This process is repeated for each block group that is intersected by one of the rings. The total area, partial area, and percentage of partial area of those block groups within, or partially within a ring, are held in memory for the report.

On occasion, the algorithm described above is unable to determine the area of the partial area. Within the report program is a "Paint" routine which allows an enclosed shape to be highlighted. Another routine calculates the percentage of highlighted screen pixels to the pixels within the polygon. A manual entry is allowed. Both the "paint" method and manual entry method over ride the calculated method.

CENTRACTS lists, starting on page 4, all Block Groups in State, County, Census Tract, and Block Group ID order that lie within, or partially within, the maximum ring. Each Block Group is identified by a City or Town name and by the Block Group's State, County, Tract and Block Group ID number. Following is the Block Group's 1990 populu tion and house count extracted from the Census Bureau's 1990 STF-1A files.

The next four columns display water source data from the 1990 STF-3A files. The first column is "Units with Public system or private company source of water", followed by "Units with individual well, Drilled, source of water"; "Units with individual well, Dug, source of water" and "Units with Other source of water".

For each ring, CENTRACTS then shows the Block Groups that are within that ring, the Block Group's total area in square miles, the partial area of the Block Group within that ring, and the partial percentage within the ring. The areas of the included Block Group and the partial areas are then totaled.

The last section tallies the demographic data within each ring. The percentage of area for each Block Group is multiplied times the census data for that Block Group and totaled for all Block Group's within the ring. Ring totals are then determined by subtracting the three mile data from the four mile, the two mile from the three mile, one from the two, etc... Population on private wells is calculated using the formula: ((Drilled + Dug Wells) / Households) * Population

E. L. Beth Limited
Perth Amboy, NJ

No.	City	Block Group ID	Blk Grp	People	House Holds	Public Water	Drilled Wells	Dug Wells	Other
1	Woodbridge	34023 0030	1	727	287	286	0	0	0
2	Woodbridge	34023 0030	2	578	226	218	0	0	0
3	Woodbridge	34023 0030	3	479	207	243	0	0	0
4	Woodbridge	34023 0030	4	625	247	250	0	0	0
5	Woodbridge	34023 0030	5	1740	677	673	0	0	0
6	Woodbridge	34023 0030	6	4372	1990	1996	0	0	0
7	Woodbridge	34023 0030	7	847	407	404	0	0	0
8	Woodbridge	34023 0033	1	1890	912	897	0	0	0
9	Woodbridge	34023 0033	2	1792	715	700	0	0	0
10	Woodbridge	34023 0033	3	1445	532	510	0	0	0
11	Carteret	34023 0039	2	2609	847	901	0	0	0
12	Perth Amboy	34023 0040	1	753	249	260	0	0	0
13	Perth Amboy	34023 0040	2	2681	943	908	0	0	0
14	Perth Amboy	34023 0040	3	1458	601	614	0	0	11
15	Perth Amboy	34023 0041	1	741	323	324	0	0	0
16	Perth Amboy	34023 0041	2	629	283	269	0	0	0
17	Perth Amboy	34023 0041	3	575	257	259	0	0	0
18	Perth Amboy	34023 0042	1	1212	499	510	0	0	0
19	Perth Amboy	34023 0042	2	1096	411	417	0	0	0
20	Perth Amboy	34023 0042	3	373	127	121	0	0	0
21	Perth Amboy	34023 0043	1	669	238	224	0	0	0
22	Perth Amboy	34023 0043	2	1259	492	502	0	0	0
23	Perth Amboy	34023 0043	3	939	357	361	0	0	0
24	Perth Amboy	34023 0044	1	1081	421	417	0	0	0
25	Perth Amboy	34023 0044	2	1237	469	466	0	0	0
26	Perth Amboy	34023 0044	3	942	344	336	15	0	0
27	Perth Amboy	34023 0045	1	775	270	306	0	0	0
28	Perth Amboy	34023 0045	2	728	238	231	0	0	0
29	Perth Amboy	34023 0045	3	1972	580	540	35	0	0
30	Perth Amboy	34023 0045	9	238	89	65	0	0	0
31	Perth Amboy	34023 0046	1	362	176	146	0	0	0
32	Perth Amboy	34023 0046	2	1665	558	568	0	0	0
33	Perth Amboy	34023 0046	3	989	353	363	0	0	0
34	Perth Amboy	34023 0046	4	2056	639	666	0	0	8
35	Perth Amboy	34023 0047	1	542	178	185	0	0	0
36	Perth Amboy	34023 0047	2	960	345	296	0	0	0
37	Perth Amboy	34023 0047	3	485	196	184	0	0	0
38	Perth Amboy	34023 0047	4	100	36	51	0	0	0
39	Perth Amboy	34023 0047	5	750	236	241	9	0	0
40	Perth Amboy	34023 0048	1	2376	638	668	0	0	0
41	Perth Amboy	34023 0048	2	2407	912	903	0	0	0
42	Perth Amboy	34023 0048	3	597	224	231	0	0	0
43	Perth Amboy	34023 0048	4	183	73	45	0	0	0
44	Perth Amboy	34023 0049	1	1368	758	802	0	0	0
45	Perth Amboy	34023 0049	2	821	370	380	0	0	0
46	Perth Amboy	34023 0049	3	1740	561	507	0	0	0
47	Perth Amboy	34023 0050	1	750	286	270	0	0	0
48	Perth Amboy	34023 0050	2	943	276	276	0	0	0
49	Perth Amboy	34023 0050	3	3515	1011	1027	0	0	0
50	South Amboy	34023 0075	1	985	411	424	0	0	0
51	South Amboy	34023 0075	2	902	298	269	0	0	0
52	South Amboy	34023 0075	3	1404	529	540	0	0	0
53	South Amboy	34023 0076	1	1063	426	439	0	0	0
54	South Amboy	34023 0076	2	1342	511	513	0	0	0
55	South Amboy	34023 0076	3	683	284	284	0	0	0

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56	South Amboy	34023	0076 4	604	227	230	0	0	0
57	South Amboy	34023	0076 5	844	360	342	0	0	0
58	Edison	34023	0018051	225	78	66	0	0	0
59	Edison	34023	0018055	89	31	30	0	0	0
60	Edison	34023	0018062	130	47	50	0	0	0
61	Edison	34023	0019012	1259	421	416	0	0	0
62	Edison	34023	0019021	190	57	51	0	0	0
63	Edison	34023	0019022	530	209	196	0	0	0
64	Edison	34023	0019023	782	333	378	0	0	0
65	Edison	34023	0019024	691	277	262	0	0	0
66	Edison	34023	0019031	1265	537	511	0	0	0
67	Edison	34023	0019033	862	348	358	0	0	0
68	Woodbridge	34023	0026022	692	320	281	0	0	0
69	Woodbridge	34023	0026032	1949	907	899	0	0	0
70	Woodbridge	34023	0028013	1704	856	844	0	0	7
71	Woodbridge	34023	0028021	1556	562	569	0	0	0
72	Woodbridge	34023	0028022	1338	461	483	8	0	0
73	Woodbridge	34023	0028031	1069	382	388	0	0	0
74	Woodbridge	34023	0028033	1232	406	422	0	0	0
75	Woodbridge	34023	0028034	208	79	71	0	0	0
76	Woodbridge	34023	0028035	843	294	300	0	0	0
77	Woodbridge	34023	0029011	569	214	198	0	0	0
78	Woodbridge	34023	0029012	760	307	295	0	0	0
79	Woodbridge	34023	0029021	892	488	522	0	0	0
80	Woodbridge	34023	0029022	1057	435	427	0	0	0
81	Woodbridge	34023	0029023	641	259	261	0	0	0
82	Woodbridge	34023	0031021	2962	1388	1419	0	0	0
83	Woodbridge	34023	0031022	601	190	172	5	0	0
84	Woodbridge	34023	0031023	1240	391	373	0	0	0
85	Woodbridge	34023	0032011	435	152	148	0	0	0
86	Woodbridge	34023	0032012	1179	480	481	0	0	0
87	Woodbridge	34023	0032013	1394	565	568	0	0	0
88	Woodbridge	34023	0032031	1303	539	525	0	0	0
89	Woodbridge	34023	0032032	686	281	322	0	0	0
90	Woodbridge	34023	0032033	1181	530	503	0	0	0
91	Woodbridge	34023	0032034	34	14	10	0	0	0
92	Woodbridge	34023	0032041	493	238	262	0	0	0
93	Woodbridge	34023	0032042	774	391	439	0	0	0
94	Woodbridge	34023	0034011	312	107	87	0	0	0
95	Woodbridge	34023	0034012	1381	512	503	0	0	0
96	Woodbridge	34023	0034013	525	186	184	0	0	0
97	Woodbridge	34023	0034014	405	164	146	0	0	0
98	Woodbridge	34023	0034015	11	6	4	0	0	0
99	Woodbridge	34023	0034016	824	313	302	0	0	0
100	Woodbridge	34023	0034994	0	0	0	0	0	0
101	Carteret	34023	0036999	24	0	0	0	0	0
102	Sayreville	34023	0072012	2036	800	784	0	6	0
103	Sayreville	34023	0072013	9	3	0	0	0	0
104	Sayreville	34023	0072024	14	5	4	0	0	0
105	Sayreville	34023	0072031	1347	689	701	0	0	0
106	Sayreville	34023	0072032	1336	501	491	0	0	0
107	Sayreville	34023	0072033	993	358	362	0	0	4
108	Sayreville	34023	0072034	720	221	211	0	0	0
109	Sayreville	34023	0073011	1389	410	425	0	0	0
110	Sayreville	34023	0073031	1424	462	489	0	0	0
111	Sayreville	34023	0073041	1234	436	403	0	0	0
112	Sayreville	34023	0073042	957	368	346	0	0	0
113	Sayreville	34023	0074011	525	205	210	0	0	0
114	Sayreville	34023	0074012	575	207	212	0	0	0
115	Sayreville	34023	0074021	714	260	257	0	0	0
116	Sayreville	34023	0074022	519	188	188	0	0	0

117	Sayreville	34023	0074023	1155	333	308	0	0	0
118	Sayreville	34023	0074024	794	356	376	0	0	0
119	Sayreville	34023	0074025	2	1	0	0	0	0
120	Sayreville	34023	0074026	1104	406	410	0	0	0
121	Old Bridge	34023	0080011	846	387	416	0	0	0
122	Old Bridge	34023	0080012	776	295	279	0	0	0
123	Old Bridge	34023	0080013	1062	372	361	0	0	0
124	Old Bridge	34023	0080983	1262	472	491	0	0	0
125	Keansburg	34025	8017 5	675	215	212	0	0	0
126	Aberdeen	34025	8121 3	0	0	0	0	0	0
	Totals:			124663	47815	47720	72	6	30

E. L. Beth Limited
Perth Amboy, NJ

City	Census Tract ID	Tract People	House Count	Public Water	Drilled Wells	Dug Wells	Other Sources
Aberdeen	34025 8121 3	0	0	0	0	0	0
	Sub Totals:	0	0	0	0	0	0
Carteret	34023 0039 2	2609	847	901	0	0	0
Carteret	34023 0036999	24	0	0	0	0	0
	Sub Totals:	2633	847	901	0	0	0
Edison	34023 0019024	691	277	262	0	0	0
Edison	34023 0019031	1265	537	511	0	0	0
Edison	34023 0018051	225	78	66	0	0	0
Edison	34023 0018055	89	31	30	0	0	0
Edison	34023 0019012	1259	421	416	0	0	0
Edison	34023 0019021	190	57	51	0	0	0
Edison	34023 0019023	782	333	378	0	0	0
Edison	34023 0019033	862	348	358	0	0	0
Edison	34023 0019022	530	209	196	0	0	0
Edison	34023 0018062	130	47	50	0	0	0
	Sub Totals:	6023	2338	2318	0	0	0
Keansburg	34025 8017 5	675	215	212	0	0	0
	Sub Totals:	675	215	212	0	0	0
Old Bridge	34023 0080012	776	295	279	0	0	0
Old Bridge	34023 0080983	1262	472	491	0	0	0
Old Bridge	34023 0080013	1062	372	361	0	0	0
Old Bridge	34023 0080011	846	387	416	0	0	0
	Sub Totals:	3946	1526	1547	0	0	0
Perth Amboy	34023 0047 3	485	196	184	0	0	0
Perth Amboy	34023 0042 3	373	127	121	0	0	0
Perth Amboy	34023 0043 1	669	238	224	0	0	0
Perth Amboy	34023 0047 2	960	345	296	0	0	0
Perth Amboy	34023 0048 1	2376	638	668	0	0	0
Perth Amboy	34023 0048 2	2407	912	903	0	0	0
Perth Amboy	34023 0047 5	750	236	241	9	0	0
Perth Amboy	34023 0042 2	1096	411	417	0	0	0
Perth Amboy	34023 0040 1	753	249	260	0	0	0
Perth Amboy	34023 0040 2	2681	943	908	0	0	0
Perth Amboy	34023 0043 2	1259	492	502	0	0	0
Perth Amboy	34023 0043 3	939	357	361	0	0	0
Perth Amboy	34023 0044 1	1081	421	417	0	0	0
Perth Amboy	34023 0044 2	1237	469	466	0	0	0
Perth Amboy	34023 0044 3	942	344	336	15	0	0
Perth Amboy	34023 0046 4	2056	639	666	0	0	8
Perth Amboy	34023 0047 1	542	178	185	0	0	0
Perth Amboy	34023 0048 4	183	73	45	0	0	0
Perth Amboy	34023 0040 3	1458	601	614	0	0	11
Perth Amboy	34023 0041 1	741	323	324	0	0	0
Perth Amboy	34023 0047 4	100	36	51	0	0	0
Perth Amboy	34023 0041 3	575	257	259	0	0	0
Perth Amboy	34023 0042 1	1212	499	510	0	0	0

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Perth Amboy	34023	0048	3	597	224	231	0	0	0
Perth Amboy	34023	0046	3	989	353	363	0	0	0
Perth Amboy	34023	0045	1	775	270	306	0	0	0
Perth Amboy	34023	0049	1	1368	758	802	0	0	0
Perth Amboy	34023	0041	2	629	283	269	0	0	0
Perth Amboy	34023	0049	3	1740	561	507	0	0	0
Perth Amboy	34023	0050	1	750	286	270	0	0	0
Perth Amboy	34023	0050	3	3515	1011	1027	0	0	0
Perth Amboy	34023	0046	1	362	176	146	0	0	0
Perth Amboy	34023	0046	2	1665	558	568	0	0	0
Perth Amboy	34023	0045	3	1972	580	540	35	0	0
Perth Amboy	34023	0049	2	821	370	380	0	0	0
Perth Amboy	34023	0045	2	728	238	231	0	0	0
Perth Amboy	34023	0050	2	943	276	276	0	0	0
Perth Amboy	34023	0045	9	238	89	65	0	0	0
	Sub Totals:			41967	15017	14939	59	0	19
Sayreville	34023	0074022		519	188	188	0	0	0
Sayreville	34023	0074021		714	260	257	0	0	0
Sayreville	34023	0072024		14	5	4	0	0	0
Sayreville	34023	0074012		575	207	212	0	0	0
Sayreville	34023	0072012		2036	800	784	0	6	0
Sayreville	34023	0072013		9	3	0	0	0	0
Sayreville	34023	0072031		1347	689	701	0	0	0
Sayreville	34023	0074011		525	205	210	0	0	0
Sayreville	34023	0073042		957	368	346	0	0	0
Sayreville	34023	0073031		1424	462	489	0	0	0
Sayreville	34023	0074025		2	1	0	0	0	0
Sayreville	34023	0074023		1155	333	308	0	0	0
Sayreville	34023	0074024		794	356	376	0	0	0
Sayreville	34023	0072032		1336	501	491	0	0	0
Sayreville	34023	0074026		1104	406	410	0	0	0
Sayreville	34023	0073041		1234	436	403	0	0	0
Sayreville	34023	0073011		1389	410	425	0	0	0
Sayreville	34023	0072033		993	358	362	0	0	4
Sayreville	34023	0072034		720	221	211	0	0	0
	Sub Totals:			16847	6209	6177	0	6	4
South Amboy	34023	0075	2	902	298	269	0	0	0
South Amboy	34023	0076	4	604	227	230	0	0	0
South Amboy	34023	0076	5	844	360	342	0	0	0
South Amboy	34023	0075	1	985	411	424	0	0	0
South Amboy	34023	0075	3	1404	529	540	0	0	0
South Amboy	34023	0076	1	1063	426	439	0	0	0
South Amboy	34023	0076	2	1342	511	513	0	0	0
South Amboy	34023	0076	3	683	284	284	0	0	0
	Sub Totals:			7827	3046	3041	0	0	0
Woodbridge	34023	0030	6	4372	1990	1996	0	0	0
Woodbridge	34023	0030	7	847	407	404	0	0	0
Woodbridge	34023	0030	5	1740	677	673	0	0	0
Woodbridge	34023	0030	2	578	226	218	0	0	0
Woodbridge	34023	0030	3	479	207	243	0	0	0
Woodbridge	34023	0030	4	625	247	250	0	0	0
Woodbridge	34023	0026022		692	320	281	0	0	0
Woodbridge	34023	0026032		1949	907	899	0	0	0
Woodbridge	34023	0033	1	1890	912	897	0	0	0
Woodbridge	34023	0033	2	1792	715	700	0	0	0

Woodbridge	34023	0033 3	1445	532	510	0	0	0
Woodbridge	34023	0030 1	727	287	286	0	0	0
Woodbridge	34023	0034013	525	186	184	0	0	0
Woodbridge	34023	0034014	405	164	146	0	0	0
Woodbridge	34023	0034015	11	6	4	0	0	0
Woodbridge	34023	0034016	824	313	302	0	0	0
Woodbridge	34023	0034994	0	0	0	0	0	0
Woodbridge	34023	0028013	1704	856	844	0	0	7
Woodbridge	34023	0028021	1556	562	569	0	0	0
Woodbridge	34023	0028022	1338	461	483	8	0	0
Woodbridge	34023	0028031	1069	382	388	0	0	0
Woodbridge	34023	0028033	1232	406	422	0	0	0
Woodbridge	34023	0028034	208	79	71	0	0	0
Woodbridge	34023	0028035	843	294	300	0	0	0
Woodbridge	34023	0029011	569	214	198	0	0	0
Woodbridge	34023	0029012	760	307	295	0	0	0
Woodbridge	34023	0029021	892	488	522	0	0	0
Woodbridge	34023	0029022	1057	435	427	0	0	0
Woodbridge	34023	0029023	641	259	261	0	0	0
Woodbridge	34023	0031021	2962	1388	1419	0	0	0
Woodbridge	34023	0031022	601	190	172	5	0	0
Woodbridge	34023	0031023	1240	391	373	0	0	0
Woodbridge	34023	0032011	435	152	148	0	0	0
Woodbridge	34023	0032012	1179	480	481	0	0	0
Woodbridge	34023	0032013	1394	565	568	0	0	0
Woodbridge	34023	0032031	1303	539	525	0	0	0
Woodbridge	34023	0032032	686	281	322	0	0	0
Woodbridge	34023	0032033	1181	530	503	0	0	0
Woodbridge	34023	0032034	34	14	10	0	0	0
Woodbridge	34023	0032041	493	238	262	0	0	0
Woodbridge	34023	0032042	774	391	439	0	0	0
Woodbridge	34023	0034011	312	107	87	0	0	0
Woodbridge	34023	0034012	1381	512	503	0	0	0
	Sub Totals:		44745	18617	18585	13	0	7

For Radius of 4 Mi., Circle Area = 50.265482

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
1	Woodbridge	34023 301	0.164122	0.163662	99.72
2	Woodbridge	34023 302	0.067662	0.067662	100.00
3	Woodbridge	34023 303	0.073275	0.073275	100.00
4	Woodbridge	34023 304	0.106646	0.106646	100.00
5	Woodbridge	34023 305	0.458783	0.458783	100.00
6	Woodbridge	34023 306	0.943425	0.750866	79.59
7	Woodbridge	34023 307	0.381936	0.323115	84.60
8	Woodbridge	34023 331	0.847824	0.847824	100.00
9	Woodbridge	34023 332	0.386648	0.386648	100.00
10	Woodbridge	34023 333	0.434088	0.434088	100.00
11	Carteret	34023 392	0.861407	0.268007	31.11
12	Perth Amboy	34023 401	0.373630	0.373630	100.00
13	Perth Amboy	34023 402	0.288566	0.288566	100.00
14	Perth Amboy	34023 403	0.131428	0.131428	100.00
15	Perth Amboy	34023 411	0.072218	0.072218	100.00
16	Perth Amboy	34023 412	0.058464	0.058464	100.00
17	Perth Amboy	34023 413	0.073836	0.073836	100.00
18	Perth Amboy	34023 421	0.142349	0.142349	100.00
19	Perth Amboy	34023 422	0.055677	0.055677	100.00
20	Perth Amboy	34023 423	0.026378	0.026378	100.00
21	Perth Amboy	34023 431	0.049962	0.049962	100.00
22	Perth Amboy	34023 432	0.092062	0.092062	100.00
23	Perth Amboy	34023 433	0.108545	0.108545	100.00
24	Perth Amboy	34023 441	0.068085	0.068085	100.00
25	Perth Amboy	34023 442	0.069255	0.069255	100.00
26	Perth Amboy	34023 443	0.039956	0.039956	100.00
27	Perth Amboy	34023 451	0.041215	0.041215	100.00
28	Perth Amboy	34023 452	0.038075	0.038075	100.00
29	Perth Amboy	34023 453	0.107973	0.107973	100.00
30	Perth Amboy	34023 459	1.527987	1.527987	100.00
31	Aberdeen	34025 81213	2.055576	1.029735	50.09
32	Perth Amboy	34023 462	0.070832	0.070832	100.00
33	Perth Amboy	34023 463	0.051677	0.051677	100.00
34	Perth Amboy	34023 464	0.070452	0.070452	100.00
35	Perth Amboy	34023 471	0.035490	0.035490	100.00
36	Perth Amboy	34023 472	0.064249	0.064249	100.00
37	Perth Amboy	34023 473	0.062298	0.062298	100.00
38	Perth Amboy	34023 474	0.032930	0.032930	100.00
39	Perth Amboy	34023 475	0.047787	0.047787	100.00
40	Perth Amboy	34023 481	0.070913	0.070913	100.00
41	Perth Amboy	34023 482	0.145181	0.145181	100.00
42	Perth Amboy	34023 483	0.056470	0.056470	100.00
43	Perth Amboy	34023 484	0.678674	0.678674	100.00
44	Perth Amboy	34023 491	0.070521	0.070521	100.00
45	Perth Amboy	34023 492	0.073908	0.073908	100.00
46	Perth Amboy	34023 493	0.145806	0.145806	100.00
47	Perth Amboy	34023 501	0.430568	0.430568	100.00
48	Perth Amboy	34023 502	0.047703	0.047703	100.00
49	Perth Amboy	34023 503	0.135664	0.135664	100.00
50	South Amboy	34023 751	1.073347	1.073347	100.00
51	South Amboy	34023 752	0.226585	0.226585	100.00
52	South Amboy	34023 753	0.229254	0.229254	100.00
53	South Amboy	34023 761	0.132213	0.132213	100.00

54	South Amboy	34023	762	0.109824	0.109824	100.00
55	South Amboy	34023	763	0.593866	0.593866	100.00
56	South Amboy	34023	764	0.073483	0.073483	100.00
57	South Amboy	34023	765	0.139194	0.139194	100.00
58	Edison	34023	18051	0.234495	0.012008	5.12
59	Edison	34023	18055	0.349028	0.022512	6.45
60	Edison	34023	18062	6.782317	0.857356	12.64
61	Edison	34023	19012	0.325006	0.115498	35.54
62	Edison	34023	19021	0.053195	0.053195	100.00
63	Edison	34023	19022	0.107544	0.105858	98.43
64	Edison	34023	19023	0.076432	0.076432	100.00
65	Edison	34023	19024	0.094119	0.094119	100.00
66	Edison	34023	19031	0.207998	0.030210	14.52
67	Edison	34023	19033	0.147524	0.002581	1.75
68	Woodbridge	34023	26022	0.255748	0.141375	55.28
69	Woodbridge	34023	26032	0.494642	0.005259	1.06
70	Woodbridge	34023	28013	0.697019	0.097667	14.01
71	Woodbridge	34023	28021	0.329666	0.287820	87.31
72	Woodbridge	34023	28022	0.296135	0.218778	73.88
73	Woodbridge	34023	28031	0.607485	0.438007	72.10
74	Woodbridge	34023	28033	0.153533	0.048347	31.49
75	Woodbridge	34023	28034	0.235821	0.128828	54.63
76	Woodbridge	34023	28035	0.310494	0.310494	100.00
77	Woodbridge	34023	29011	0.168506	0.168506	100.00
78	Woodbridge	34023	29012	0.173699	0.173699	100.00
79	Woodbridge	34023	29021	0.102586	0.102586	100.00
80	Woodbridge	34023	29022	0.183074	0.183074	100.00
81	Woodbridge	34023	29023	0.078331	0.078331	100.00
82	Woodbridge	34023	31021	0.290851	0.269396	92.62
83	Woodbridge	34023	31022	0.095566	0.023476	24.57
84	Woodbridge	34023	31023	0.173121	0.165733	95.73
85	Woodbridge	34023	32011	0.096758	0.096758	100.00
86	Woodbridge	34023	32012	0.217815	0.217815	100.00
87	Woodbridge	34023	32013	0.171811	0.171811	100.00
88	Woodbridge	34023	32031	0.183006	0.183006	100.00
89	Woodbridge	34023	32032	0.100500	0.100500	100.00
90	Woodbridge	34023	32033	0.134903	0.134903	100.00
91	Woodbridge	34023	32034	0.073716	0.073716	100.00
92	Woodbridge	34023	32041	1.994091	1.994091	100.00
93	Woodbridge	34023	32042	0.351115	0.351115	100.00
94	Woodbridge	34023	34011	0.114247	0.114247	100.00
95	Woodbridge	34023	34012	0.275904	0.275904	100.00
96	Woodbridge	34023	34013	0.249902	0.249902	100.00
97	Woodbridge	34023	34014	0.240836	0.240836	100.00
98	Woodbridge	34023	34015	1.205538	1.205538	100.00
99	Woodbridge	34023	34016	0.426047	0.426047	100.00
102	Sayreville	34023	72012	1.618198	0.840239	51.92
103	Sayreville	34023	72013	1.353953	1.216521	89.85
104	Sayreville	34023	72024	0.321389	0.040765	12.68
105	Sayreville	34023	72031	0.370851	0.004942	1.33
106	Sayreville	34023	72032	0.297186	0.196142	66.00
107	Sayreville	34023	72033	0.093778	0.093234	99.42
108	Sayreville	34023	72034	0.081429	0.081429	100.00
109	Sayreville	34023	73011	0.294104	0.098141	33.37
110	Sayreville	34023	73031	0.265122	0.132320	49.91
111	Sayreville	34023	73041	0.471342	0.329987	70.01
112	Sayreville	34023	73042	0.634493	0.084618	13.34
113	Sayreville	34023	74011	0.625440	0.625440	100.00
114	Sayreville	34023	74012	0.462559	0.462559	100.00
115	Sayreville	34023	74021	0.274031	0.274031	100.00
116	Sayreville	34023	74022	0.137083	0.137083	100.00

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117	Sayreville	34023 74023	0.385486	0.385486	100.00
118	Sayreville	34023 74024	0.504031	0.449145	89.11
119	Sayreville	34023 74025	1.341877	1.341877	100.00
120	Sayreville	34023 74026	0.177312	0.177312	100.00
121	Old Bridge	34023 80011	1.077578	0.157796	14.64
122	Old Bridge	34023 80012	0.237936	0.168760	70.93
123	Old Bridge	34023 80013	0.134855	0.003215	2.38
124	Old Bridge	34023 80983	2.355308	2.091199	88.79
125	Keansburg	34025 80175	13.529829	0.281694	2.08
126	Perth Amboy	34023 461	0.187024	0.187024	100.00
	Totals:		61.108265	33.053150	

For Radius of 3 Mi., Circle Area = 28.274334

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
4	Woodbridge	34023 304	0.106646	0.000005	0.01
5	Woodbridge	34023 305	0.458783	0.393993	85.88
8	Woodbridge	34023 331	0.847824	0.823048	97.08
9	Woodbridge	34023 332	0.386648	0.386648	100.00
10	Woodbridge	34023 333	0.434088	0.434088	100.00
12	Perth Amboy	34023 401	0.373630	0.373630	100.00
13	Perth Amboy	34023 402	0.288566	0.288566	100.00
14	Perth Amboy	34023 403	0.131428	0.131428	100.00
15	Perth Amboy	34023 411	0.072218	0.072218	100.00
16	Perth Amboy	34023 412	0.058464	0.058464	100.00
17	Perth Amboy	34023 413	0.073836	0.073836	100.00
18	Perth Amboy	34023 421	0.142349	0.142349	100.00
19	Perth Amboy	34023 422	0.055677	0.055677	100.00
20	Perth Amboy	34023 423	0.026378	0.026378	100.00
21	Perth Amboy	34023 431	0.049962	0.049962	100.00
22	Perth Amboy	34023 432	0.092062	0.092062	100.00
23	Perth Amboy	34023 433	0.108545	0.108545	100.00
24	Perth Amboy	34023 441	0.068085	0.068085	100.00
25	Perth Amboy	34023 442	0.069255	0.069255	100.00
26	Perth Amboy	34023 443	0.039956	0.039956	100.00
27	Perth Amboy	34023 451	0.041215	0.041215	100.00
28	Perth Amboy	34023 452	0.038075	0.038075	100.00
29	Perth Amboy	34023 453	0.107973	0.107973	100.00
30	Perth Amboy	34023 459	1.527987	1.527987	100.00
31	Aberdeen	34025 81213	2.055576	0.006685	0.33
32	Perth Amboy	34023 462	0.070832	0.070832	100.00
33	Perth Amboy	34023 463	0.051677	0.051677	100.00
34	Perth Amboy	34023 464	0.070452	0.070452	100.00
35	Perth Amboy	34023 471	0.035490	0.035490	100.00
36	Perth Amboy	34023 472	0.064249	0.064249	100.00
37	Perth Amboy	34023 473	0.062298	0.062298	100.00
38	Perth Amboy	34023 474	0.032930	0.032930	100.00
39	Perth Amboy	34023 475	0.047787	0.047787	100.00
40	Perth Amboy	34023 481	0.070913	0.070913	100.00
41	Perth Amboy	34023 482	0.145181	0.145181	100.00
42	Perth Amboy	34023 483	0.056470	0.056470	100.00
43	Perth Amboy	34023 484	0.678674	0.678674	100.00
44	Perth Amboy	34023 491	0.070521	0.070521	100.00
45	Perth Amboy	34023 492	0.073908	0.073908	100.00
46	Perth Amboy	34023 493	0.145806	0.145806	100.00
47	Perth Amboy	34023 501	0.430568	0.430568	100.00

48	Perth Amboy	34023 502	0.047703	0.047703	100.00
49	Perth Amboy	34023 503	0.135664	0.135664	100.00
50	South Amboy	34023 751	1.073347	1.073347	100.00
51	South Amboy	34023 752	0.226585	0.226585	100.00
52	South Amboy	34023 753	0.229254	0.218247	95.20
53	South Amboy	34023 761	0.132213	0.093074	70.40
54	South Amboy	34023 762	0.109824	0.109824	100.00
55	South Amboy	34023 763	0.593866	0.593866	100.00
56	South Amboy	34023 764	0.073483	0.011195	15.23
57	South Amboy	34023 765	0.139194	0.133974	96.25
77	Woodbridge	34023 29011	0.168506	0.003298	1.96
78	Woodbridge	34023 29012	0.173699	0.068346	39.35
79	Woodbridge	34023 29021	0.102586	0.041381	40.34
80	Woodbridge	34023 29022	0.183074	0.000028	0.02
81	Woodbridge	34023 29023	0.078331	0.077143	98.48
86	Woodbridge	34023 32012	0.217815	0.032514	14.93
87	Woodbridge	34023 32013	0.171811	0.086682	50.45
88	Woodbridge	34023 32031	0.183006	0.183006	100.00
89	Woodbridge	34023 32032	0.100500	0.090788	90.34
90	Woodbridge	34023 32033	0.134903	0.108336	80.31
91	Woodbridge	34023 32034	0.073716	0.073716	100.00
92	Woodbridge	34023 32041	1.994091	0.577641	28.97
93	Woodbridge	34023 32042	0.351115	0.351115	100.00
95	Woodbridge	34023 34012	0.275904	0.160073	58.02
96	Woodbridge	34023 34013	0.249902	0.249902	100.00
97	Woodbridge	34023 34014	0.240836	0.240557	99.88
98	Woodbridge	34023 34015	1.205538	0.584089	48.45
99	Woodbridge	34023 34016	0.426047	0.426047	100.00
102	Sayreville	34023 72012	1.618198	0.098099	6.06
103	Sayreville	34023 72013	1.353953	0.799464	59.05
113	Sayreville	34023 74011	0.625440	0.625440	100.00
114	Sayreville	34023 74012	0.462559	0.260151	56.24
115	Sayreville	34023 74021	0.274031	0.177759	64.87
119	Sayreville	34023 74025	1.341877	1.154682	86.05
120	Sayreville	34023 74026	0.177312	0.003080	1.74
124	Old Bridge	34023 80983	2.355308	0.618614	26.26
126	Perth Amboy	34023 461	0.187024	0.187024	100.00
	Totals:		27.251194	17.440340	

For Radius of 2 Mi., Circle Area = 12.566371

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
9	Woodbridge	34023 332	0.386648	0.114198	29.54
10	Woodbridge	34023 333	0.434088	0.240645	55.44
12	Perth Amboy	34023 401	0.373630	0.338244	90.53
13	Perth Amboy	34023 402	0.288566	0.145836	50.54
14	Perth Amboy	34023 403	0.131428	0.131428	100.00
15	Perth Amboy	34023 411	0.072218	0.072218	100.00
16	Perth Amboy	34023 412	0.058464	0.058464	100.00
17	Perth Amboy	34023 413	0.073836	0.073836	100.00
18	Perth Amboy	34023 421	0.142349	0.142349	100.00
19	Perth Amboy	34023 422	0.055677	0.055677	100.00
20	Perth Amboy	34023 423	0.026378	0.026378	100.00
21	Perth Amboy	34023 431	0.049962	0.049962	100.00
22	Perth Amboy	34023 432	0.092062	0.092062	100.00
23	Perth Amboy	34023 433	0.108545	0.108545	100.00

24	Perth Amboy	34023 441	0.068085	0.068085	100.00
25	Perth Amboy	34023 442	0.069255	0.069255	100.00
26	Perth Amboy	34023 443	0.039956	0.039956	100.00
27	Perth Amboy	34023 451	0.041215	0.041215	100.00
28	Perth Amboy	34023 452	0.038075	0.038075	100.00
29	Perth Amboy	34023 453	0.107973	0.107973	100.00
30	Perth Amboy	34023 459	1.527987	1.491582	97.62
32	Perth Amboy	34023 462	0.070832	0.070832	100.00
33	Perth Amboy	34023 463	0.051677	0.051677	100.00
34	Perth Amboy	34023 464	0.070452	0.070452	100.00
35	Perth Amboy	34023 471	0.035490	0.035490	100.00
36	Perth Amboy	34023 472	0.064249	0.064249	100.00
37	Perth Amboy	34023 473	0.062298	0.062298	100.00
38	Perth Amboy	34023 474	0.032930	0.032930	100.00
39	Perth Amboy	34023 475	0.047787	0.047787	100.00
40	Perth Amboy	34023 481	0.070913	0.070913	100.00
41	Perth Amboy	34023 482	0.145181	0.145181	100.00
42	Perth Amboy	34023 483	0.056470	0.056470	100.00
43	Perth Amboy	34023 484	0.678674	0.678674	100.00
44	Perth Amboy	34023 491	0.070521	0.070521	100.00
45	Perth Amboy	34023 492	0.073908	0.073908	100.00
46	Perth Amboy	34023 493	0.145806	0.145806	100.00
47	Perth Amboy	34023 501	0.430568	0.430568	100.00
48	Perth Amboy	34023 502	0.047703	0.047703	100.00
49	Perth Amboy	34023 503	0.135664	0.135664	100.00
50	South Amboy	34023 751	1.073347	0.789069	73.51
55	South Amboy	34023 763	0.593866	0.311534	52.46
96	Woodbridge	34023 34013	0.249902	0.019314	7.73
97	Woodbridge	34023 34014	0.240836	0.080816	33.56
98	Woodbridge	34023 34015	1.205538	0.030679	2.54
113	Sayreville	34023 74011	0.625440	0.203822	32.59
119	Sayreville	34023 74025	1.341877	0.063321	4.72
126	Perth Amboy	34023 461	0.187024	0.187024	100.00
	Totals:		11.995350	7.482686	

For Radius of 1 Mi., Circle Area = 3.141593

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
19	Perth Amboy	34023 422	0.055677	0.013124	23.57
22	Perth Amboy	34023 432	0.092062	0.003593	3.90
23	Perth Amboy	34023 433	0.108545	0.044042	40.58
24	Perth Amboy	34023 441	0.068085	0.044940	66.01
25	Perth Amboy	34023 442	0.069255	0.066021	95.33
26	Perth Amboy	34023 443	0.039956	0.039956	100.00
27	Perth Amboy	34023 451	0.041215	0.041215	100.00
28	Perth Amboy	34023 452	0.038075	0.038075	100.00
29	Perth Amboy	34023 453	0.107973	0.107973	100.00
30	Perth Amboy	34023 459	1.527987	0.590775	38.66
32	Perth Amboy	34023 462	0.070832	0.070832	100.00
33	Perth Amboy	34023 463	0.051677	0.051677	100.00
34	Perth Amboy	34023 464	0.070452	0.070452	100.00
35	Perth Amboy	34023 471	0.035490	0.033344	93.95
36	Perth Amboy	34023 472	0.064249	0.010604	16.50
39	Perth Amboy	34023 475	0.047787	0.035067	73.38
40	Perth Amboy	34023 481	0.070913	0.063054	88.92
41	Perth Amboy	34023 482	0.145181	0.020256	13.95

43	Perth Amboy	34023 484	0.678674	0.000038	0.01
44	Perth Amboy	34023 491	0.070521	0.070521	100.00
45	Perth Amboy	34023 492	0.073908	0.073908	100.00
46	Perth Amboy	34023 493	0.145806	0.145806	100.00
47	Perth Amboy	34023 501	0.430568	0.145086	33.70
48	Perth Amboy	34023 502	0.047703	0.036267	76.03
49	Perth Amboy	34023 503	0.135664	0.058733	43.29
126	Perth Amboy	34023 461	0.187024	0.187024	100.00
	Totals:		4.475281	2.062387	

For Radius of .5 Mi., Circle Area = 0.785398

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
27	Perth Amboy	34023 451	0.041215	0.002518	6.11
29	Perth Amboy	34023 453	0.107973	0.015317	14.19
30	Perth Amboy	34023 459	1.527987	0.155420	10.17
32	Perth Amboy	34023 462	0.070832	0.070832	100.00
33	Perth Amboy	34023 463	0.051677	0.040814	78.98
34	Perth Amboy	34023 464	0.070452	0.027731	39.36
44	Perth Amboy	34023 491	0.070521	0.039327	55.77
45	Perth Amboy	34023 492	0.073908	0.000984	1.33
46	Perth Amboy	34023 493	0.145806	0.027132	18.61
126	Perth Amboy	34023 461	0.187024	0.187024	100.00
	Totals:		2.347397	0.567101	

For Radius of .25 Mi., Circle Area = 0.196350

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
30	Perth Amboy	34023 459	1.527987	0.011281	0.74
32	Perth Amboy	34023 462	0.070832	0.015938	22.50
126	Perth Amboy	34023 461	0.187024	0.169130	90.43
	Totals:		1.785843	0.196350	

E. L. Beth Limited
Perth Amboy, NJ

========== Site Data ==========

Population:	103954.50
Households:	39613.74
Drilled Wells:	66.14
Dug Wells:	3.12
Other Water Sources:	23.96

========== Partial (RING) data ==========

---- Within Ring: 4 Mile(s) and 3 Mile(s) ----

Population:	38164.76
Households:	14933.33
Drilled Wells:	7.14
Dug Wells:	2.75
Other Water Sources:	4.96

** Population On Private Wells: 25.28

---- Within Ring: 3 Mile(s) and 2 Mile(s) ----

Population:	22465.10
Households:	9061.90
Drilled Wells:	0.00
Dug Wells:	0.36
Other Water Sources:	0.00

** Population On Private Wells: 0.90

---- Within Ring: 2 Mile(s) and 1 Mile(s) ----

Population:	21075.41
Households:	7915.38
Drilled Wells:	2.40
Dug Wells:	0.00
Other Water Sources:	11.00

** Population On Private Wells: 6.38

---- Within Ring: 1 Mile(s) and .5 Mile(s) ----

Population:	17182.95
Households:	5798.96
Drilled Wells:	51.64
Dug Wells:	0.00
Other Water Sources:	4.85

** Population On Private Wells: 153.01

---- Within Ring: .5 Mile(s) and .25 Mile(s) ----

Population:	4362.53
Households:	1618.80
Drilled Wells:	4.97
Dug Wells:	0.00
Other Water Sources:	3.15

** Population On Private Wells: 13.38

---- Within Ring: .25 Mile(s) and 0 Mile(s) ----

Population:	703.76
Households:	285.37
Drilled Wells:	0.00
Dug Wells:	0.00
Other Water Sources:	0.00

** Population On Private Wells: 0.00

** Total Population On Private Wells: 198.95

FROST ASSOCIATES

88 Founders Village, Clinton, CT 06413
(860) 669-5859 FAX (860) 669-5869

March 6, 2000

To: Roy F. Weston Inc - Region II START
1090 King Georges Post Road, Suite 201
Edison, NJ

Attn: Harry Allen

NEW YORK PORTION

Fr: Frost Associates
Founders Village
Clinton, Conn 06413

Tel: (203) 669-5859
Fax: (860) 669-5859

Sub: E. L. Beth Limited
Perth Amboy, NJ

CERCLIS:

Job: 6517

Site Longitude: 74-15-34 74.259453
Site Latitude : 40-30-48 40.513329

The CENTRACTS report below identifies the population, households, and private water wells of each Block Group that lies within, or partially within, the 4, 3, 2, 1, .5, and .25, mile "rings" of the latitude and longitude coordinates above. A CENTRACTS report may have up to six radii of any length and 1500 block groups.

CENTRACTS uses the 1990 Block Group population and Block Group house count data found in the Census Bureau's 1990 STF-1A files. The sources of water supply data are from The Bureau's 1990 STF-3A files. The boundary line coordinates of the Block Groups were extracted from the Census Bureau's 1990 TIGER/Line Files.

CENTRACTS reports are created with programs written by Frost Associates, 88 Founders Village, Clinton Conn 06413. The code was written using Microsoft's Quick-Basic Ver. 4.5.

Latitude and Longitude coordinates identifying a site are entered in degrees and decimal degrees. One or more county files holding Block Group boundary lines are selected for use by CENTRACTS by determining whether the site coordinates fall within the minimum and maximum Lat\Lon coordinates of each county in the state.

Each Block Group line segment has Lat\Lon coordinates representing the "From" and "To" ends of that line. All coordinates from the selected county files are read and converted from degrees, decimal degrees to X\Y miles from the site location. Each line segment is then examined whether it lies within or partially within the maximum ring from the site.

The unique Block Group ID numbers of each line segment that lie within the maximum ring are retained. All Block Group boundary lines matching the Block Group numbers are then extracted from the respective county files to obtain all sides of the included Block Groups. Boundary records are then sorted in adjacent side order to determine the shape and area of each Block Group polygon.

A method to solve for the area of a polygon is to take one-half the sum of the products obtained by multiplying each X-coordinate by the difference between the adja-

cent Y-coordinates. For a polygon with coordinates at adjacent angles A, B, C, D, and E. The formula can be expressed:

Area = 1/2{Xa(Ye-Yb)+ Xb(Ya-Yb)+ Xc(Yb-Yd)+ Xd(Yc-Ye)+ Xe(Yd-Ya)}

For each ring, the selected Block Groups will be inside, outside, or intersected by the ring. When a polygon is intersected, the partial Block Group area within that ring is calculated using the method described below.

When a ring intersects a Block Group, the intersect points are solved and plotted at the points where the ring enters and exits the shape. The chord line, a line within the circle connecting the intersect points is determined. This chord line is used to calculate the segment area, the half moon shape between the chord line and the ring, and the sub-polygon created by the chord line and the Block Group boundaries that lie outside the ring.

The segment area is subtracted from the sub-polygon area to determine the area of the sub-polygon outside the ring. The area outside the ring is then subtracted from the area of the entire polygon to arrive at the inside area. This inside area is then divided by the tract's total area to determine the percentage of area within the ring. This process is repeated for each block group that is intersected by one of the rings. The total area, partial area, and percentage of partial area of those block groups within, or partially within a ring, are held in memory for the report.

On occasion, the algorithm described above is unable to determine the area of the partial area. Within the report program is a "Paint" routine which allows an enclosed shape to be highlighted. Another routine calculates the percentage of highlighted screen pixels to the pixels within the polygon. A manual entry is allowed. Both the "paint" method and manual entry method over ride the calculated method.

CENTRACTS lists, starting on page 4, all Block Groups in State, County, Census Tract, and Block Group ID order that lie within, or partially within, the maximum ring. Each Block Group is identified by a City or Town name and by the Block Group's State, County, Tract and Block Group ID number. Following is the Block Group's 1990 populu tion and house count extracted from the Census Bureau's 1990 STF-1A files.

The next four columns display water source data from the 1990 STF-3A files. The first column is "Units with Public system or private company source of water", followed by "Units with individual well, Drilled, source of water"; "Units with individual well, Dug, source of water" and "Units with Other source of water".

For each ring, CENTRACTS then shows the Block Groups that are within that ring, the Block Group's total area in square miles, the partial area of the Block Group within that ring, and the partial percentage within the ring. The areas of the included Block Group and the partial areas are then totaled.

The last section tallies the demographic data within each ring. The percentage of area for each Block Group is multiplied times the census data for that Block Group and totaled for all Block Group's within the ring. Ring totals are then determined by subtracting the three mile data from the four mile, the two mile from the three mile, one from the two, etc... Population on private wells is calculated using the formula: ((Drilled + Dug Wells) / Households) * Population

E. L. Beth Limited NEW YORK PORTION
Perth Amboy, NJ

No.	City	Block Group ID	Blk Grp People	House Holds	Public Water	Drilled Wells	Dug Wells	Other
1	Staten Island	36085 0176 4	858	329	354	0	0	0
2	Staten Island	36085 0176 5	1063	322	309	0	0	0
3	Staten Island	36085 0196 1	390	157	151	0	0	0
4	Staten Island	36085 0196 2	662	241	240	0	0	0
5	Staten Island	36085 0196 3	2343	831	859	0	0	0
6	Staten Island	36085 0226 1	1230	152	147	0	0	0
7	Staten Island	36085 0226 2	1444	492	490	0	0	0
8	Staten Island	36085 0226 9	25	9	11	0	0	0
9	Staten Island	36085 0236 1	263	17	13	0	0	0
10	Staten Island	36085 0244 1	164	61	58	0	0	0
11	Staten Island	36085 0244 2	1248	604	618	0	0	0
12	Staten Island	36085 0244 3	195	71	62	0	0	0
13	Staten Island	36085 0244 4	3464	1182	1157	0	0	0
14	Staten Island	36085 0248 1	528	193	196	0	0	0
15	Staten Island	36085 0248 2	1440	480	485	0	0	0
16	Staten Island	36085 0248 3	927	350	340	0	0	0
17	Staten Island	36085 0170023	2658	895	914	0	0	0
18	Staten Island	36085 0170041	9898	3259	3233	0	0	0
19	Staten Island	36085 0170042	2361	756	782	0	0	0
20	Staten Island	36085 0208011	4983	1763	1763	0	0	0
21	Staten Island	36085 0208021	4307	1358	1333	0	0	0
22	Staten Island	36085 0208022	5805	1828	1853	0	0	0
	Totals:		46256	15350	15368	0	0	0

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E. L. Beth Limited NEW YORK PORTION
Perth Amboy, NJ

City	Census Tract ID	Tract People	House Count	Public Water	Drilled Wells	Dug Wells	Other Sources
Staten Island	36085 0176 4	858	329	354	0	0	0
Staten Island	36085 0176 5	1063	322	309	0	0	0
Staten Island	36085 0196 1	390	157	151	0	0	0
Staten Island	36085 0196 2	662	241	240	0	0	0
Staten Island	36085 0196 3	2343	831	859	0	0	0
Staten Island	36085 0226 1	1230	152	147	0	0	0
Staten Island	36085 0226 2	1444	492	490	0	0	0
Staten Island	36085 0226 9	25	9	11	0	0	0
Staten Island	36085 0236 1	263	17	13	0	0	0
Staten Island	36085 0244 1	164	61	58	0	0	0
Staten Island	36085 0244 2	1248	604	618	0	0	0
Staten Island	36085 0244 3	195	71	62	0	0	0
Staten Island	36085 0244 4	3464	1182	1157	0	0	0
Staten Island	36085 0248 1	528	193	196	0	0	0
Staten Island	36085 0248 2	1440	480	485	0	0	0
Staten Island	36085 0248 3	927	350	340	0	0	0
Staten Island	36085 017002 3	2658	895	914	0	0	0
Staten Island	36085 017004 1	9898	3259	3233	0	0	0
Staten Island	36085 017004 2	2361	756	782	0	0	0
Staten Island	36085 020801 1	4983	1763	1763	0	0	0
Staten Island	36085 020802 1	4307	1358	1333	0	0	0
Staten Island	36085 020802 2	5805	1828	1853	0	0	0
Sub Totals:		46256	15350	15368	0	0	0

E. L. Beth Limited NEW YORK PORTION
Perth Amboy, NJ

For Radius of 4 Mi., Circle Area = 50.265482

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
1	Staten Island	36085 1764	3.665314	0.030791	0.84
2	Staten Island	36085 1765	0.423382	0.151229	35.72
3	Staten Island	36085 1961	0.290760	0.262330	90.22
4	Staten Island	36085 1962	4.330011	2.631126	60.76
5	Staten Island	36085 1963	0.752620	0.752620	100.00
6	Staten Island	36085 2261	2.001037	1.996734	99.78
7	Staten Island	36085 2262	1.180808	1.180808	100.00
8	Staten Island	36085 2269	2.854883	0.705981	24.73
9	Staten Island	36085 2361	0.990897	0.990897	100.00
10	Staten Island	36085 2441	0.244625	0.244625	100.00
11	Staten Island	36085 2442	4.087979	4.087979	100.00
12	Staten Island	36085 2443	0.214968	0.214968	100.00
13	Staten Island	36085 2444	0.542380	0.542380	100.00
14	Staten Island	36085 2481	0.640089	0.640089	100.00
15	Staten Island	36085 2482	0.119581	0.119581	100.00
16	Staten Island	36085 2483	0.139759	0.139759	100.00
17	Staten Island	36085 170023	0.522439	0.082688	15.83
18	Staten Island	36085 170041	0.638001	0.099986	15.67
19	Staten Island	36085 170042	0.180940	0.117730	65.07
20	Staten Island	36085 208011	0.952077	0.925693	97.23
21	Staten Island	36085 208021	0.347027	0.347027	100.00
22	Staten Island	36085 208022	0.949085	0.949085	100.00
	Totals:		26.068659	17.214106	

For Radius of 3 Mi., Circle Area = 28.274334

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
4	Staten Island	36085 1962	4.330011	0.267440	6.18
5	Staten Island	36085 1963	0.752620	0.517844	68.81
6	Staten Island	36085 2261	2.001037	1.643440	82.13
7	Staten Island	36085 2262	1.180808	1.180808	100.00
8	Staten Island	36085 2269	2.854883	0.409996	14.36
9	Staten Island	36085 2361	0.990897	0.990897	100.00
10	Staten Island	36085 2441	0.244625	0.244625	100.00
11	Staten Island	36085 2442	4.087979	3.531206	86.38
12	Staten Island	36085 2443	0.214968	0.214968	100.00
13	Staten Island	36085 2444	0.542380	0.542380	100.00
14	Staten Island	36085 2481	0.640089	0.640089	100.00
15	Staten Island	36085 2482	0.119581	0.119581	100.00
16	Staten Island	36085 2483	0.139759	0.139759	100.00
20	Staten Island	36085 208011	0.952077	0.027946	2.94
22	Staten Island	36085 208022	0.949085	0.559272	58.93
	Totals:		20.000803	11.030250	

For Radius of 2 Mi., Circle Area = 12.566371

E. L. Beth Limited NEW YORK PORTION
Perth Amboy, NJ

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
6	Staten Island	36085 2261	2.001037	0.250797	12.53
7	Staten Island	36085 2262	1.180808	0.748000	63.35
8	Staten Island	36085 2269	2.854883	0.226967	7.95
9	Staten Island	36085 2361	0.990897	0.171668	17.32
10	Staten Island	36085 2441	0.244625	0.244625	100.00
11	Staten Island	36085 2442	4.087979	1.716126	41.98
12	Staten Island	36085 2443	0.214968	0.214968	100.00
13	Staten Island	36085 2444	0.542380	0.542380	100.00
14	Staten Island	36085 2481	0.640089	0.640089	100.00
15	Staten Island	36085 2482	0.119581	0.119581	100.00
16	Staten Island	36085 2483	0.139759	0.139759	100.00
	Totals:		13.017005	5.014959	

For Radius of 1 Mi., Circle Area = 3.141593

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
11	Staten Island	36085 2442	4.087979	0.133215	3.26
12	Staten Island	36085 2443	0.214968	0.077756	36.17
13	Staten Island	36085 2444	0.542380	0.268316	49.47
14	Staten Island	36085 2481	0.640089	0.340581	53.21
15	Staten Island	36085 2482	0.119581	0.119578	100.00
16	Staten Island	36085 2483	0.139759	0.139759	100.00
	Totals:		5.744756	1.079205	

For Radius of .5 Mi., Circle Area = 0.785398

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
11	Staten Island	36085 2442	4.087979	0.014686	0.36
13	Staten Island	36085 2444	0.542380	0.008008	1.48
14	Staten Island	36085 2481	0.640089	0.114475	17.88
15	Staten Island	36085 2482	0.119581	0.000041	0.03
16	Staten Island	36085 2483	0.139759	0.081088	58.02
	Totals:		5.529788	0.218298	

For Radius of .25 Mi., Circle Area = 0.196350

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
14	Staten Island	36085 2481	0.640089	0.022796	3.56
	Totals:		0.640089	0.022796	

E. L. Beth Limited NEW YORK PORTION
Perth Amboy, NJ

========== Site Data ==========

Population:	32855.56
Households:	10885.21
Drilled Wells:	0.00
Dug Wells:	0.00
Other Water Sources:	0.00

========== Partial (RING) data ==========

---- Within Ring: 4 Mile(s) and 3 Mile(s) ----

Population:	17118.75
Households:	5675.74
Drilled Wells:	0.00
Dug Wells:	0.00
Other Water Sources:	0.00

** Population On Private Wells: 0.00

---- Within Ring: 3 Mile(s) and 2 Mile(s) ----

Population:	7378.47
Households:	2284.53
Drilled Wells:	0.00
Dug Wells:	0.00
Other Water Sources:	0.00

** Population On Private Wells: 0.00

---- Within Ring: 2 Mile(s) and 1 Mile(s) ----

Population:	3885.59
Households:	1362.15
Drilled Wells:	0.00
Dug Wells:	0.00
Other Water Sources:	0.00

** Population On Private Wells: 0.00

---- Within Ring: 1 Mile(s) and .5 Mile(s) ----

Population:	3784.36
Households:	1305.41
Drilled Wells:	0.00
Dug Wells:	0.00
Other Water Sources:	0.00

** Population On Private Wells: 0.00

---- Within Ring: .5 Mile(s) and .25 Mile(s) ----

Population:	669.59
Households:	250.50
Drilled Wells:	0.00
Dug Wells:	0.00
Other Water Sources:	0.00

** Population On Private Wells: 0.00

---- Within Ring: .25 Mile(s) and 0 Mile(s) ----

Population:	18.80
Households:	6.87
Drilled Wells:	0.00
Dug Wells:	0.00
Other Water Sources:	0.00

** Population On Private Wells: 0.00

** Total Population On Private Wells: 0.00

REFERENCE NO. 7

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
PERTH AMBOY,
NEW JERSEY
MIDDLESEX COUNTY

ONLY PANEL PRINTED

COMMUNITY-PANEL NUMBER
340272 0001 C

MAP REVISED:
May 1, 1984

Federal Emergency Management Agency

KEY TO MAP

500-Year Flood Boundary	
100-Year Flood Boundary	
Zone Designations* With Date of Identification e.g., 12/2/74	
100-Year Flood Boundary	
500-Year Flood Boundary	
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7x
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
AO	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance and flood plain management purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas. The coastal flooding elevations shown may differ significantly from those developed by the National Weather Service for hurricane evacuation planning.

Coastal base flood elevations shown on this map include the effects of wave action.

Coastal base flood elevations apply only landward of the shoreline shown on this map.

INITIAL IDENTIFICATION:
JUNE 21, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
JUNE 4, 1976

FLOOD INSURANCE RATE MAP EFFECTIVE:
DECEMBER 18, 1979

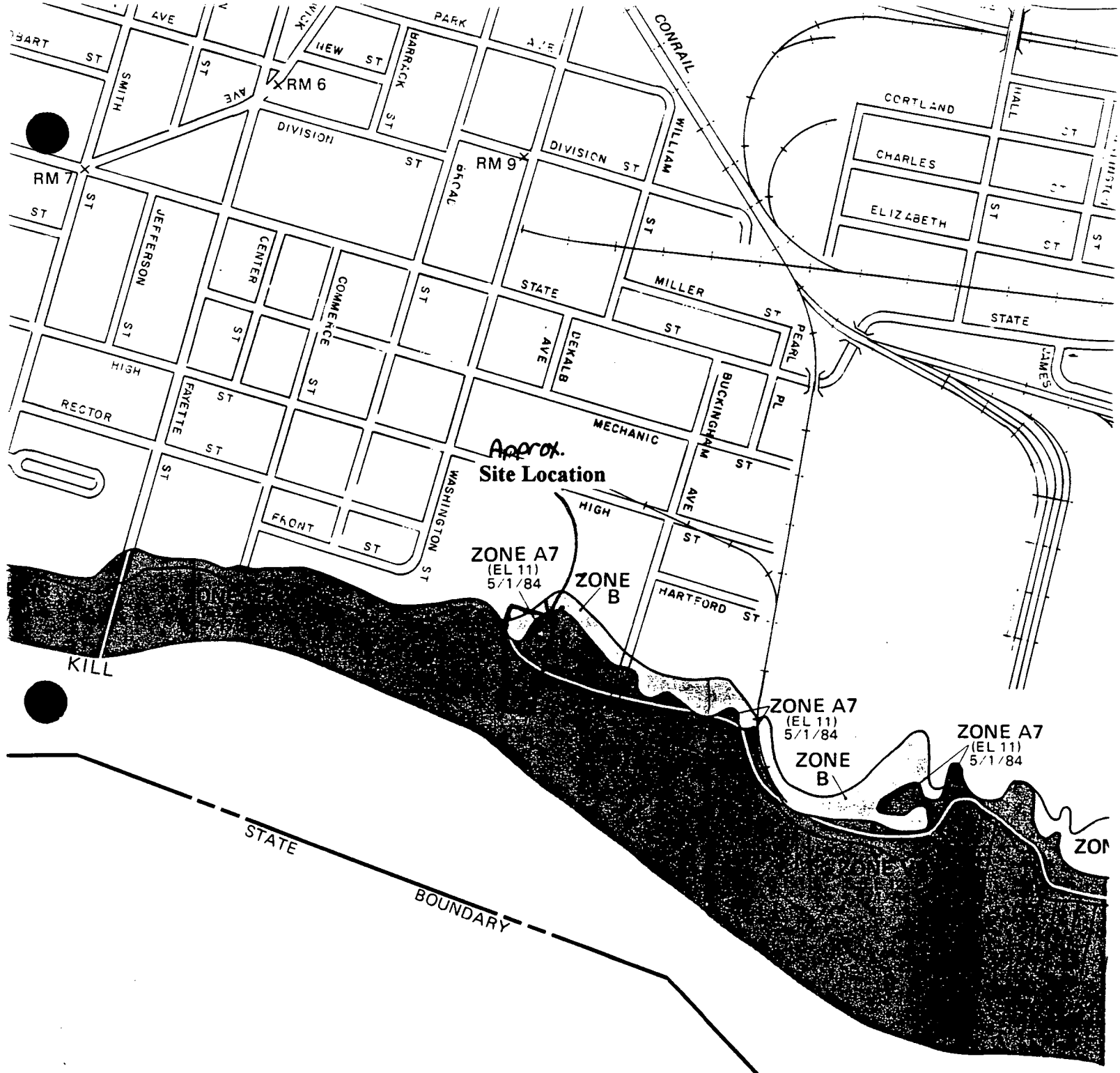
FLOOD INSURANCE RATE MAP REVISIONS:
May 1, 1984-to add base flood elevations, to change special flood hazard areas, to add the effects of wave action

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

N

APPROXIMATE SCALE

600 0 600 FEET



e Avenue in sidewalk and 0.45 foot below it.

bridge, 6 feet west of west rail of west rack, 8 feet north

Amboy, about 52 yards east of State Street, set vertical-
southwest corner and about 1 1/2 feet above ground.

Amboy, about 110 yards south of junction of Amboy
any Refinery, 21 feet north of centerline of drive, 14.3
fence, 1.5 feet south of a metal witness post, about level
ects 2 inches above level of ground.

t f south one of two offsets in east abutment of
utment and about 2 1/2 feet above ground.

n with Division Street, flush with sidewalk.

in door sill of entrance to Perth Amboy National Bank

tate Route 35), set in concrete base of a light pole, 33.0
metal rivet.

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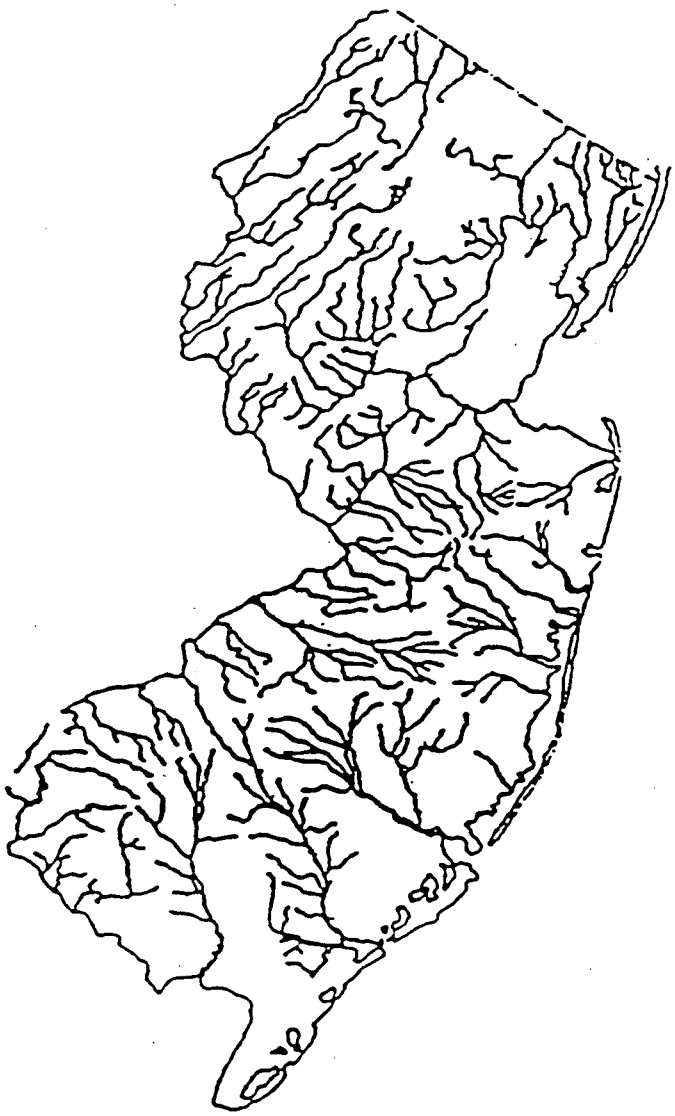
REFERENCE NO. 8

Surface Water Quality Standards

N. J. A. C. 7:9B



NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Office Of Environmental Planning
April 1998

p 1

STATE OF NEW JERSEY
Christine Todd Whitman, Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Robert Shinn, Commissioner

ENVIRONMENTAL PLANNING AND SCIENCE
Bob Tudor, Assistant Commissioner

SURFACE WATER QUALITY STANDARDS

Authority
N.J.S.A. 13:1D-1 et seq., 58:10A-1 et seq.,and 58:11A-1 et seq.

Effective Date
Readoption - April 17, 1998
Amendments - May 18, 1998

Executive Order No. 66(1978) Expiration Date
Chapter 9B, Surface Water Quality Standards, expires on April 18, 2003

A copy of this document can be obtained by calling 609-633-7020
or by sending a written request to:

Office of Environmental Planning
Department of Environmental Protection
P.O. Box 418
Trenton, NJ 08625

(e) The surface water classifications in Table 3 are for waters of the Passaic, Hackensack and New York Harbor Complex Basin:

TABLE 3

Waterbody	Classification
APSHAWA BROOK (Macopin) - Entire length	FW2-TP(C1)
ARTHUR KILL	
(Perth Amboy) - The Kill and its saline New Jersey tributaries between the Outerbridge Crossing and a line connecting Ferry Pt., Perth Amboy to Wards Pt., Staten Island, New York	SE2
(Elizabeth) - From an east-west line connecting Elizabethport with Bergen Pt., Bayonne to the Outerbridge Crossing	SE3
(Woodbridge) - All freshwater tributaries	FW2-NT
BEAR SWAMP BROOK (Mahwah) - Entire length	FW2-TP(C1)
BEAR SWAMP LAKE (Ringwood State Park)	FW2-NT(C1)
BEAVER BROOK	
(Meriden) - From Splitrock Reservoir Dam downstream to Meriden Road Bridge	FW2-TP(C1)
(Denville) - Meriden Road Bridge to Rockaway River	FW2-NT
TRIBUTARIES	
(Meriden) - Two tributaries located approximately three quarters of a mile southwest of Meriden	FW2-TP(C1)
BEECH BROOK	
(West Milford) - From State line downstream to Monksville Reservoir	FW2-TM
BELCHER CREEK (W. Milford) - Entire length	FW2-NT
BERRYS CREEK (Secaucus) - Entire length	FW2-NT/SE2
BLACK BROOK	
(Meyersville) - Entire length, except segment described below	FW2-NT
(Great Swamp) - Segment and tributaries within the Great Swamp National Wildlife Refuge	FW2-NT(C1)
BLUE MINE BROOK	
(Wanaque) - Headwaters Downstream to lower Snake Den Road bridge	FW2-TP(C1)
(Wanaque) - lower Snake Den Road bridge to the boundary of Norvin Green State Forest	FW2-TM
(Norvin Green State Forest) - That portion of the stream and any tributaries within the Norvin Green State Forest	FW2-TM(C1)

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Vernon-Stockholm Rd. to its confluence with Lake Stockholm Brook, north of Rt. 23	
LITTLE POND BROOK (Oakland) - Entire length	FW2-TP(C1)
LOANTAKA BROOK	
(Green Village) - Entire length, except segment described below	FW2-NT
(Great Swamp) - Brook and all tributaries within the boundaries of Great Swamp National Wildlife Refuge	FW2-NT(C1)
LUD-DAY BROOK (Camp Garfield) - Source downstream to its confluence with the southwestern outlet stream from Clinton Resevoir just upstream of the confluence of the outlet stream and a tributary from Camp Garfield	FW1
MACOPIN RIVER	
(Newfoundland) - Source to Echo Lake dam	FW2-NT
(Newfoundland) - Echo Lake dam to Pequannock River	FW2-TM
MEADOW BROOK	
(Wanaque) - Skyline Lake to E. Belmont Ave.	FW2-NT
(Wanaque) - E. Belmont Ave. downstream to Wanaque River	FW2-TP(C1)
MILL BROOK	
(Randolph) - Source to Rt. 10 bridge	FW2-TP(C1)
(Randolph) - Rt. 10 bridge to Rockaway River	FW2-NT
MONKSVILLE RESERVOIR (Long Pond Iron Works State Park)	FW2-TM(C1)
* MORSES CREEK (Linden) - Entire length	FW2-NT/SE3
MOSSMANS BROOK (West Milford) - Source to confluence with Clinton Reservoir	FW2-TP(C1)
MT. TABOR BROOK (Morris Plains) - Entire length	FW2-NT
NEWARK BAY (Newark) - North of an east-west line connecting Elizabethport with Bergen Pt., Bayonne up to the mouths of the Passaic and Hackensack Rivers	SE3
NOSENZO POND (Upper Macopin)	FW2-NT(C1)
OAK RIDGE RESERVOIR (Oak Ridge)	FW2-TM
OAK RIDGE RESERVOIR (Oak Ridge) - Northwestern tributary to Reservoir	FW1(tm)
OHIO BROOK (Morris Township) - Source downstream to Morristown town line	FW2-TM
OVERPECK CREEK (Palisades Park) - Entire length	FW2-NT/SE2
PACACK BROOK	
(Canistear) - Brook and tributaries upstream of Canistear Reservoir located entirely within the boundaries of the Newark Watershed	FW1
(Stockholm) - Outlet of Canistear Reservoir to	FW2-NT

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Norvin Green State Forest, originating west of Torne Mtn.	
PILES CREEK (Grasselli) - Entire length	SE3
POMPTON LAKE (Pompton Lakes)	FW2-NT
POMPTON RIVER (Wayne) - Entire length	FW2-NT
POND BROOK (Oakland) - Entire length	FW2-NT
POSTS BROOK	
(Bloomingdale) - Source to confluence with Wanaque River, except Wanaque Reservoir and segment described below	FW2-NT
(Norvin Green State Forest) - That segment of the stream and all tributaries within the boundaries of Norvin Green State Forest	FW2-NT(C1)
PREAKNESS (SINGAC) BROOK	
(Wayne) - Source to, but not including, Barbour Pond	FW2-TP(C1)
(Barbour Pond) - Pond to Passaic River	FW2-NT
PRIMROSE BROOK	
(Harding) - Source to Lees Hill Road bridge	FW2-TP(C1)
(Harding) - Lees Hill Road bridge to Great Swamp National Wildlife Refuge boundary	FW2-NT
(Great Swamp) - Wildlife Refuge boundary to Great Brook	FW2-NT(C1)
* RAHWAY RIVER	
SOUTH BRANCH	
(Rahway) - Source to Hazelwood Ave., Rahway	FW2-NT
→ (Rahway) - Hazelwood Ave. to mouth	SE2
MAIN STEM	
(Rahway) - Upstream of Pennsylvania Railroad bridge	FW2-NT
→ (Linden) - Penn. Railroad bridge to Route 1&9 crossing	SE2
→ (Carteret) - Route 1&9 crossing to mouth	SE3
RAMAPO LAKE (Ramapo) - Lake and all outlet streams and tributaries within the boundaries of Ramapo Mtn. State Forest	FW2-NT(C1)
RAMAPO RIVER (Mahwah) - State line to Pompton River	FW2-NT
TRIBUTARY (Oakland) - Entire length	FW2-TP(C1)
RINGWOOD CREEK	
(Ringwood) - Entire length, except segment described below	FW2-TM
(Sloatsburg) - Creek within Ringwood State Park	FW2-TM(C1)
RINGWOOD MILL POND (Ringwood)	FW2-NT(C1)
ROCKAWAY RIVER	
(Wharton) - Source to Washington Pond outlet, excluding the segment within the boundaries of the Berkshire Valley Wildlife Management Area	FW2-NT
(Berkshire Valley) - That segment within the boundaries	FW2-NT(C1)

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TROY BROOK (Troy Hills) - Entire length	FW2-NT
WANAQUE RESERVOIR	FW2-TM
WANAQUE RIVER	
MAIN STEM	
(Wanaque) - Greenwood Lake outlet, through Wanaque Wildlife Management Area and Long Pond Iron Works State Park, including the Monksville Reservoir, to the Monksville Reservoir dam at Stonetown Road, except tributary described separately below	FW2-TM(C1)
(Hewitt) - Entire length of tributary south of Jennings Creek	FW2-TP(C1)
(Pompton Lakes) - Wanaque Reservoir dam to Wanaque Ave. bridge	FW2-NT
(Pompton Lakes) - Wanaque Ave. bridge downstream to Pequannock River	FW2-TM
WEST BROOK (W. Milford) - Entire length	FW2-TP(C1)
WEST POND (Hewitt)	FW1
WEYBLE POND (Ringwood)	FW2-NT(C1)
WHIPANNY RIVER	
(Brookside) - Source to Whitehead Rd. bridge	FW2-TP(C1)
(Morristown) - Whitehead Rd. bridge to Rockaway River	FW2-NT
TRIBUTARIES	
(Brookside) - Entire length	FW2-TP(C1)
(E. of Brookside) - Entire length	FW2-TM
(E. of Washington Valley) - Entire length	FW2-TM
(Gillespie Hill) - Entire length	FW2-TP(C1)
(Shongum Mtn.) - Entire length	FW2-NT
WONDER LAKE (West Milford)	FW2-NT(C1)
* WOODBRIDGE CREEK (Woodbridge) - Entire length	FW2-NT/SE3

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point of land located at the northern extent of Monmouth Parkway in Monmouth Beach and all waters south of a line beginning on the western shoreline (just east of Monmouth Parkway in Monmouth Beach) and bearing approximately 081 degrees T (True North), intersecting Channel Marker Flashing Red 4 and Channel Marker Flashing Red 2 and terminating on the eastern shoreline of the Galilee section of Monmouth Beach.	
NESHANIC RIVER (Reaville) - Entire length	FW2-NT
NORTON BROOK (Norton) - Entire length	FW2-TP(C1)
OAKDALE CREEK (Chester) - Entire length	FW2-TP(C1)
OAKEYS BROOK (Deans) - Entire length	FW2-NT
OCEANPORT CREEK	
(Fort Monmouth) - Source to a line beginning on the easternmost extent of Horseneck Point and bearing approximately 140 degrees T (True North) to its terminus on the westernmost extent of an unnamed extent of Monmouth Boulevard in Oceanport	FW2-NT/SE1
(Oceanport) - Creek downstream of line described above	SE1(C1)
PARKERS CREEK	
(Fort Monmouth) - Source to a line beginning on the easternmost extent of Horseneck Point and bearing approximately 000 degrees T (True North) to its terminus on Breezy Point on the Little Silver side (north) side of the creek	FW2-NT/SE1
(Fort Monmouth) - Creek downstream of line described above	SE1(C1)
PEAPACK BROOK (Gladstone) - Entire length	FW2-TP(C1)
PETERS BROOK (Somerville) - Entire length	FW2-NT
PIGEON SWAMP (Pigeon Swamp State Park) - All waters within the boundaries of Pigeon Swamp State Park	FW2-NT(C1)
PIKE RUN (Belle Meade) - Entire length	FW2-NT
PINE BROOK (Clarks Mills) - Entire length	FW2-NT
PINE BROOK (Cooks Mill) - Entire length	FW2-TM
PLEASANT RUN (Readington) - Entire length	FW2-NT
PRESCOTT BROOK (Stanton Station) - Entire length	FW2-TM
RAMANESSIN (HOP) BROOK (Holmdel) - Entire length	FW2-TM
* RARITAN BAY - Entire drainage	FW2-NT/SE1

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RARITAN RIVER	
NORTH BRANCH (Also see INDIA BROOK)	
(Pleasant Valley) - Source to, but not including, Ravine Lake	FW2-TP(C1)
(Far Hills) - Ravine Lake dam to Rt. 512 bridge	FW2-TM
(Bedminister) - Rt. 512 bridge to confluence with South Branch, Raritan River	FW2-NT
SOUTH BRANCH RARITAN RIVER	
(Mt. Olive) - Source to the dam that is 390 feet upstream of the Flanders-Drakestown Road bridge and the two tributaries which originate north and east of the Budd Lake Airfield	FW2-NT(C1)
(Mt. Olive) - Dam to confluence with Turkey Brook	FW2-TM(C1)
(Middle Valley) - Confluence with Turkey Brook to Rt. 512 bridge	FW2-TP(C1)
(Califon) - Rt. 512 bridge to downstream end of Packers Island, except segment described separately, below	FW2-TM
(Ken Lockwood Gorge) - River and tributaries within Ken Lockwood Gorge Wildlife Management Area	FW2-TM(C1)
(Neshanic Sta.) - Downstream end of Packers Island to confluence with North Branch, Raritan River	FW2-NT
TRIBUTARIES, SOUTH BRANCH RARITAN RIVER	
(Long Valley) - Entire length	FW2-TP(C1)
(S. of Hoffmans) - Entire length	FW2-TP(C1)
(S. of Schooley's Mt.) - Entire length	FW2-TP(C1)
MAIN STEM RARITAN RIVER	
(Bound Brook) - From confluence of North and South Branches to Landing Lane bridge in New Brunswick and all freshwater tributaries downstream of Landing Lane bridge.	FW2-NT
(Sayreville) - Landing Lane bridge to Raritan Bay and all saline water tributaries	SE1
RINEHART BROOK (Hacklebarney) - Entire length	FW2-TP(C1)
ROCK BROOK (Montgomery) - Entire length	FW2-NT
ROCKAWAY CREEK	
NORTH BRANCH	
(Mountainville) - Source to Rt. 523 bridge	FW2-TP(C1)
(Whitehouse) - Rt. 523 bridge to confluence with South Branch	FW2-TM
SOUTH BRANCH (Whitehouse) - Entire length	FW2-TM
MAIN STEM (Whitehouse) - Confluence of North and South Branches to Lamington River	FW2-NT
ROCKY RUN - (Lebanon) - Entire length	FW2-TP(C1)
ROUND VALLEY RESERVOIR (Clinton)	FW2-TP

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ROYCE BROOK (Manville) - Entire length	FW2-NT
SANDY HOOK BAY (Sandy Hook)	SE1
SHREWSBURY RIVER	
(Little Silver) - Source to Rt. 36 highway bridge	SE1(C1)
(Highlands) - Rt. 36 bridge to Sandy Hook Bay	SE1
SIDNEY BROOK (Grandin) - Entire length	FW2-NT
SIMONSON BROOK (Griggstown) - Entire length	FW2-NT
SIX MILE RUN	
(Franklin Church) - Entire length, except segment described below	FW2-NT
(Hillsborough) - Segment within the boundaries of Six Mile Run State Park	FW2-NT(C1)
SOUTH RIVER	
(Old Bridge) - Duhernal Lake to intake of the Sayreville Water Department	FW2-NT
(Sayreville) - Below the intake of the Sayreville Water Department	SE1
SPOOKY BROOK (Bound Brook)	FW2-NT
SPRUCE RUN	
(Glen Gardner) - Source to, but not including, Spruce Run Reservoir	FW2-TP(C1)
(Clinton) - Spruce Run Reservoir dam to Raritan River, South Branch	FW2-TM
SPRUCE RUN RESERVOIR (Union) - Reservoir and tributaries	FW2-TM(C1)
STONY BROOK (Washington) - Entire length	FW2-TP(C1)
STONY BROOK	
(Hopewell) - Entire length, except that segment described below	FW2-NT
(Syndertown) - Brook and tributaries within Amwell Lake Wildlife Management Area	FW2-NT(C1)
STONY BROOK (Watchung) - Entire length	FW2-NT
SUN VALLEY BROOK (Mt Olive) - Entire length	FW2-TP(C1)
SWIMMING RIVER	
(Red Bank) - Source to the intake of the Monmouth Consolidated Water Company at the Swimming River Reservoir dam	FW2-NT
(Red Bank) - Below the Swimming River Reservoir dam to the Navesink River	FW2-NT/SE1
TANNERS BROOK (Washington) - Entire length	FW2-NT(C1)
TEETERTOWN BROOK (Lebanon) - Entire length	FW2-TP(C1)
TEN MILE RUN (Franklin) - Entire length	FW2-NT
TENNENT BROOK (Old Bridge) - Entire length	FW2-NT
TEPEHEMUS BROOK (Manalapan) - Entire length	FW2-NT

"DRBC" means Delaware River Basin Commission.

"EC50" means the median effective concentration of a toxic substance expressed as a statistical estimate of the concentration that has a specified adverse effect on 50 percent of the test organisms under specified test conditions, based on the results of an acute bioassay.

"Epilimnion" means the freely circulating upper region of a thermally stratified waterbody extending from the surface to the thermocline.

"Existing uses" means those uses actually attained in the waterbody on or after November 28, 1975, whether or not they are included in the Surface Water Quality Standards.

"Federal Act" means the "Federal Water Pollution Control Act" (33 U.S.C. § 1251 et seq.), commonly referred to as the Clean Water Act, including all subsequent supplements and amendments.

"Flow-through bioassay" means a toxicity test in which the test solutions flow into and out of the test chambers on a once-through basis for the duration of the test, in accordance with N.J.A.C. 7:18.

"Fresh water(s)" means all nontidal and tidal waters generally having a salinity, due to natural sources, of less than or equal to 3.5 parts per thousand at mean high tide.

"FW" means the general surface water classification applied to fresh waters.

"FW1" means those fresh waters, as designated in N.J.A.C. 7:9B-1.15(h) Table 6, that are to be maintained in their natural state of quality (set aside for posterity) and not subjected to any man-made wastewater discharges or increases in runoff from anthropogenic activities. These waters are set aside for posterity because of their clarity, color, scenic setting, other characteristic of aesthetic value, unique ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resource(s).

* "FW2" means the general surface water classification applied to those fresh waters that are not designated as FW1 or Pinelands Waters.

"Groundwater" means that portion of water beneath the land surface that is within the zone of saturation (below the water table) where pore spaces are filled with water.

"Heat dissipation area" means a mixing zone, as may be designated by the Department, into which thermal effluents may be discharged for the purpose of mixing, dispersing, or dissipating such effluents without creating nuisances, hazardous

"Nonpoint source" or "NPS" means:

1. Any man-made or man-induced activity, factor, or condition, other than a point source, from which pollutants are or may be discharged;
2. Any man-made or man-induced activity, factor, or condition, other than a point source, that may temporarily or permanently change any chemical, physical, biological, or radiological characteristic of waters of the State from what was or is the natural, pristine condition of such waters, or that may increase the degree of such change; or
3. Any activity, factor, or condition, other than a point source, that contributes or may contribute to water pollution.

"Nontrout waters" means fresh waters that have not been designated in N.J.A.C. 7:9B-1.15(b) through (h) as trout production or trout maintenance. These waters are generally not suitable for trout because of their physical, chemical, or biological characteristics, but are suitable for a wide variety of other fish species.

"NPDES" means National Pollutant Discharge Elimination System.

* "NT" means nontrout waters.

"Nutrient" means a chemical element or compound, such as nitrogen or phosphorus, which is essential to and promotes the growth and development of organisms.

"Outstanding National Resource Waters" means high quality waters that constitute an outstanding national resource (for example, waters of National/State Parks and Wildlife Refuges and waters of exceptional recreational or ecological significance) as designated in N.J.A.C. 7:9B-1.15(i).

"Persistent" means relatively resistant to degradation, generally having a half life of over 96 hours.

"Pinelands waters" means all waters within the boundaries of the Pinelands Area, except those waters designated as FW1 in N.J.A.C. 7:9B-1.15(h) Table 6, as established in the Pinelands Protection Act (N.J.S.A. 13:18A-1 et seq.) and shown on Plate 1 of the "Comprehensive Management Plan" adopted by the New Jersey Pinelands Commission in November 1980.

"PL" means the general surface water classification applied to Pinelands Waters.

"Point source" or "PS" means any discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture.

"Pollutant" means any dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, refuse, oil, grease, sewage sludge, munitions, chemical wastes, biological materials, medical wastes, radioactive substance (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. § 2011 et. seq.)), thermal waste, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, agricultural and construction waste or runoff or other residue discharged directly or indirectly to the land, ground waters or surface waters of the State, or to a domestic treatment works as defined at N.J.A.C. 7:14A-1.2. "Pollutant" includes both hazardous and nonhazardous pollutants.

"Primary contact recreation" means water related recreational activities that involve significant ingestion risks and includes, but is not limited to, wading, swimming, diving, surfing, and water skiing.

"Public hearing" means a legislative type hearing before a representative or representatives of the Department providing the opportunity for public comment, but does not include cross-examination.

"River mile" or "R.M." means the distance, measured in statute miles, between two locations on a stream, with the first location designated as mile zero. For example, mile zero for the Delaware River is located at the intersection of the center line of the navigation channel and a line between the Cape May Light, New Jersey, and the tip of Cape Henlopen, Delaware.

"Saline waters" means waters having salinities generally greater than 3.5 parts per thousand at mean high tide.

"SC" means the general surface water classification applied to coastal saline waters.

* "SE" means the general surface water classification applied to saline waters of estuaries.

"Secondary contact recreation" means recreational activities where the probability of water ingestion is minimal and includes, but is not limited to, boating and fishing.

"Shellfish" means those mollusks commonly known as clams, oysters, or mussels.

"Shellfish waters" means waters classified as Approved, Seasonally Approved, Special Restricted, Seasonally Special Restricted or Condemned that support or possess the potential to support shellfish which are within the Coastal Area Facility Review Act (C.A.F.R.A.) zone as delineated in 1973, (excluding: 1 - The Cohansey River upstream of Brown's Run; 2 - The Maurice River upstream of Route 548; 3 - The Great Egg Harbor River upstream of Powell Creek; 4 - The Tuckahoe River upstream of Route 50; 5 - The Mullica River upstream of the Garden State Parkway) plus the adjacent areas between Route 35 (from its juncture with the C.A.F.R.A. zone just north of Red Bank to

(g) In those cases in which a thermal discharge is involved, the procedures for reclassifying segments for more restrictive uses shall be consistent with section 316 of the Federal Clean Water Act.

7:9B-1.12 Designated uses of FW1, PL, FW2, SE1, SE2, SE3, and SC waters

(a) In all FW1 waters the designated uses are:

1. Set aside for posterity to represent the natural aquatic environment and its associated biota;

2. Primary and secondary contact recreation;

3. Maintenance, migration and propagation of the natural and established aquatic biota; and

4. Any other reasonable uses.

(b) In all PL waters the designated uses are:

1. Cranberry bog water supply and other agricultural uses;

2. Maintenance, migration and propagation of the natural and established biota indigenous to this unique ecological system;

3. Public potable water supply after conventional filtration treatment (a series of processes including filtration, flocculation, coagulation, and sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituents) and disinfection;

4. Primary and secondary contact recreation; and

5. Any other reasonable uses.

* (c) In all FW2 waters the designated uses are:

1. Maintenance, migration and propagation of the natural and established biota;

2. Primary and secondary contact recreation;

3. Industrial and agricultural water supply;

4. Public potable water supply after conventional filtration treatment (a series of processes including filtration, flocculation, coagulation, and

sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituents) and disinfection; and

5. Any other reasonable uses.

(d) In all SE1 waters the designated uses are:

1. Shellfish harvesting in accordance with N.J.A.C. 7:12;

2. Maintenance, migration and propagation of the natural and established biota;

3. Primary and secondary contact recreation; and

4. Any other reasonable uses.

* (e) In all SE2 waters the designated uses are:

1. Maintenance, migration and propagation of the natural and established biota;

2. Migration of diadromous fish;.

3. Maintenance of wildlife;

4. Secondary contact recreation; and

5. Any other reasonable uses.

* (f) In all SE3 waters the designated uses are:

1. Secondary contact recreation;

2. Maintenance and migration of fish populations;

3. Migration of diadromous fish;

4. Maintenance of wildlife; and

5. Any other reasonable uses.

(g) In all SC waters the designated uses are:

1. Shellfish harvesting in accordance with N.J.A.C. 7:12;

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REFERENCE NO. 9

federal register

Friday
December 14, 1990

Part II

Environmental Protection Agency

40 CFR Part 300
Hazard Ranking System; Final Rule

p. 1

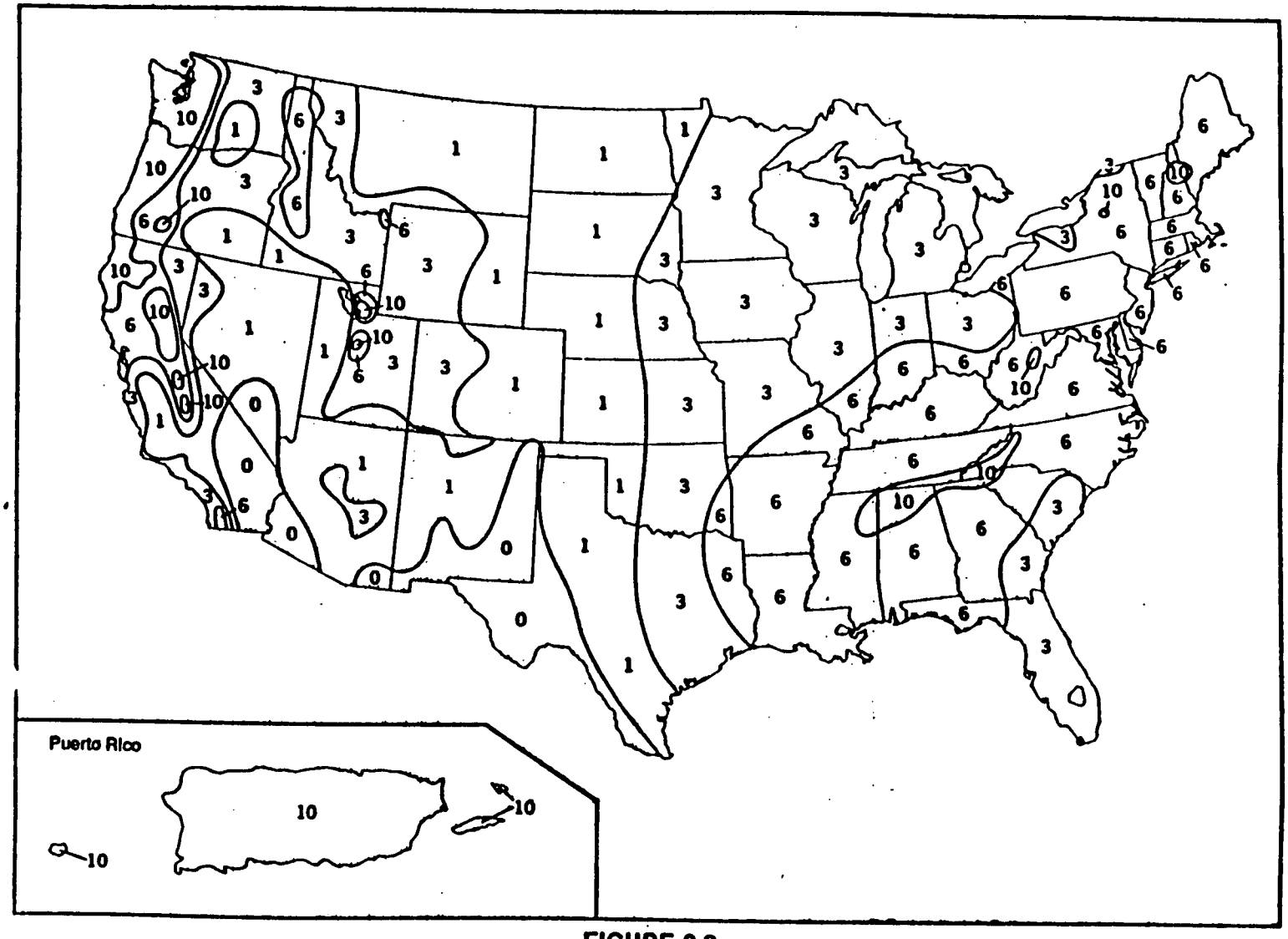

FIGURE 3-2
NET PRECIPITATION FACTOR VALUES

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–When measured monthly evapotranspiration is not available. calculate monthly potential evapotranspiration (E_i) as follows:

$$E_i = 0.6\, F_i\, (10\, T_i/I)^a$$

where:

E_i = Monthly potential evapotranspiration (inches) for month i.

F_i = Monthly latitude adjusting value for month i.

T_i = Mean monthly temperature (°C) for month i.

$$I = \sum_{i=1}^{12} (T_i/5)^{1.514}$$

$$a = 6.75 \times 10^{-7} I^3 - 7.71 \times 10^{-5} I^2 + 1.79 \times 10^{-2} I + 0.49239$$

Select the latitude adjusting value for each month from Table 3–3. For latitudes lower than 50° North or 20° South. determine the monthly latitude adjusting value by interpolation.

• Calculate monthly net precipitation by subtracting monthly evapotranspiration (or monthly potential evapotranspiration) from monthly precipitation. If evapotranspiration (or potential evapotranspiration) exceeds precipitation for a month. assign that month a net precipitation value of 0.

• Calculate the annual net precipitation by summing the monthly net precipitation values.

• Based on the annual net precipitation. assign a net precipitation factor value from Table 3–4.

Enter the value assigned from Figure 3–2 or from Table 3–4. as appropriate. in Table 3–1.

TABLE 3–3.—MONTHLY LATITUDE ADJUSTING VALUES[a]

Latitude[b] (degrees)	Month											
	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
≥50 N	0.74	0.78	1.02	1.15	1.33	1.36	1.37	1.25	1.06	0.92	0.76	0.70
45 N	0.80	0.81	1.02	1.13	1.28	1.29	1.31	1.21	1.04	0.94	0.79	0.75
40 N	0.84	0.83	1.03	1.11	1.24	1.25	1.27	1.18	1.04	0.96	0.83	0.81
35 N	0.87	0.85	1.03	1.09	1.21	1.21	1.23	1.16	1.03	0.97	0.89	0.85
30 N	0.90	0.87	1.03	1.06	1.16	1.17	1.20	1.14	1.03	0.98	0.89	0.88
20 N	0.95	0.90	1.03	1.05	1.13	1.11	1.14	1.11	1.02	1.00	0.93	0.94
10 N	1.00	0.91	1.03	1.03	1.06	1.06	1.08	1.07	1.02	1.02	0.98	0.99
0	1.04	0.94	1.04	1.01	1.04	1.01	1.04	1.04	1.01	1.04	1.01	1.04
10 S	1.08	0.97	1.05	0.99	1.00	0.96	1.00	1.02	1.00	1.06	1.05	1.09
20 S	1.14	0.99	1.05	0.97	0.96	0.91	0.95	0.99	1.00	1.08	1.09	1.15

[a] Do not round to nearest integer.
[b] For unlisted latitudes lower than 50° North or 20° South, determine the latitude adjusting value by interpolation.

TABLE 3–4.—NET PRECIPITATION FACTOR VALUES

Net precipitation (inches)	Assigned value
0	0
Greater than 0 to 5	1
Greater than 5 to 15	3
Greater than 15 to 30	6
Greater than 30	10

3.1.2.3 *Depth to aquifer.* Evaluate depth to aquifer by determining the depth from the lowest known point of hazardous substances at a site to the top of the aquifer being evaluated. considering all layers in that interval. Measure the depth to an aquifer as the distance from the surface to the top of the aquifer minus the distance from the surface to the lowest known point of hazardous substances eligible to be evaluated for that aquifer. In evaluating depth to aquifer in karst terrain. assign a thickness of 0 feet to a karst aquifer that underlies any portion of the sources at the site. Based on the calculated depth. assign a value from Table 3–5 to the depth to aquifer factor.

Determine the depth to aquifer only at locations within 2 miles of the sources at the site. except: if observed ground water contamination attributable to sources at the site extends more than 2 miles beyond these sources. use any location within the limits of this observed ground water contamination when evaluating the depth to aquifer factor for any aquifer that does not have an observed release. If the necessary geologic information is available at multiple locations. calculate the depth to aquifer at each location. Use the location having the smallest depth to assign the factor value. Enter this value in Table 3–1.

TABLE 3–5.—DEPTH TO AQUIFER FACTOR VALUES

Depth to aquifer[a] (feet)	Assigned value
Less than or equal to 25	5
Greater than 25 to 250	3
Greater than 250	1

[a] Use depth of all layers between the hazardous substances and aquifer. Assign a thickness of 0 feet to any karst aquifer that underlies any portion of the sources at the site.

3.1.2.4 *Travel time.* Evaluate the travel time factor based on the geologic materials in the interval between the lowest known point of hazardous substances at the site and the top of the aquifer being evaluated. Assign a value to the travel time factor as follows:

• If the depth to aquifer (see section 3.1.2.3) is 10 feet or less. assign a value of 35.

• If. for the interval being evaluated. all layers that underlie a portion of the sources at the site are karst. assign a value of 35.

• Otherwise:

–Select the lowest hydraulic conductivity layer(s) from within the above interval. Consider only layers at least 3 feet thick. However. do not consider layers or portions of layers within the first 10 feet of the depth to the aquifer.

–Determine hydraulic conductivities for individual layers from Table 3–6 or from in-situ or laboratory tests. Use representative. measured. hydraulic conductivity values whenever available.

–If more than one layer has the same lowest hydraulic conductivity. include all such layers and sum their thicknesses. Assign a thickness of 0 feet to a karst layer that underlies any portion of the sources at the site.

–Assign a value from Table 3–7 to the travel time factor. based on the thickness and hydraulic conductivity of the lowest hydraulic conductivity layer(s).

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TABLE 3-6.—HYDRAULIC CONDUCTIVITY OF GEOLOGIC MATERIALS

Type of material	Assigned hydraulic conductivity [a] (cm/sec)
Clay; low permeability till (compact unfractured till); shale; unfractured metamorphic and igneous rocks	10^{-6}
Silt; loesses; silty clays; sediments that are predominantly silts; moderately permeable till (fine-grained, unconsolidated till, or compact till with some fractures); low permeability limestones and dolomites (no karst); low permeability sandstone; low permeability fractured igneous and metamorphic rocks	10^{-4}
Sands; sandy silts; sediments that are predominantly sand; highly permeable till (coarse-grained, unconsolidated or compact and highly fractured); peat; moderately permeable limestones and dolomites (no karst); moderately permeable sandstone; moderately permeable fractured igneous and metamorphic rocks	10^{-2}
Gravel; clean sand; highly permeable fractured igneous and metamorphic rocks; permeable basalt; karst limestones and dolomites	10^{-0}

[a] Do not round to nearest integer.

TABLE 3-7.—TRAVEL TIME FACTOR VALUES [a]

Hydraulic conductivity (cm/sec)	Thickness of lowest hydraulic conductivity layer(s) [b] (feet)			
	Greater than 3 to 5	Greater than 5 to 100	Greater than 100 to 500	Greater than 500
Greater than or equal to 10^{-3}	35	35	35	25
Less than 10^{-3} to 10^{-5}	35	25	15	15
Less than 10^{-5} to 10^{-7}	15	15	5	5
Less than 10^{-7}	5	5	1	1

[a] If depth to aquifer is 10 feet or less or if, for the interval being evaluated, all layers that underlie a portion of the sources at the site are karst, assign a value of 35.

[b] Consider only layers at least 3 feet thick. Do not consider layers or portions of layers within the first 10 feet of the depth to the aquifer.

Determine travel time only at locations within 2 miles of the sources at the site, except: if observed ground water contamination attributable to sources at the site extends more than 2 miles beyond these sources, use any location within the limits of this observed ground water contamination when evaluating the travel time factor for any aquifer that does not have an observed release. If the necessary subsurface geologic information is available at multiple locations, evaluate the travel time factor at each location. Use the location having the highest travel time factor value to assign the factor value for the aquifer. Enter this value in Table 3-1.

3.1.2.5 *Calculation of potential to release factor value.* Sum the factor values for net precipitation, depth to aquifer, and travel time, and multiply this sum by the factor value for containment. Assign this product as the potential to release factor value for the aquifer. Enter this value in Table 3-1.

3.1.3 *Calculation of likelihood of release factor category value.* If an observed release is established for an aquifer, assign the observed release factor value of 550 as the likelihood of release factor category value for that aquifer. Otherwise, assign the potential to release factor value for that aquifer as the likelihood of release value. Enter the value assigned in Table 3-1.

3.2 *Waste characteristics.* Evaluate the waste characteristics factor category for an aquifer based on two factors: toxicity/mobility and hazardous waste quantity. Evaluate only those hazardous substances available to migrate from the sources at the site to ground water. Such hazardous substances include:

- Hazardous substances that meet the criteria for an observed release to ground water.
- All hazardous substances associated with a source that has a ground water containment factor value greater than 0 (see sections 2.2.2, 2.2.3, and 3.1.2.1).

3.2.1 *Toxicity/mobility.* For each hazardous substance, assign a toxicity factor value, a mobility factor value, and a combined toxicity/mobility factor value as specified in the following sections. Select the toxicity/mobility factor value for the aquifer being evaluated as specified in section 3.2.1.3.

3.2.1.1 *Toxicity.* Assign a toxicity factor value to each hazardous substance as specified in Section 2.4.1.1.

3.2.1.2 *Mobility.* Assign a mobility factor value to each hazardous substance for the aquifer being evaluated as follows:

- For any hazardous substance that meets the criteria for an observed release by chemical analysis to one or more aquifers underlying the sources at the site, regardless of the aquifer being evaluated, assign a mobility factor value of 1.
- For any hazardous substance that does not meet the criteria for an observed release by chemical analysis to at least one of the aquifers, assign that hazardous substance a mobility factor value from Table 3-8 for the aquifer being evaluated, based on its water solubility and distribution coefficient (K_d).
- If the hazardous substance cannot be assigned a mobility factor value because data on its water solubility or distribution coefficient are not available, use other hazardous substances for which information is available in evaluating the pathway.

TABLE 3-8.—GROUND WATER MOBILITY FACTOR VALUES [a]

Water solubility (mg/l)	Distribution coefficient (K_d) (ml/g)			
	Karst [c]	≤ 10	> 10 to 1,000	> 1,000
Present as liquid [b]	1	1	0.01	0.0001
Greater than 100	1	1	0.01	0.0001
Greater than 1 to 100	0.2	0.2	0.002	2×10^{-5}
Greater than 0.01 to 1	0.002	0.002	2×10^{-5}	2×10^{-7}
Less than or equal to 0.01	2×10^{-5}	2×10^{-5}	2×10^{-7}	2×10^{-9}

[a] Do not round to nearest integer.
[b] Use if the hazardous substance is present or deposited as a liquid.
[c] Use if the entire interval from the source to the aquifer being evaluated is karst.

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Drainage area. Determine the drainage area for the sources at the site. Include in this drainage area both the source areas and the area upgradient of the sources, but exclude any portion of this drainage area for which runoff is diverted from entering the sources by storm sewers or run-on control and/or runoff management systems. Assign a drainage area value for the watershed from Table 4–3.

Soil group. Based on the predominant soil group within the drainage area described above, assign a soil group designation for the watershed from Table 4–4 as follows:

• Select the predominant soil group as that type which comprises the largest total area within the applicable drainage area.

• If a predominant soil group cannot be delineated, select that soil group in the drainage area that yields the highest value for the runoff factor.

Calculation of runoff factor value. Assign a combined rainfall/runoff value for the watershed from Table 4–5, based on the 2-year, 24-hour rainfall and the soil group designation. Determine the runoff factor value for the watershed from Table 4–6, based on the rainfall/runoff and drainage area values. Enter the runoff factor value in Table 4–1.

TABLE 4–3.—DRAINAGE AREA VALUES

Drainage area (acres)	Assigned value
Less than 50	1
50 to 250	2
Greater than 250 to 1,000	3
Greater than 1,000	4

TABLE 4–4.—SOIL GROUP DESIGNATIONS

Surface soil description	Soil group designation
Coarse-textured soils with high infiltration rates (for example, sands, loamy sands).	A
Medium-textured soils with moderate infiltration rates (for example, sandy loams, loams).	B
Moderately fine-textured soils with low infiltration rates (for example, silty loams, silts, sandy clay loams).	C
Fine-textured soils with very low infiltration rates (for example, clays, sandy clays, silty clay loams, clay loams, silty clays); or impermeable surfaces (for example, pavement).	D

TABLE 4–5.—RAINFALL/RUNOFF VALUES

2-Year, 24-hour rainfall (inches)	Soil group designation			
	A	B	C	D
Less than 1.0	0	0	2	3
1.0 to less than 1.5	0	1	2	3
1.5 to less than 2.0	0	2	3	4
2.0 to less than 2.5	1	2	3	4
2.5 to less than 3.0	2	3	4	4
3.0 to less than 3.5	2	3	4	5
3.5 or greater	3	4	5	6

TABLE 4–6.—RUNOFF FACTOR VALUES

Drainage area value	Rainfall/runoff value						
	0	1	2	3	4	5	6
1	0	0	0	1	1	1	1
2	0	0	1	1	2	3	4
3	0	0	1	3	7	11	15
4	0	1	2	7	17	25	25

4.1.2.1.2.1.3 *Distance to surface water.* Evaluate the distance to surface water as the shortest distance, along the overland segment, from any source with a surface water containment factor value greater than 0 to either the mean high water level for tidal waters or the mean water level for other surface waters. Based on this distance, assign a value from Table 4–7 to the distance to surface water factor for the watershed. Enter this value in Table 4–1.

4.1.2.1.2.1.4 *Calculation of factor value for potential to release by overland flow.* Sum the factor values for runoff and distance to surface water for the watershed and multiply this sum by the factor value for containment. Assign the resulting product as the factor value for potential to release by overland flow for the watershed. Enter this value in Table 4–1.

4.1.2.1.2.2 *Potential to release by flood.* Evaluate potential to release by flood for each watershed as the product of two factors: containment (flood) and flood frequency. Evaluate potential to release by flood separately for each source that is within the watershed. Furthermore, for each source, evaluate potential to release by flood separately for each category of floodplain in which the source lies. (See section 4.1.2.1.2.2.2 for the applicable floodplain categories.) Calculate the value for the potential to release by flood factor as specified in 4.1.2.1.2.2.3.

4.1.2.1.2.2.1 *Containment (flood).* For each source within the watershed, separately evaluate the containment (flood) factor for each category of floodplain in which the source is partially or wholly located. Assign a containment (flood) factor value from Table 4–8 to each floodplain category applicable to that source. Assign a containment (flood) factor value of 0 to each floodplain category in which the source does not lie.

4.1.2.1.2.2.2 *Flood frequency.* For each source within the watershed, separately evaluate the flood frequency factor for each category of floodplain in which the source is partially or wholly located. Assign a flood frequency factor value from Table 4–9 to each floodplain category in which the source is located.

4.1.2.1.2.2.3 *Calculation of factor value for potential to release by flood.* For each source within the watershed and for each category of floodplain in which the source is partially or wholly located, calculate a separate potential to release by flood factor value. Calculate this value as the product of the containment (flood) value and the flood frequency value applicable to the source for the floodplain category. Select the highest value calculated for those sources that meet the minimum size requirement specified in section 4.1.2.1.2.1.1 and assign it as the value for the potential to release by flood factor for the watershed. However, if, for this watershed, no source at the site meets the minimum size requirement, select the highest value calculated for the sources at the site eligible to be evaluated for this watershed and assign it as the value for this factor.

TABLE 4–7.—DISTANCE TO SURFACE WATER FACTOR VALUES

Distance	Assigned value
Less than 100 feet	25
100 feet to 500 feet	20
Greater than 500 feet to 1,000 feet	16
Greater than 1,000 feet to 2,500 feet	9
Greater than 2,500 feet to 1.5 miles	6
Greater than 1.5 miles to 2 miles	3

TABLE 4–8.—CONTAINMENT (FLOOD) FACTOR VALUES

Containment criteria	Assigned value
Documentation that containment at the source is designed, constructed, operated, and maintained to prevent a washout of hazardous substances by the flood being evaluated.	0
Other	10

TABLE 4–9.—FLOOD FREQUENCY FACTOR VALUES

Floodplain category	Assigned value
Source floods annually	50
Source in 10-year floodplain	50
Source in 100-year floodplain	25
Source in 500-year floodplain	7
None of above	0

Enter this highest potential to release by flood factor value for the watershed in Table 4–1, as well as the values for containment (flood) and flood frequency that yield this highest value.

4.1.2.1.2.3 *Calculation of potential to release factor value.* Sum the factor values assigned to the watershed for potential to release by overland flow and potential to release by flood. Assign this sum as the potential to release factor value for the watershed, subject to a maximum value of 500. Enter this value in Table 4–1.

4.1.2.1.3 *Calculation of drinking water threat-likelihood of release factor category value.* If an observed release is established for the watershed, assign the observed release factor value of 550 as the likelihood of release factor category value for that watershed. Otherwise, assign the potential to release factor value for that watershed as the likelihood of release factor category value for that watershed. Enter the value assigned in Table 4–1.

4.1.2.2 *Drinking water threat-waste characteristics.* Evaluate the waste characteristics factor category for each

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the hazardous substance with the highest toxicity/persistence factor value for the watershed to assign the toxicity/persistence factor value for the drinking water threat for the watershed. Enter this value in Table 4–1.

4.1.2.2.2 *Hazardous waste quantity.* Assign a hazardous waste quantity factor value for the watershed as specified in section 2.4.2. Enter this value in Table 4–1.

4.1.2.2.3 *Calculation of drinking water threat-waste characteristics factor category value.* Multiply the toxicity/persistence and hazardous waste quantity factor values for the watershed, subject to a maximum product of 1 x 10[6]. Based on this product, assign a value from Table 2–7 (section 2.4.3.1) to the drinking water threat-waste characteristics factor category for the watershed. Enter this value in Table 4–1.

TABLE 4–12.—TOXICITY/PERSISTENCE FACTOR VALUES [a]

Persistence factor value	Toxicity factor value					
	10,000	1,000	100	10	1	0
1.0	10,000	1,000	100	10	1	0
0.4	4,000	400	40	4	0.4	0
0.07	700	70	7	0.7	0.07	0
0.0007	7	0.7	0.07	0.007	0.0007	0

[a] Do not round to nearest integer.

4.1.2.3 *Drinking water threat-targets.* Evaluate the targets factor category for each watershed based on three factors: nearest intake, population, and resources.

To evaluate the nearest intake and population factors, determine whether the target surface water intakes are subject to actual or potential contamination as specified in section 4.1.1.2. Use either an observed release based on direct observation at the intake or the exposure concentrations from samples (or comparable samples) taken at or beyond the intake to make this determination (see section 4.1.2.1.1). The exposure concentrations for a sample (that is, surface water, benthic, or sediment sample) consist of the concentrations of those hazardous substances present that are significantly above background levels and attributable at least in part to the site (that is, those hazardous substance concentrations that meet the criteria for an observed release).

When an intake is subject to actual contamination, evaluate it using Level I concentrations or Level II concentrations. If the actual contamination is based on an observed release by direct observation, use Level II concentrations for that intake. However, if the actual contamination is based on an observed release from samples, determine which level applies for the intake by comparing the exposure concentrations from samples (or comparable samples) to health-based benchmarks as specified in sections 2.5.1 and 2.5.2. Use the health-based benchmarks from Table 3–10 (section 3.3.1) in determining the level of contamination from samples. For contaminated sediments with no identified source, evaluate the actual contamination using Level II concentrations (see section 4.1.1.2).

4.1.2.3.1 *Nearest intake.* Evaluate the nearest intake factor based on the drinking water intakes along the overland/flood hazardous substance migration path for the watershed. Include standby intakes in evaluating this factor only if they are used for supply at least once a year.

Assign the nearest intake factor a value as follows and enter the value in Table 4–1:

- If one or more of these drinking water intakes is subject to Level I concentrations as specified in section 4.1.2.3, assign a factor value of 50.
- If not, but if one or more of these drinking water intakes is subject to Level II concentrations, assign a factor value of 45.
- If none of these drinking water intakes is subject to Level I or Level II concentrations, determine the nearest of these drinking water intakes, as measured from the probable point of entry (or from the point where measurement begins for contaminated sediments with no identified source). Assign a dilution weight from Table 4–13 to this intake, based on the type of surface water body in which it is located. Multiply this dilution weight by 20, round the product to the nearest integer, and assign it as the factor value.

Assign the dilution weight from Table 4–13 as follows:

TABLE 4–13.—SURFACE WATER DILUTION WEIGHTS

Type of surface water body [a]		Assigned dilution weight [b]
Descriptor	Flow characteristics	
Minimal stream	Less than 10 cfs [c]	1
Small to moderate stream	10 to 100 cfs	0.1
Moderate to large stream	Greater than 100 to 1,000 cfs	0.01
Large stream to river	Greater than 1,000 to 10,000 cfs	0.001
Large river	Greater than 10,000 to 100,000 cfs	0.0001
Very large river	Greater than 100,000 cfs	0.00001
Coastal tidal waters [d]	Flow not applicable, depth not applicable	0.0001
Shallow ocean zone [e] or Great Lake	Flow not applicable, depth less than 20 feet	0.0001
Moderate depth ocean zone [e] or Great Lake	Flow not applicable, depth 20 to 200 feet	0.00001
Deep ocean zone [e] or Great Lake	Flow not applicable, depth greater than 200 feet	0.000005
3-mile mixing zone in quiet flowing river	10 cfs or greater	0.5

[a] Treat each lake as a separate type of water body and assign a dilution weight as specified in text.
[b] Do not round to nearest integer.
[c] cfs = cubic feet per second.
[d] Embayments, harbors, sounds, estuaries, back bays, lagoons, wetlands, etc., seaward from mouths of rivers and landward from baseline of Territorial Sea.
[e] Seaward from baseline of Territorial Sea. This baseline represents the generalized U.S. coastline. It is parallel to the seaward limit of the Territorial Sea and other maritime limits such as the inner boundary of the Federal fisheries jurisdiction and the limit of States jurisdiction under the Submerged Lands Act, as amended.

- For a river (that is, surface water body types specified in Table 4–13 as minimal stream through very large river), assign a dilution weight based on the average annual flow in the river at the intake. If available, use the average annual discharge as defined in the U.S. Geological Survey Water Resources Data Annual Report. Otherwise, estimate the average annual flow.
- For a lake, assign a dilution weight as follows:
  - For a lake that has surface water flow entering the lake, assign a dilution weight based on the sum of the

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REFERENCE NO. 10

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM **PROJECT NOTE**

TO:
E L Beth Ltd site file

DATE:
5/23/00

FROM:
Kelley Curran

SUBJECT:
Groundwater Population Use Summary

REFERENCE:
USGS Groundwater Records Search (attached), NJGS PSW2000 Database Report (attached), Housing Units and Household Population Report (Reference No. 5), and attached telecon

Based on the USGS and NJGS PSW2000 printouts of well records within 4 miles of the E L Beth Ltd site, the Housing and Household Population Report (based on the 1990 Census data) and a telephone conversation with a water company, the following information is summarized for the site:

Nearest Well

The nearest well currently used for drinking water is located approximately 2.10 miles from the site and serves approximately 3 people. The well draws from the Farrington aquifer is 133 feet deep.

Groundwater Populations

The populations that obtain their drinking water from groundwater wells within each distance ring are listed below. Groundwater in Middlesex County in the vicinity of the site location is obtained from either the Old Bridge or Farrington aquifers.

Distance	Private Well Population	Public Supply Population	Total
0 - 1/4	None Identified	None Identified	0
1/4 - ½	None Identified	None Identified	0
½ - 1	None Identified	None Identified	0
1 - 2	None Identified	None Identified	0
2 - 3	5	None Identified	5
3 - 4	None Identified	38,000	38,000

Therefore, the total population served by either private or public groundwater supply sources within a 4-mile radius of the site is approximately 38,005.

Groundwater Resource Use

The USGS Groundwater Records Search indicated that groundwater within four miles of the site is used for industrial and irrigation purposes as well as for public drinking water.

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Water Supply Within 4-miles

E L Beth Ltd Site

Site Latitude:	**403048**	**Lat. Dec. Degrees(y):**	**40.5133333333**
Site Longitude:	**741534**	**Long. Dec. Degrees(x):**	**74.2594444444**

Well Name	Latitude	Longitude	Water Use	Population	Aquifer	Depth (ft)	z-distance (mi)
McKeon 1	402925	741703	Domestic	2.67	Farrington	133	2.06
Ciraky 1	403207	741816	Domestic	2.68	Farrington	123	2.81
SWD-Q	402744	741628	Public	9500	Old Bridge	136	3.62
SWD-R	402745	741645	Public	9500	Old Bridge	111	3.66
SWD-S	402745	741645	Public	9500	Farrington	286	3.66
SWD-T	402737	741658	Public	9500	Old Bridge	137	3.87

Population served based on the distance of wells from the site (in miles):

1/4 - 1/2	0
1/2 - 1	0
1 - 2	0
2 - 3	5.35
3 - 4	38000
Total population served by wells:	**38005**

SWD = Sayreville Water Department

Population based on 1990 Census Population:
Persons per household:

South Amboy City	2.67
Woodbridge Twp	2.68

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EXPLANATION OF THE GROUND WATER DATA TABLES

----------WATER-QUALITY DATA TABLE----------

Water-quality data for the period October 1, 1998 to present are provisional and subject to revision.

For ground-water sites, if we realize that a well has been sealed the local identifier is modified to include the word "SEALED". Water-quality samples collected at those sites were collected before the well was sealed.

Coded remarks you might see:
"<", less than, ">" greater than, "E" estimated, "K", non-ideal colony count

EXPLANATION OF THE GROUND WATER DATA TABLES

----------USGS DESCRIPTIVE WELL INFORMATION (GWSI) TABLE----------

Please be aware of the following in regards to the table of descriptive well information (GWSI). (GWSI is the USGS Ground Water Site Inventory database.)

1. The table contains the records in our GWSI database, but we do not have records for all wells in the state of New Jersey. In general we enter records as we need them for work on our various projects.

2. The data are all provisional and subject to revision. Most of the data comes from well driller's well records which are submitted to the NJ Department of Environmental Protection, Bureau of Safe Drinking Water in observance of the State's well permitting program; other data may be taken from well permits and other sources. If in the course of our project work a site is visited and some part of the GWSI record is found no longer correct, that data is updated, however much of the data has not been field checked. Also there are few mechanisms for our being informed of changes to original information, such as changes depth of the well.

3. The GWSI components in this file were selected because we think they are the most useful to requestors. The GWSI system has other components. If our database shows a change in some component, two or more lines of information are printed for that site with the bottom line having the most recent information.

4. Some of the variables, including aquifer and county are coded. Lists of these codes are attached

5. In some cases, you may see a site with some data on a second line. In these cases, the first line contains the more recent data; the next line contains earlier data.

6. Following are the components in your GWSI table:

1.) SITE-ID/STATION NUMBER- a 15 digit unique number identifying the site, by which it can be retrieved. This number is used to uniquely identify each site on your table of water-quality data.

A - anode
C - standby, emergency supply
D - drain
E - geothermal
G - seismic
H - heat reservoir
M - mine
O - observation
P - oil or gas
R - recharge
S - repressurize
T - test
U - unused
W - withdrawal
X - waste
Z - destroyed

Primary Use of Water codes (C24)

A - air conditioning
B - bottling
C - commercial
D - dewater
E - power
F - fire
H - domestic
I - irrigation
J - industrial (cooling)
K - mining
M - medicinal
N - industrial
P - public supply
Q - aquaculture
R - recreation
S - stock
T - institutional
U - unused
Y - desalinization
Z - other

Casing material (C80)

B-brick
C-concrete
D-copper

34	100CNZC	CENOZOIC ERATHEM
34	110QRNR	QUATERNARY SYSTEM
34	111ALVM	HOLOCENE ALLUVIUM
34	111HLCN	HOLOCENE SERIES
34	111HPPM	UNDIFFERENTIATED HOLOCENE,PLEISTOCENE,PLIOCENE, AND MIOCENE
34	111SWMP	SWAMP DEPOSIT
34	112BRDG	BRIDGETON FORMATION
34	112CPMY	CAPE MAY FORMATION
34	112DLTC	DELTAIC SAND FACIES
34	112ESRNC	ESTUARINE CLAY FACIES
34	112ESRNS	ESTUARINE SAND FACIES
34	112GCLK	GLACIAL LAKE DEPOSITS
34	112GKMK	KAME AND KAME TERRACE DEPOSITS
34	112GLCD	GLACIAL DELTA DEPOSITS
34	112HLBC	HOLLY BEACH WATER-BEARING ZONE
34	112MORN	MORAINE
34	112MRIN	MARINE SAND FACIES
34	112PKBG	PENSAUKEN-BRIDGETON FORMATIONS
34	112PLCC	PLEISTOCENE SERIES-COHANSEY SAND
34	112PLSC	PLEISTOCENE SERIES
34	112PNSK	PENSAUKEN FORMATION
34	112SFDF	STRATIFIED DRIFT
34	112TILL	TILL
34	120TRTR	TERTIARY SYSTEM
34	121BCHL	BEACON HILL GRAVEL
34	121CKKD	COHANSEY SAND-KIRKWOOD FORMATION
34	121CNSY	COHANSEY SAND
34	121PCMC	PLIOCENE-MIOCENE SERIES
34	121PLCN	PLIOCENE SERIES
34	122KRKD	KIRKWOOD FORMATION
34	122KRKDL	KIRKWOOD FORMATION,LOWER SAND
34	122KRKDU	KIRKWOOD FORMATION,UPPER SAND
34	122MOCN	MIOCENE SERIES
34	123OLGC	OLIGOCENE SERIES
34	124EOCN	EOCENE SERIES
34	124MNSQ	MANASQUAN FORMATION
34	124MQVC	MANASQUAN-VINCENTOWN FORMATIONS
34	124PNPN	PINEY POINT FORMATION
34	124SKRV	SHARK RIVER MARL
34	125HRRS	HORNERSTOWN SAND
34	125PLCN	PALEOCENE SERIES
34	125VCHR	VINCETOWN FORMATION-HORNERSTOWN SAND
34	125VNCN	VINCENTOWN FORMATION
34	200MSZC	MESOZOIC ERATHEM
34	210CRCS	CRETACEOUS SYSTEM
34	211EGLS	ENGLISHTOWN FORMATION
34	211FRNG	FARRINGTON SAND MEMBER OF RARITAN FORMATION
34	211MCVL	MERCHANTVILLE FORMATION
34	211MGRR	MAGOTHY-RARITAN FORMATIONS
34	211MGTY	MAGOTHY FORMATION

34	347DNVL	DUTTONVILLE MEMBER OF RONDOUT FORMATION
34	347FBKV	FLATBROOKVILLE MEMBER OF NEW SCOTLAND FORMATION
34	347KKBG	KALKBERG LIMESTONE
34	347MNSK	MINISINK LIMESTONE
34	347MPCG	MASHIPACONG MEMBER OF RONDOUT FORMATION
34	347MSKZ	MASKENOZHA MEMBER
34	347NSCD	NEW SCOTLAND FORMATION
34	347ORSK	ORISKANY FORMATION
34	347PREN	PORT EWEN SHALE
34	347PRVL	PETERS VALLEY MEMBER OF COEYMANS FORMATION
34	347RNDT	RONDOUT FORMATION
34	347RVEN	RAVENA MEMBER OF COEYMANS LIMESTONE
34	347SILD	SHAWNEE ISLAND MEMBER OF COEYMANS FORMATION
34	347SMVL	STORMVILLE MEMBER OF COEYMANS FORMATION
34	347TCKR	THACKER MEMBER OF MANLIUS LIMESTONE
34	347WTPR	WHITEPORT DOLOMITE MEMBER OF RANDOUT FORMATION
34	350GRPD	GREEN POND CONGLOMERATE
34	350HGFL	HIGH FALLS FORMATION
34	350SLRN	SILURIAN SYSTEM
34	351BDVL	BOSSARDVILLE LIMESTONE
34	351CVBK	CLOVE BROOK MEMBER OF DECKER FORMATION
34	351DCKR	DECKER FORMATION
34	351LNGD	LONGWOOD SHALE
34	351PXID	POXONO ISLAND FORMATION
34	351WPKC	WALLPACK CENTER MEMBER OF DECKER FORMATION
34	354SNGK	SHAWANGUNK FORMATION
34	360KTTN	KITTATINNY LIMESTONE
34	360ODVC	ORDOVICIAN SYSTEM
34	361BSKL	BUSHKILL MEMBER OF MARTINSBURG SHALE
34	361MRBG	MARTINSBURG SHALE
34	361PAGL	PEN ARGYL MEMBER OF MARTINSBURG SHALE
34	361RMBG	RAMSEYBURG MEMBER OF MARTINSBURG SHALE
34	364JKBG	JACKSONBURG LIMESTONE
34	367EPLR	EPLER FORMATION
34	367KTTNU	UPPER KITTATINY LIMESTONE
34	367RCKB	RICKENBACH DOLOMITE
34	370CMBR	CAMBRIAN SYSTEM
34	371ALNN	ALLENTOWN DOLOMITE
34	374LSVL	LEITHSVILLE FORMATION
34	377HRDS	HARDYSTON QUARTZITE
34	400BLMR	BALTIMORE GNEISS
34	400FRKL	FRANKLIN LIMESTONE
34	400PCMB	PRECAMBRIAN ERATHEM
34	BASEMENT	BASEMENT
34	BEDROCK	BEDROCK

NEW JERSEY UNIQUE NUMBER	SITE-ID	LOCAL WELL NUMBER	COUNTY	TOWNSHIP	AQUIFER CODE	DEPTH OF WELL (FEET)	TOP OF OPEN INTERVAL (FEET)	BOTTOM OF OPEN INTERVAL (FEET)
--	402744074142301	GWORPHAN	023	OLD BRIDGE TWP	--	--	--	--
230251	403028074164301	RARITAN STEEL 11	023	PERTH AMBOY CITY	211FRNG	40.0	29.00	40.00
230252	403028074164501	18/SEALED	023	PERTH AMBOY CITY	211FRNG	55.0	--	--
230253	403029074164101	16 A/SEALED	023	PERTH AMBOY CITY	211FRNG	58.0	43.00	58.00
230254	403044074153901	2-1945/SEALED	023	PERTH AMBOY CITY	211FRNG	170	--	--
230255	403046074182701	CARBORUNDUM 1	023	WOODBRIDGE TWP	211FRNG	71	57.00	67.00
230256	403049074165901	AMBOY ICE 1/SEALED	023	PERTH AMBOY CITY	211FRNG	160	130.00	160.00
230257	403052074165401	ALL STAR 1	023	PERTH AMBOY CITY	211FRNG	158	--	--
230258	403054074154701	1 (R&H CHEM C)	023	PERTH AMBOY CITY	211FRNG	149	141.00	149.00
230259	403055074153101	ATLANTIC 1/SEALED	023	PERTH AMBOY CITY	211FRNG	140	--	--
230260	403129074153701	PERTH AMBOY CITY/SEALED	023	PERTH AMBOY CITY	211FRNG	77.0	61.00	71.00
							67.00	77.00
230261	403150074160301	CHEVRON 1-1951	023	PERTH AMBOY CITY	211FRNG	82.50	74.00	83.00
230262	403150074160302	CHEVRON OBS 1	023	PERTH AMBOY CITY	211FRNG	82.0	72.00	82.00
230263	403200074162001	CHEVRON 2-1950	023	PERTH AMBOY CITY	211FRNG	106	96.00	106.00
230264	403200074162002	CHEVRON OBS 2	023	PERTH AMBOY CITY	211FRNG	106	96.00	106.00
230265	403211074161301	CHEVRON 11	023	PERTH AMBOY CITY	211FRNG	94.0	11.00	94.00
230266	403212074163501	CHEVRON 3	023	PERTH AMBOY CITY	211FRNG	96.2	87.00	96.00
230267	403212074163502	CHEVRON OBS 3	023	PERTH AMBOY CITY	211FRNG	96.0	86.00	96.00
230268	403217074162101	BIRD & SONS 1	023	PERTH AMBOY CITY	227BRCKS	64.0	40.00	64.00
230269	403229074162801	KEASBEY 1R	023	PERTH AMBOY CITY	211FRNG	61.0	--	--
230270	403231074161601	AMER CYANAMID TEST 2	023	PERTH AMBOY CITY	211FRNG	57.0	53.00	57.00
230271	403234074162701	NJ WOOD 2	023	WOODBRIDGE TWP	211FRNG	65.0	--	--
230272	403234074162901	NJ WOOD 1/SEALED	023	WOODBRIDGE TWP	211FRNG	151	--	--
230400	402743074162101	R-1973	023	SAYREVILLE BORO	211ODBG	82.0	57.00	82.00
230401	402744074162801	MORGAN P	023	SAYREVILLE BORO	211FRNG	288	--	--
							254.00	288.00
230402	402745074162802	TEST WELL 3-69	023	SAYREVILLE BORO	211ODBG	140	119.00	140.00
230403	402745074163101	SWD Q-1973	023	SAYREVILLE BORO	211ODBG	136	78.00	98.00
							116.00	136.00
230404	402746074314501	MORGAN OBS 1	023	SAYREVILLE BORO	211FRNG	248	238.00	248.00
230405	402753074171101	CHEESEQUAKE 2/SEALED	023	SAYREVILLE BORO	211MRPA	107	88.00	107.00
230407	402754074171401	CHEESEQUAKE 3/SEALED	023	SAYREVILLE BORO	211MRPA	122	--	--
230408	402754074171402	CHEESEQUAKE 1/SEALED	023	SAYREVILLE BORO	211ODBG	122	92.00	121.50
230411	402822074163001	SAWD 8/SEALED	023	SAYREVILLE BORO	211FRNG	234	209.00	234.00
230412	402823074163101	SAWD 5/SEALED	023	SAYREVILLE BORO	211ODBG	52.0	--	--
230413	402824074163101	SAWD 9/SEALED	023	SAYREVILLE BORO	211ODBG	48.0	25.00	47.00
230414	402825074163201	SAWD 10	023	SAYREVILLE BORO	211ODBG	48.0	38.00	48.00
230415	402831074181501	NL IND 4/SEALED	023	SAYREVILLE BORO	211FRNG	251	220.00	251.00
230418	402842074181101	NL IND 3/SEALED	023	SAYREVILLE BORO	211FRNG	270	240.00	270.00

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NEW JERSEY UNIQUE NUMBER	CASING MATERIAL	LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LATITUDE-LONGITUDE-CONVERTED FROM NAD1927	PRIMARY USE OF SITE	PRIMARY USE OF WATER	NEW JERSEY PERMIT NUMBER
--	-	402744	741422	(*)	W	-	--
230251	-	403028	741642	(*)	U	U	--
230252	-	403028	741644	(*)	Z	U	--
230253	-	403029	741640	(*)	Z	U	--
230254	-	403044	741538	(*)	Z	U	--
230255	-	403046	741826	(*)	W	N	26-01232
230256	-	403049	741658	(*)	Z	U	--
230257	-	403052	741653	(*)	U	U	--
230258	-	403054	741546	(*)	W	N	--
230259	-	403055	741530	(*)	Z	U	--
230260	S	403129	741532	(*)	Z	U	26-04688
	-			(*)			--
230261	-	403150	741602	(*)	U	U	46-00185
230262	-	403150	741602	(*)	O	U	--
230263	-	403200	741619	(*)	U	U	46-00186
230264	-	403200	741619	(*)	O	U	--
230265	-	403211	741611	(*)	O	U	26-00124
230266	-	403211	741630	(*)	U	U	--
230267	-	403212	741634	(*)	O	U	--
230268	S	403217	741620	(*)	W	N	26-04622
230269	-	403229	741627	(*)	W	N	--
230270	-	403231	741615	(*)	O	U	--
230271	-	403234	741626	(*)	U	U	--
230272	-	403234	741628	(*)	Z	U	--
230400	-	402745	741644	(*)	W	P	--
230401	-	402744	741627	(*)	W	P	--
	-			(*)			29-05352
230402	-	402745	741627	(*)	T	U	29-05856
230403	-	402745	741630	(*)	W	P	29-06767
	-			(*)			--
230404	-	402745	741644	(*)	O	U	29-05043
230405	-	402753	741710	(*)	Z	U	--
230407	-	402802	741626	(*)	Z	U	--
230408	-	402802	741626	(*)	Z	U	--
230411	-	402822	741629	(*)	Z	U	46-00144
230412	-	402823	741630	(*)	Z	U	--
230413	-	402824	741630	(*)	Z	U	26-00067
230414	-	402825	741631	(*)	W	P	26-04078
230415	-	402835	741814	(*)	Z	U	--
230418	-	402843	741807	(*)	Z	U	46-00184

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NEW JERSEY UNIQUE NUMBER	SITE-ID	LOCAL WELL NUMBER	COUNTY	TOWNSHIP	AQUIFER CODE	DEPTH OF WELL (FEET)	TOP OF OPEN INTERVAL (FEET)	BOTTOM OF OPEN INTERVAL (FEET)
230419	402854074180501	NL IND 2/SEALED	023	SAYREVILLE BORO	211FRNG	253	220.00	253.00
230420	402905074180001	1-1934/SEALED	023	SAYREVILLE BORO	211FRNG	266	36.00	66.00
							236.00	266.00
230421	402905074180002	NL IND TEST 3/SEALED	023	SAYREVILLE BORO	211FRNG	--	--	--
230422	402920074180401	DUHRNL OBS 35F	023	SAYREVILLE BORO	211FRNG	156	--	--
230423	402942074180901	CL TEST 1	023	SAYREVILLE BORO	211FRNG	84.0	75.00	84.00
230424	402945074175501	DUHRNL OBS 34F/SEALED	023	SAYREVILLE BORO	211FRNG	129	--	--
230427	402904074164801	SWAN HILL 1/SEALED	023	SOUTH AMBOY CITY	211ODBG	52.0	40.00	52.00
230428	402922074165801	WERNER STA 5	023	SOUTH AMBOY CITY	211FRNG	160	--	--
230429	402923074155601	WERNER STA 6	023	SOUTH AMBOY CITY	211FRNG	177	154.00	177.00
230430	402923074165101	7-1972/SEALED	023	SOUTH AMBOY CITY	211FRNG	165	135.00	165.00
230431	402926074155001	WERNER STA 4/SEALED	023	SOUTH AMBOY CITY	211FRNG	168	143.00	168.00
230462	403043074184201	CARBIDE 1	023	WOODBRIDGE TWP	211FRNG	57.0	47.00	57.00
230463	403050074191601	HEYDEN CHEM 1	023	WOODBRIDGE TWP	227BRCKS	190	--	--
230464	403050074191602	3-1934	023	WOODBRIDGE TWP	211FRNG	50.0	--	--
230465	403050074191603	4-1934	023	WOODBRIDGE TWP	211FRNG	45.0	--	--
230466	403051074193101	CATALIN 1	023	WOODBRIDGE TWP	211FRNG	38.0	--	--
230467	403051074193102	CATALIN 2	023	WOODBRIDGE TWP	211FRNG	32.0	--	--
230468	403051074193103	CATALIN 3	023	WOODBRIDGE TWP	211FRNG	42.0	--	--
230469	403051074193104	CATALIN 4	023	WOODBRIDGE TWP	211FRNG	31.0	--	--
230470	403051074193105	CATALIN 5	023	WOODBRIDGE TWP	211FRNG	34.0	--	--
230471	403051074193106	CATALIN 6	023	WOODBRIDGE TWP	227BRCKS	210	--	--
230472	403233074162001	CYAN WDBRG P3/SEALED	023	WOODBRIDGE TWP	211MRPA	80.0	--	--
230473	403233074163301	SWIFT 1/SEALED	023	WOODBRIDGE TWP	211FRNG	59.0	39.00	59.00
230474	403233074163302	RECHARGE WELL/SEALED	023	WOODBRIDGE TWP	211FRNG	61.0	41.00	61.00
230475	403233074164701	DAIRY WELL	023	WOODBRIDGE TWP	211FRNG	68.0	--	--
230476	403234074163301	NJ WOOD 3	023	WOODBRIDGE TWP	211FRNG	77.0	--	--
230477	403236074154301	VULCAN DET 1	023	WOODBRIDGE TWP	211FRNG	10.0	--	--
230478	403236074161601	CYANAMID 2A	023	WOODBRIDGE TWP	211FRNG	60.0	45.00	60.00
230479	403236074161602	CYAN WDBRG P2/SEALED	023	WOODBRIDGE TWP	211FRNG	74.0	44.00	54.00
							46.00	56.00
							63.00	73.00
							64.00	75.00
230480	403236074161701	CYAN WDBRG P1/SEALED	023	WOODBRIDGE TWP	211FRNG	28.0	--	--
230481	403238074154201	VULCAN 2	023	WOODBRIDGE TWP	211FRNG	15.0	--	--
230482	403242074161701	AMERICAN CYANAMID 1 OBS	023	WOODBRIDGE TWP	211FRNG	76.0	44.00	54.00
							64.00	76.00
230485	403406074144101	READING 14	023	WOODBRIDGE TWP	211FRNG	30.0	--	--
230487	403407074144701	READING RR 2	023	WOODBRIDGE TWP	211FRNG	41.0	31.00	41.00
230488	403407074144702	READING RR 1	023	WOODBRIDGE TWP	211FRNG	41.0	31.00	41.00

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NEW JERSEY UNIQUE NUMBER	CASING MATERIAL	LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LATITUDE-LONGITUDE-CONVERTED FROM NAD1927	PRIMARY USE OF SITE	PRIMARY USE OF WATER	NEW JERSEY PERMIT NUMBER
230419	-	402854	741803	(*)	Z	U	46-00183
230420	-	402905	741759	(*)	Z	U	--
	-			(*)			--
230421	-	402905	741759	(*)	Z	U	--
230422	-	402920	741803	(*)	O	U	--
230423	-	402943	741807	(*)	T	U	--
230424	-	402945	741751	(*)	Z	U	--
230427	-	402900	741643	(*)	Z	U	--
230428	-	402922	741657	(*)	U	U	--
230429	-	402923	741647	(*)	U	U	--
230430	-	402923	741650	(*)	Z	N	26-04485
230431	-	402926	741648	(*)	Z	U	--
230462	-	403043	741841	(*)	W	N	26-03325
230463	-	403050	741915	(*)	W	N	--
230464	-	403050	741915	(*)	W	N	--
230465	-	403050	741915	(*)	W	N	--
230466	-	403051	741930	(*)	W	N	--
230467	-	403051	741930	(*)	W	N	--
230468	-	403051	741930	(*)	W	N	--
230469	-	403051	741930	(*)	W	N	--
230470	-	403051	741930	(*)	W	N	--
230471	-	403051	741930	(*)	W	N	--
230472	-	403233	741619	(*)	Z	U	--
230473	-	403233	741632	(*)	Z	N	--
230474	-	403233	741632	(*)	Z	N	28-01084
230475	-	403233	741646	(*)	W	N	--
230476	-	403234	741632	(*)	W	N	--
230477	-	403236	741542	(*)	W	N	--
230478	-	403236	741615	(*)	W	N	26-01889
230479	-	403236	741615	(*)	Z	U	WR.NO_C213
	-			(*)			--
	-			(*)			--
	-			(*)			--
230480	-	403236	741616	(*)	Z	U	--
230481	-	403238	741541	(*)	W	N	--
230482	-	403242	741616	(*)	O	U	--
	-			(*)			--
230485	-	403406	741440	(*)	W	N	--
230487	S	403407	741446	(*)	W	N	--
230488	S	403407	741446	(*)	W	N	--

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NEW JERSEY UNIQUE NUMBER	SITE-ID	LOCAL WELL NUMBER	COUNTY	TOWNSHIP	AQUIFER CODE	DEPTH OF WELL (FEET)	TOP OF OPEN INTERVAL (FEET)	BOTTOM OF OPEN INTERVAL (FEET)
230495	403234074163001	STANLEY CORP RUSS 1	023	WOODBRIDGE TWP	211FRNG	80.0	--	--
							--	--
230523	403217074164101	STANLEY 2	023	WOODBRIDGE TWP	211FRNG	61.5	46.50	61.50
230524	403212074161901	BIRD & SONS 2	023	PERTH AMBOY CITY	211FRNG	67.0	57.00	67.00
230541	403231074151801	44	023	WOODBRIDGE TWP	211FRNG	36.0	--	--
230542	403232074152201	2(28)	023	WOODBRIDGE TWP	211FRNG	22.0	--	--
230543	403242074152301	SHELL 5(S2)	023	WOODBRIDGE TWP	211FRNG	42	--	--
230544	403243074152801	4(S1)/SEALED	023	WOODBRIDGE TWP	211FRNG	28.5	--	--
230545	403243074153301	SHELL OIL 5	023	WOODBRIDGE TWP	211FRNG	44.5	--	--
230546	403249074153801	SHELL OIL 9	023	WOODBRIDGE TWP	211FRNG	45.0	--	--
230547	403250074153401	SHELL OIL 3	023	WOODBRIDGE TWP	211FRNG	43.0	--	--
230548	403257074153901	SHELL 8(R7)	023	WOODBRIDGE TWP	211FRNG	36	--	--
230549	402746074314503	SWD R	023	SAYREVILLE BORO	211ODBG	111	--	--
							70.00	111.00
230554	402738074165901	SWD S	023	SAYREVILLE BORO	211FRNG	286	--	--
							213.00	286.00
230557	392833074163701	SAWD 9A/SEALED	023	SAYREVILLE BORO	211ODBG	58.0	--	--
							48.00	58.00
230558	403220074182001	FUTZ IRR	023	WOODBRIDGE TWP	227BRCKS	302	--	--
230561	403313074160701	DISABLED VETS 1	023	WOODBRIDGE TWP	227BRCKS	614	--	--
230569	402738074170001	SWD T	023	SAYREVILLE BORO	211ODBG	137	--	--
							--	--
							102.00	132.00
230573	403207074181701	CIRAKY 1	023	WOODBRIDGE TWP	211FRNG	123	--	--
230575	402925074170401	MCKEON 1	023	SOUTH AMBOY CITY	211FRNG	133	127.00	133.00
230576	402933074171801	SPINELLO 1/SEALED	023	SOUTH AMBOY CITY	211ODBG	165	--	--
230577	403210074152001	SB-13A	023	PERTH AMBOY CITY	211FRNG	57.0	37.00	57.00
230578	403236074154302	E15A	023	WOODBRIDGE TWP	211FRNG	64.2	44.20	64.20
230804	402945074193701	R-01	023	WOODBRIDGE TWP	--	--	--	--
230805	402948074193901	R-02	023	WOODBRIDGE TWP	--	--	--	--
230806	402952074193901	WOODBRIDGE TWP	023	--	--	--	--	--
230807	402957074193301	R-04	023	WOODBRIDGE TWP	--	--	--	--
230808	403008074191901	R-05	023	WOODBRIDGE TWP	--	--	--	--
230809	403012074191301	R-06	023	WOODBRIDGE TWP	--	--	--	--
230810	402946074193501	R-08	023	WOODBRIDGE TWP	--	--	--	--
230811	402936074192801	R-09	023	WOODBRIDGE TWP	--	--	--	--
230812	402922074191801	R-10	023	SAYREVILLE BORO	--	--	--	--
230813	402919074191601	R-11	023	SAYREVILLE BORO	--	--	--	--
230814	402803074140501	TC-243	023	OLD BRIDGE TWP	--	--	--	--
230815	403034074172801	TP-T01B	023	WOODBRIDGE TWP	--	--	--	--

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NEW JERSEY UNIQUE NUMBER	CASING MATERIAL	LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LATITUDE-LONGITUDE-CONVERTED FROM NAD1927	PRIMARY USE OF SITE	PRIMARY USE OF WATER	NEW JERSEY PERMIT NUMBER
230495	-	403234	741629	(*)	W	N	--
	-			(*)			26-04183
230523	S	403229	741634	(*)	W	N	26-04706
230524	S	403212	741618	(*)	W	N	26-04798
230541	-	403231	741517	(*)	W	N	--
230542	-	403232	741521	(*)	W	N	--
230543	-	403242	741525	(*)	O	U	--
230544	-	403242	741530	(*)	Z	U	--
230545	-	403243	741532	(*)	W	N	--
230546	-	403249	741537	(*)	W	N	--
230547	-	403250	741533	(*)	O	U	--
230548	-	403257	741538	(*)	O	U	--
230549	S	402745	741644	(*)	W	P	--
	S			(*)			29-10500
230554	S	402745	741644	(*)	W	P	--
	S			(*)			29-10499
230557	S	402820	741628	(*)	Z	P	--
	S			(*)			26-04812
230558	-	403220	741819	(*)	W	I	--
230561	-	403313	741606	(*)	W	-	--
230569	S	402738	741659	(*)	W	P	--
	S			(*)			--
	S			(*)			29-11861
230573	S	403207	741816	(*)	W	H	26-03264
230575	S	402925	741703	(*)	W	H	26-04635
230576	S	402933	741717	(*)	Z	U	26-04710
230577	P	403210	741519	(*)	O	U	26-05321
230578	P	403236	741542	(*)	O	U	26-05324
230804	-	402945	741936	(*)	T	-	--
230805	-	402948	741938	(*)	T	-	--
230806	-	402952	741938	(*)	T	-	--
230807	-	402957	741932	(*)	T	-	--
230808	-	403008	741918	(*)	T	-	--
230809	-	403012	741912	(*)	T	-	--
230810	-	402946	741934	(*)	T	-	--
230811	-	402936	741927	(*)	T	U	--
230812	-	402922	741917	(*)	T	-	--
230813	-	402919	741915	(*)	T	-	--
230814	-	402803	741404	(*)	T	U	--
230815	-	403034	741727	(*)	T	U	--

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NEW JERSEY UNIQUE NUMBER	SITE-ID	LOCAL WELL NUMBER	COUNTY	TOWNSHIP	AQUIFER CODE	DEPTH OF WELL (FEET)	TOP OF OPEN INTERVAL (FEET)	BOTTOM OF OPEN INTERVAL (FEET)
230816	403039074180801	TP-T02B	023	WOODBRIDGE TWP	--	--	--	--
230817	403029074183801	TP-T03B	023	WOODBRIDGE TWP	--	--	--	--
230818	403029074182701	TP-T04	023	WOODBRIDGE TWP	--	--	--	--
230819	403022074184301	TP-T05B	023	WOODBRIDGE TWP	--	--	--	--
230820	403021074183801	TP-T06	023	WOODBRIDGE TWP	--	--	--	--
230821	403020074184401	TP-T07	023	WOODBRIDGE TWP	--	--	--	--
230822	403019074184001	TP-T08B	023	WOODBRIDGE TWP	--	--	--	--
230823	403018074184501	TP-T09	023	WOODBRIDGE TWP	--	--	--	--
230824	403017074184101	TP-T10	023	SAYREVILLE BORO	--	--	--	--
230825	403016074184501	TP-T11B	023	SAYREVILLE BORO	--	--	--	--
230826	403014074184201	TP-T12	023	SAYREVILLE BORO	--	--	--	--
230827	403013074184701	TP-T13	023	SAYREVILLE BORO	--	--	--	--
230828	403010074184401	TP-T14	023	SAYREVILLE BORO	--	--	--	--
230829	403008074184501	TP-T15	023	SAYREVILLE BORO	--	--	--	--
230830	403007074185001	TP-T16	023	SAYREVILLE BORO	--	--	--	--
230831	403005074184601	TP-T17	023	SAYREVILLE BORO	--	--	--	--
230832	403005074185101	TP-T18	023	SAYREVILLE BORO	--	--	--	--
230833	403002074184801	TP-T19B	023	SAYREVILLE BORO	--	--	--	--
230834	403003074185201	TP-T20	023	SAYREVILLE BORO	--	--	--	--
230835	403000074184901	TP-T21	023	SAYREVILLE BORO	--	--	--	--
230836	403001074185301	TP-T22	023	SAYREVILLE BORO	--	--	--	--
230837	402958074184701	TP-T23	023	SAYREVILLE BORO	--	--	--	--
230838	402958074184901	TP-T24	023	SAYREVILLE BORO	--	--	--	--
230839	402958074185401	TP-T25	023	SAYREVILLE BORO	--	--	--	--
230840	402957074185001	TP-T26	023	SAYREVILLE BORO	--	--	--	--
230841	402956074185501	TP-T27	023	SAYREVILLE BORO	--	--	--	--
230842	402953074185201	TP-T28	023	SAYREVILLE BORO	--	--	--	--
230843	403027074183301	TP-T30	023	WOODBRIDGE TWP	--	--	--	--
230844	403026074183101	TP-T31	023	WOODBRIDGE TWP	--	--	--	--
230845	403024074183001	TP-T32	023	SAYREVILLE BORO	--	--	--	--
230851	402945074193901	DH-R-6	023	WOODBRIDGE TWP	--	--	--	--
230862	402912074164001	O-01	023	SOUTH AMBOY CITY	--	--	--	--
230863	402932074180601	O-04	023	SOUTH AMBOY CITY	--	--	--	--
230864	402848074144201	O-16	023	SOUTH AMBOY CITY	--	--	--	--
230865	402851074145501	O-19	023	SOUTH AMBOY CITY	--	--	--	--
230866	402900074154201	O-29	023	SOUTH AMBOY CITY	--	--	--	--
230867	402901074155001	O-30	023	SOUTH AMBOY CITY	--	--	--	--
230868	402904074160501	O-33	023	SOUTH AMBOY CITY	--	--	--	--
230869	402905074161501	O-35	023	SOUTH AMBOY CITY	--	--	--	--
230870	402908074163001	O-37	023	SOUTH AMBOY CITY	--	--	--	--

NEW JERSEY UNIQUE NUMBER	CASING MATERIAL	LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LATITUDE-LONGITUDE-CONVERTED FROM NAD1927	PRIMARY USE OF SITE	PRIMARY USE OF WATER	NEW JERSEY PERMIT NUMBER
230816	-	403039	741807	(*)	T	U	--
230817	-	403029	741837	(*)	T	U	--
230818	-	403029	741826	(*)	T	U	--
230819	-	403022	741842	(*)	T	U	--
230820	-	403021	741837	(*)	T	U	--
230821	-	403020	741843	(*)	T	U	--
230822	-	403019	741839	(*)	T	U	--
230823	-	403018	741844	(*)	T	U	--
230824	-	403017	741840	(*)	T	U	--
230825	-	403016	741844	(*)	T	U	--
230826	-	403014	741841	(*)	T	U	--
230827	-	403013	741846	(*)	T	U	--
230828	-	403010	741843	(*)	T	U	--
230829	-	403008	741844	(*)	T	U	--
230830	-	403007	741849	(*)	T	U	--
230831	-	403005	741845	(*)	T	U	--
230832	-	403005	741850	(*)	T	U	--
230833	-	403002	741847	(*)	W	-	--
230834	-	403003	741851	(*)	T	U	--
230835	-	403000	741848	(*)	T	U	--
230836	-	403001	741852	(*)	T	U	--
230837	-	402958	741846	(*)	T	U	--
230838	-	402958	741848	(*)	T	U	--
230839	-	402958	741853	(*)	T	U	--
230840	-	402957	741849	(*)	T	U	--
230841	-	402956	741854	(*)	T	U	--
230842	-	402953	741851	(*)	T	U	--
230843	-	403027	741832	(*)	T	U	--
230844	-	403026	741830	(*)	T	U	--
230845	-	403024	741829	(*)	T	U	--
230851	-	402945	741938	(*)	T	U	--
230862	-	402912	741639	(*)	T	U	--
230863	-	402932	741805	(*)	T	U	--
230864	-	402848	741441	(*)	T	U	--
230865	-	402851	741454	(*)	T	U	--
230866	-	402900	741541	(*)	T	U	--
230867	-	402901	741549	(*)	T	U	--
230868	-	402904	741604	(*)	T	U	--
230869	-	402905	741614	(*)	T	U	--
230870	-	402908	741629	(*)	T	U	--

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NEW JERSEY UNIQUE NUMBER	SITE-ID	LOCAL WELL NUMBER	COUNTY	TOWNSHIP	AQUIFER CODE	DEPTH OF WELL (FEET)	TOP OF OPEN INTERVAL (FEET)	BOTTOM OF OPEN INTERVAL (FEET)
230871	402910074164301	O-43	023	SOUTH AMBOY CITY	--	--	--	--
230872	402915074165401	O-50	023	SOUTH AMBOY CITY	--	--	--	--
230873	402925074174001	O-54	023	SOUTH AMBOY CITY	--	--	--	--
230874	402926074182201	O-57A	023	SOUTH AMBOY CITY	--	--	--	--
230875	402928074181601	O-57A6	023	SOUTH AMBOY CITY	--	--	--	--
230876	402924074182801	O-58	023	SOUTH AMBOY CITY	--	--	--	--
230973	403023074180401	NJ-01	023	SAYREVILLE BORO	--	--	--	--
230974	403023074180301	NJ-02	023	SAYREVILLE BORO	--	--	--	--
230975	403026074180401	NJ-03	023	SAYREVILLE BORO	--	--	--	--
230976	403025074180201	NJ-04	023	SAYREVILLE BORO	--	--	--	--
230977	403027074180401	NJ-05	023	SAYREVILLE BORO	--	--	--	--
230978	403027074180301	NJ-06	023	SAYREVILLE BORO	--	--	--	--
230979	403030074180401	NJ-07	023	SAYREVILLE BORO	--	--	--	--
230980	403031074180201	NJ-08	023	SAYREVILLE BORO	--	--	--	--
230981	403033074180301	NJ-09	023	SAYREVILLE BORO	--	--	--	--
230982	403033074180201	NJ-10	023	SAYREVILLE BORO	--	--	--	--
230983	403035074180301	NJ-11	023	WOODBRIDGE TWP	--	--	--	--
230984	403034074180201	NJ-12	023	WOODBRIDGE TWP	--	--	--	--
230985	403037074180301	NJ-13	023	WOODBRIDGE TWP	--	--	--	--
230986	403037074180201	NJ-14	023	WOODBRIDGE TWP	--	--	--	--
230987	403039074180301	NJ-15	023	WOODBRIDGE TWP	--	--	--	--
230988	403039074180201	NJ-16	023	WOODBRIDGE TWP	--	--	--	--
230989	403040074180301	NJ-17	023	WOODBRIDGE TWP	--	--	--	--
230990	403041074180201	NJ-18	023	WOODBRIDGE TWP	--	--	--	--
230991	403042074180301	NJ-19	023	WOODBRIDGE TWP	--	--	--	--
230992	403042074180201	NJ-20	023	WOODBRIDGE TWP	--	--	--	--
230993	403025074180401	NJ-21A	023	SAYREVILLE BORO	--	--	--	--
230994	403025074180301	NJ-22	023	SAYREVILLE BORO	--	--	--	--
230995	403028074180401	NJ-23	023	SAYREVILLE BORO	--	--	--	--
230996	403027074180201	NJ-24	023	SAYREVILLE BORO	--	--	--	--
230997	403030074180402	NJ-25	023	SAYREVILLE BORO	--	--	--	--
230998	403030074180301	NJ-26	023	SAYREVILLE BORO	--	--	--	--
230999	403025074180402	NJ-27	023	SAYREVILLE BORO	--	--	--	--
231000	402845074152901	DH-1	023	SAYREVILLE BORO	--	--	--	--
231001	402813074151201	US ARMY - COE DH-2	023	SAYREVILLE BORO	--	--	--	--
231002	402823074143601	DH-3	023	OLD BRIDGE TWP	--	--	--	--
231003	402751074141301	DH-4	023	OLD BRIDGE TWP	--	--	--	--
231004	402813074153001	DH-27A	023	SAYREVILLE BORO	--	--	--	--
231005	402755074145801	US ARMY - COE DH-28	023	OLD BRIDGE TWP	--	--	--	--
231027	402905074191701	13-M/SEALED	023	SAYREVILLE BORO	--	--	--	--

NEW JERSEY UNIQUE NUMBER	CASING MATERIAL	LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LATITUDE-LONGITUDE-CONVERTED FROM NAD1927	PRIMARY USE OF SITE	PRIMARY USE OF WATER	NEW JERSEY PERMIT NUMBER
230871	-	402910	741642	(*)	T	U	--
230872	-	402915	741653	(*)	T	U	--
230873	-	402925	741739	(*)	T	U	--
230874	-	402926	741821	(*)	T	U	--
230875	-	402928	741815	(*)	T	U	--
230876	-	402924	741827	(*)	T	U	--
230973	-	403023	741803	(*)	T	U	--
230974	-	403023	741802	(*)	T	U	--
230975	-	403026	741803	(*)	T	U	--
230976	-	403025	741801	(*)	T	U	--
230977	-	403027	741803	(*)	T	U	--
230978	-	403027	741802	(*)	T	U	--
230979	-	403030	741803	(*)	T	U	--
230980	-	403031	741801	(*)	T	U	--
230981	-	403033	741802	(*)	T	U	--
230982	-	403033	741801	(*)	T	U	--
230983	-	403035	741802	(*)	T	U	--
230984	-	403034	741801	(*)	T	U	--
230985	-	403037	741802	(*)	T	U	--
230986	-	403037	741801	(*)	T	U	--
230987	-	403039	741802	(*)	T	U	--
230988	-	403039	741801	(*)	T	U	--
230989	-	403040	741802	(*)	T	U	--
230990	-	403041	741801	(*)	T	U	--
230991	-	403042	741802	(*)	T	U	--
230992	-	403042	741801	(*)	T	U	--
230993	-	403025	741803	(*)	T	U	--
230994	-	403025	741802	(*)	T	U	--
230995	-	403028	741803	(*)	T	U	--
230996	-	403027	741801	(*)	T	U	--
230997	-	403030	741803	(*)	T	U	--
230998	-	403030	741802	(*)	T	U	--
230999	-	403025	741803	(*)	T	U	--
231000	-	402845	741528	(*)	T	U	--
231001	-	402813	741511	(*)	T	U	--
231002	-	402823	741435	(*)	T	U	--
231003	-	402751	741412	(*)	T	U	--
231004	-	402813	741529	(*)	T	U	--
231005	-	402755	741457	(*)	T	U	--
231027	-	402905	741916	(*)	Z	U	--

NEW JERSEY UNIQUE NUMBER	SITE-ID	LOCAL WELL NUMBER	COUNTY	TOWNSHIP	AQUIFER CODE	DEPTH OF WELL (FEET)	TOP OF OPEN INTERVAL (FEET)	BOTTOM OF OPEN INTERVAL (FEET)
231028	402910074191201	14-N/SEALED	023	SAYREVILLE BORO	--	--	--	--
231029	402916074190801	15-O/SEALED	023	SAYREVILLE BORO	--	--	--	--
231030	402922074190501	16-P/SEALED	023	SAYREVILLE BORO	--	--	--	--
231031	402926074185901	17-Q/SEALED	023	SAYREVILLE BORO	--	--	--	--
231032	402929074185301	18-R/SEALED	023	SAYREVILLE BORO	--	--	--	--
231033	402933074184601	19-S/SEALED	023	SAYREVILLE BORO	--	--	--	--
231034	402937074184001	20-T/SEALED	023	SAYREVILLE BORO	--	--	--	--
231035	403210074162101	TEST WELL #4	023	PERTH AMBOY CITY	--	--	--	--
231036	403200074160501	TEST WELL #6	023	PERTH AMBOY CITY	--	--	--	--
231037	403156074162601	TEST WELL #7	023	PERTH AMBOY CITY	--	--	--	--
231038	403214074171401	TEST WELL #8	023	PERTH AMBOY CITY	--	--	--	--
231039	403158074160801	TEST WELL #9	023	PERTH AMBOY CITY	--	--	--	--
231040	403156074162201	TEST WELL #15	023	PERTH AMBOY CITY	--	--	--	--
231057	402887074158601	DH-26A	023	SOUTH AMBOY CITY	--	--	--	--
231147	402940074175301	WELL 34, MI-26/SEALED	023	SAYREVILLE BORO	211FRNG	115	--	--
231152	403033074164701	WELL 16, MI-17/SEALED	023	PERTH AMBOY CITY	211FRNG	152	--	--
231153	403033074164702	WELL 17, MI-19/SEALED	023	PERTH AMBOY CITY	211FRNG	145	--	--
N08513	403244074121001	R-42/SEALED	085	--	--	--	--	--
N08514	403103074140101	R-54/SEALED	085	--	--	228.	208.	228.
N08515	403107074143201	R-61/SEALED	085	--	--	--	--	--
N08517	403108074140801	R-70/SEALED	085	--	--	--	--	--
N08518	403113074120401	R-71/SEALED	085	--	--	--	--	--
N08519	403042074151201	R-72/SEALED	085	--	--	--	--	--
N08520	403049074114001	PAB-1/SEALED	085	--	--	--	--	--
N08521	403034074113701	PAB-2/SEALED	085	--	--	--	--	--
N08522	403031074113601	PAB-3/SEALED	085	--	--	--	--	--
N08523	403021074113401	PAB-4/SEALED	085	--	--	--	--	--
N08524	403017074113301	PAB-5/SEALED	085	--	--	--	--	--

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NEW JERSEY UNIQUE NUMBER	CASING MATERIAL	LATITUDE (DEGREES)	LONGITUDE (DEGREES)	LATITUDE-LONGITUDE-CONVERTED FROM NAD1927	PRIMARY USE OF SITE	PRIMARY USE OF WATER	NEW JERSEY PERMIT NUMBER
231028	-	402910	741911	(*)	Z	U	--
231029	-	402916	741907	(*)	Z	U	--
231030	-	402922	741904	(*)	Z	U	--
231031	-	402926	741858	(*)	Z	U	--
231032	-	402929	741852	(*)	Z	U	--
231033	-	402933	741845	(*)	Z	U	--
231034	-	402937	741839	(*)	Z	U	--
231035	-	403210	741620	(*)	T	U	26-00111
231036	-	403200	741604	(*)	T	U	26-00122
231037	-	403156	741625	(*)	T	U	26-00125
231038	-	403214	741713	(*)	T	U	26-00126
231039	-	403158	741607	(*)	T	U	26-00123
231040	-	403156	741621	(*)	T	U	26-00257
231057	-	402852	741551	(*)	T	U	--
231147	-	402940	741752	(*)	Z	U	--
231152	-	403033	741646	(*)	Z	U	--
231153	-	403033	741646	(*)	Z	U	--
N08513	-	403244	741209	(*)	Z	U	--
N08514	S	403103	741400	(*)	Z	U	--
N08515	-	403107	741431	(*)	Z	U	--
N08517	-	403108	741407	(*)	Z	U	--
N08518	-	403130	741203	(*)	Z	U	--
N08519	-	403042	741511	(*)	Z	U	--
N08520	-	403049	741139	(*)	Z	U	--
N08521	-	403034	741136	(*)	Z	U	--
N08522	-	403031	741135	(*)	Z	U	--
N08523	-	403021	741133	(*)	Z	U	--
N08524	-	403017	741132	(*)	Z	U	--

PSW.DAT revision: 643,984 10-19-99 4:15P
Search conducted: 03-06-2000 16:07:58 Search radius: 21120 feet
Chosen search parameters were NAD27 geographic coordinates
Location entered: Latitude: 40□30'48" Longitude: 74□15'34"
Easting: 559119.658 Northing: 612034.962

Distance: 19046 ft 3.6 mi
Permit #: 29-05352
Owner: Sayreville Water Dept
Well Name: Well P
Address:
Operational status: Operational
Latitude: 40□27'44.446" Longitude: 74□16'28.561"
Easting: 554953.358 ft Northing: 593450.461 ft
Confinement Status: Unconfined

Distance: 19034 ft 3.6 mi
Permit #: 29-06767
Owner: Sayreville Water Dept
Well Name: Well Q
Address:
Operational status: Operational
Latitude: 40□27'44.621" Longitude: 74□16'28.897"
Easting: 554927.344 ft Northing: 593468.103 ft
Confinement Status: Unconfined

Distance: 19309 ft 3.7 mi
Permit #: 29-10499
Owner: Sayreville Water Dept
Well Name: Well S
Address: Ernston Rd
Operational status: Operational
Latitude: 40□27'45.139" Longitude: 74□16'45.442"
Easting: 553648.408 ft Northing: 593517.282 ft
Confinement Status: Unconfined

Distance: 19273 ft 3.7 mi
Permit #: 29-10500
Owner: Sayreville Water Dept
Well Name: Well R
Address: Ernston Rd
Operational status: Operational
Latitude: 40□27'45.493" Longitude: 74□16'45.351"
Easting: 553655.352 ft Northing: 593553.121 ft
Confinement Status: Unconfined

Distance: 20301 ft 3.8 mi
Permit #: 29-11861
Owner: Sayreville Water Dept
Well Name: Well T
Address:
Operational status: Operational
Latitude: 40□27'37.963" Longitude: 74□16'58.22"
Easting: 552662.616 ft Northing: 592788.699 ft
Confinement Status: Unconfined

End of search; 5 wells found.

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM		TELECON NOTE
CONTROL NO:	DATE: 11/23/99	TIME: 1100
DISTRIBUTION: Essex Chemical Corp. site file		
BETWEEN: Santo Triolo	OF Borough of Sayreville Water & Sewer Department	PHONE 732-390-7067
AND Kelley Curran		

DISCUSSION

KC called Mr. Triolo to discuss receipt of information regarding public supply wells in a 4-mile radius of the Essex Chemical Corp. site. To expand on the information received, Mr. Triolo clarified that only Wells Q, R, S, and T are in use at this time. Groundwater from these four wells is blended prior to distribution. The total population served by the four wells is approximately 38,000. The Borough of Sayreville Water & Sewer Department does have three lagoons located in back of the Bordentown Plant from the South River/Old Bridge section however, they are only used in warmer weather according to Mr. Triolo.

REFERENCE NO. 11

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM		PROJECT NOTE
TO: E L Beth Ltd site file	DATE: 5/23/00	Page 1 of 1
FROM: Kelley Curran		
SUBJECT: Wetlands Calculations		
REFERENCE: The following wetland acreage and frontage were determined using the 4-Mile Radius Map (Ref. No. 14), the 15-Mile Surface Migration Limit Map for this report (Ref. No. 15)		

This project note was prepared to summarize the presence of HRS eligible wetlands within 4 miles (air pathway) and 15 miles (surface water pathway) of the E L Beth Ltd site. For the air pathway, wetlands were calculated using a transparency with the appropriate acreage boxes for the 1:24,000 scale National Wetlands Inventory (NWI) maps. A copy of the transparency is included in the attached pages. Wetland acreage calculations are as follows:

Distance Ring (miles)	Wetland Acres
0 to 1/4	0
1/4 to ½	2
½ to 1	10
1 to 2	132
2 to 3	402
3 to 4	706

Total wetland acreage for the 4-mile radius is approximately 1,252 acres.

For the surface water pathway, the length of wetlands along a water body was determined by the frontage of wetlands contiguous with the waterway. The wetland frontage was measured using a map meter equipped with a tracer wheel. The tracer wheel is held in a vertical position and moved along the delineated wetland area to be measured, tracing the exact distance and recording it in inches. The total number of inches was then converted to miles. Wetland frontage calculations are as follows:

Water Body	Frontage (miles)
Arthur Kill and Associated Tributaries	40.9
Raritan Bay Complex*	13.5
Raritan River	15.9
South River	8.0

Total wetland frontage for the 15-mile surface water pathways is approximately 78.3 miles.

*The Raritan Bay Complex includes the westernmost portions of the Lower New York and Sandy Hook Bays.

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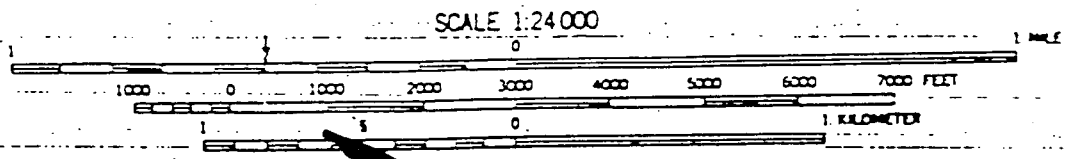
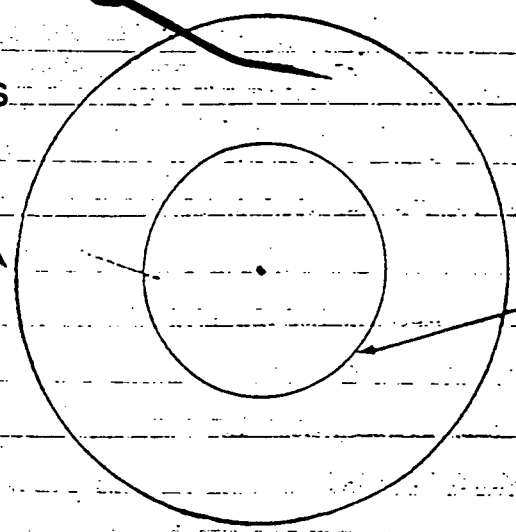
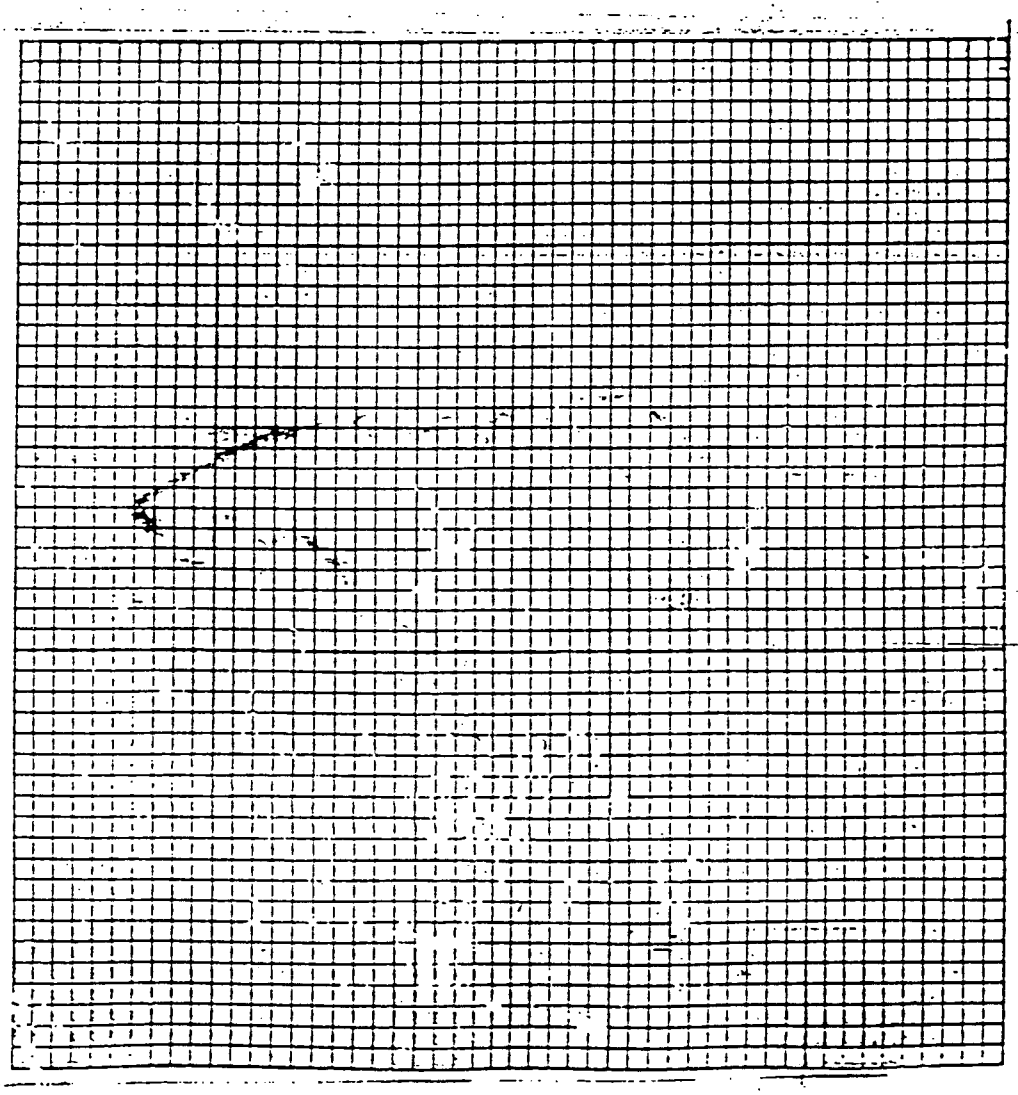
FOR USE ONLY ON 1 : 24,000 SCALE MAPS





1 SQUARE = APPROXIMATELY 1 ACRE



REFERENCE NO. 12

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM		TELECON NOTE
CONTROL NO:	DATE: 3 June 1999	TIME: 1515
DISTRIBUTION: Iceland Coin Laundry and Dry Cleaning Groundwater Contamination		
CONVERSATION WITH: Steve Spayd	OF NJGS	PHONE (609) 984-6587
RECORDED BY: Diane Minsavage, Region II START		

DISCUSSION:

Wellhead Protection Area

The Well Head Protection Program was taken over by the Source Water Assessment Program. The Source Water Assessment Program defines the sources of water; therefore, the source of water obtained from wells would be groundwater. A Preliminary Assessment Plan was put in 1998; the plan will be sent to the EPA this month. The Well Head Protection Areas (WHPAs) have not been delineated yet - there is just a plan. Some areas (counties) have draft WHPA maps; there are draft WHPA maps for Cumberland County. SS can determine if site overlies WHPA or if WHPA is located within 4 miles of the site; SS indicated that it was very likely that a WHPA is located within 4 miles of the site. To obtain site specific info - fax a map showing the location of the site on a topo map with a the request (i.e., does the site overlie WHPA and/or is WHPA located within 4 miles of the site) noting information is needed by tomorrow to SS at (609) 633-1004.

Signature: Diane Minsavage

REFERENCE NO. 13

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM		PROJECT NOTE
TO: E L Beth Ltd site file	DATE: 5/23/00	Page 1 of 1
FROM: Kelley Curran		
SUBJECT: E L Beth Ltd site, Sensitive Environments (within a 4 mile radius or 15 miles downstream)		
REFERENCE: USGS Topographic Maps, letter and information package from New Jersey Department of Environmental Protection's Natural Heritage Program, Hazard Ranking System Rule.		

On 8 March 2000 START member Kaplan received information from the NJDEP's Natural Heritage Program office regarding Duane Marine and Associated Waterways. As the Duane Marine site is located adjacent to the E L Beth Ltd site, this information is applicable to both site locations. The Natural Heritage Data Base did not have any records for rare plants, animals, or natural communities on the site but did have information regarding the population status of species characterized as endangered or threatened within the "general vicinity of the project site" and "on or in the immediate vicinity of associated waterways". The locations of these species cannot be pinpointed; therefore, they were evaluated as if they were found within the 3 to 4 mile distance ring and 15 miles downstream of the probable point of entry.

Sensitive Environments within 4 miles:	**within 15 downstream miles:**
On-site	N/A
> 0 - 1/4 mile	N/A
> 1/4 - ½ mile	N/A
> ½ - 1 mile	N/A
> 1 - 2 mile	N/A
> 2 - 3 mile	N/A
> 3 - 4 mile	**State-listed Endangered or Threatened Species (6) (*Falco peregrinus* - Peregrine Falcon) (*Scirpus Maritimus* - Salt Marsh Bulrush) (*Charadrius Melodus* - Piping Plover) (*Pandion Haliaetus* - Osprey) (*Rynchops Niger* - Black Skimmer) (*Sterna Antillarum* - Least Tern)

In addition, Sandy Hook is included in the information as a Natural Heritage Priority Site. Priority sites are described as "some of the State's best habitats for rare and endangered species and natural communities". Sandy Hook is located approximately 11 miles downstream from the site location.

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection

Robert C. Shinn, Jr.
Commissioner

Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
P.O. Box 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

March 8, 2000

Melissa Kaplan
Roy F. Weston, Inc.
1090 King Georges Post Road, Suite 201
Edison, NJ 08837-3703

Re: Duane Marine and Associated Waterways

Dear Ms. Kaplan:

Thank you for your data request regarding rare species information for the Duane Marine site in Perth Amboy City, Middlesex County.

The Natural Heritage Data Base does not have any records for rare plants, animals, or natural communities on the site. Attached is a list of rare species from records in the general vicinity of the project site (within approximately 4 miles).

There are records for a number of occurrences of rare species that may be on or in the immediate vicinity of the waterways associated with the site. The attached list provides additional information about these occurrences. In situations such as this, where the waterway flowing past the site feeds into a large open water area, it is not clear exactly how much of the shoreline should be included in the search. All of these records occur along the shores of Sandy Hook Bay, some along the southern shore and others on Sandy Hook itself.

Additionally, enclosed are lists of rare species and natural communities that have been documented from Middlesex County. This county list can be used as a master species list for directing further inventory work. If suitable habitat is present within the study area, these species have potential to be present. If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend you contact the Division of Fish, Game and Wildlife, Endangered and Nongame Species Program.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and natural communities. One of these sites is located within or near the areas you have outlined. Please refer to the enclosed Natural Heritage Priority Site Map for the location and boundary of this site. On the back of each Priority Site Map is a report describing the significance of the site.

In order to red flag the general locations of documented occurrences of rare and endangered species and natural communities, we have prepared computer generated Natural Heritage Index Maps. Enclosed please find these maps for the Perth Amboy, South Amboy, Arthur Kill, Keyport and Sandy Hook USGS quadrangles. If individual projects are to be located in the shaded areas of these maps, the Natural Heritage Program can be contacted for additional information.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Thomas F. Breden
Supervisor

cc: Lawrence Niles
Thomas Hampton
NHP File No. 00-4007453

CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

The quantity and quality of data collected by the Natural Heritage Program is dependent on the research and observations of many individuals and organizations. Not all of this information is the result of comprehensive or site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed. As a result, new locations for plant and animal species are continuously added to the data base. Since data acquisition is a dynamic, ongoing process, the Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of New Jersey. Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The attached data is provided as one source of information to assist others in the preservation of natural diversity.

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Land Use Regulation Program, P.O. Box 401, Trenton, NJ 08625-0401.

This cautions and restrictions notice must be included whenever information provided by the Natural Heritage Database is published.

06 MAR 2000

GENERAL VICINITY OF PROJECT SITE
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK	DATE OBSERVED	IDENT.
*** Vertebrates								
FALCO PEREGRINUS	PEREGRINE FALCON		E		G4	S1B,S?N	1989-SUMMER	Y
FALCO PEREGRINUS	PEREGRINE FALCON		E		G4	S1B,S?N	1992-??-??	Y
*** Vascular plants								
ARTEMISIA CAMPESTRIS SSP CAUDATA	WILD WORMWOOD				G5T5	S2	1919-05-27	Y
PLANTAGO MARITIMA	SEA-SIDE PLANTAIN				G5	S2	1905-07-30	Y
PUCCINELLIA FASCICULATA	TORREY'S MEADOW GRASS				GU	S2	1905-06-18	Y
RANUNCULUS PUSILLUS	LOW SPEARWORT				G5	S2	1889-06-??	Y
SCIRPUS MARITIMUS	SALT MARSH BULRUSH		E		G5	SH	1971-08-08	Y
VICIA AMERICANA	AMERICAN PURPLE VETCH				G5	S2	1906-05-20	Y

8 Records Processed

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06 MAR 2000

ON OR IN THE IMMEDIATE VICINITY OF ASSOCIATED WATERWAYS
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK	DATE OBSERVED	IDENT.
*** Vertebrates								
CHARADRIUS MELODUS	PIPING PLOVER	LT	E		G3	S1B	1996-06-??	Y
CHARADRIUS MELODUS	PIPING PLOVER	LT	E		G3	S1B	1996-06-??	Y
CHARADRIUS MELODUS	PIPING PLOVER	LT	E		G3	S1B	1987-07-??	Y
CHARADRIUS MELODUS	PIPING PLOVER	LT	E		G3	S1B	1996-06-??	Y
PANDION HALIAETUS	OSPREY		T/T		G5	S2B	1987-??-??	Y
PANDION HALIAETUS	OSPREY		T/T		G5	S2B	1987-??-??	Y
PANDION HALIAETUS	OSPREY		T/T		G5	S2B	1987-??-??	Y
PANDION HALIAETUS	OSPREY		T/T		G5	S2B	1987-??-??	Y
RYNCHOPS NIGER	BLACK SKIMMER		E		G5	S1B	1986-SUMMR	Y
STERNA ANTILLARUM	LEAST TERN		E		G4	S1B	1986-SUMMR	Y
STERNA ANTILLARUM	LEAST TERN		E		G4	S1B	1996-06-??	Y
STERNA ANTILLARUM	LEAST TERN		E		G4	S1B	1986-SUMMR	Y
STERNA ANTILLARUM	LEAST TERN		E		G4	S1B	1996-SUMMR	Y
*** Ecosystems								
COASTAL DUNE WOODLAND	COASTAL DUNE WOODLAND				G2G3	S1	1986-02-04	
MARITIME FOREST	MARITIME FOREST				G3?	S1	1986-02-04	
*** Invertebrates								
CALLOPHRYS HENRICI	HENRY'S ELFIN				G5	S3S4	1991-05-04	Y
*** Other types								
MIGRATORY SHOREBIRD CONCENTRATION SITE	MIGRATORY SHOREBIRD CONCENTRATION SITE				G?	S?	1982-10-??	Y
MIGRATORY SHOREBIRD CONCENTRATION SITE	MIGRATORY SHOREBIRD CONCENTRATION SITE				G?	S?	1982-10-??	Y
MIGRATORY SHOREBIRD CONCENTRATION SITE	MIGRATORY SHOREBIRD CONCENTRATION SITE				G?	S?	1982-10-??	Y

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06 MAR 2000

ON OR IN THE IMMEDIATE VICINITY OF ASSOCIATED WATERWAYS
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK	DATE OBSERVED	IDENT.
MIGRATORY SHOREBIRD CONCENTRATION SITE	MIGRATORY SHOREBIRD CONCENTRATION SITE				G?	S?	1982-10-??	Y
MIGRATORY SHOREBIRD CONCENTRATION SITE	MIGRATORY SHOREBIRD CONCENTRATION SITE				G?	S?	1982-10-??	Y
*** Vascular plants								
ARTEMISIA CAMPESTRIS SSP CAUDATA	WILD WORMWOOD				G5T5	S2	1980-09-27	Y

22 Records Processed

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Frequently Asked Questions About Natural Heritage Priority Sites

What are Natural Heritage Priority Sites?
Through its Natural Heritage Database, the Office of Natural Lands Management (ONLM) identifies critically important areas to conserve New Jersey's biological diversity. The database provides detailed, up-to-date information on rare species and natural communities to planners, developers, and conservation agencies for use in resource management, environmental impact assessment, and both public and private land protection efforts.

Using the database, ONLM has identified Natural Heritage Priority Sites that represent some of the best remaining habitat for rare species and exemplary natural communities in the state. These areas should be considered to be top priorities for the preservation of biological diversity in New Jersey. If these sites become degraded or destroyed, we may lose some of the unique components of our natural heritage.

ONLM has identified 389 priority sites over the course of more than 10 years. We have received assistance from many partner individuals and agencies over this time. The Nature Conservancy and the DEP Endangered and Nongame Species Program have provided key information or assisted with the delineation of a number of the sites.

How are Natural Heritage Priority Site maps used in conservation of biological diversity?
Natural Heritage Priority Site maps are used by individuals and agencies concerned with the protection and management of land. The maps have been used by municipalities preparing natural resource inventories; public and private conservation organizations preparing open space acquisition goals; land developers and consultants identifying environmentally sensitive lands; and public and private landowners developing land management plans.

Natural Heritage Priority Sites contain some of the best and most viable occurrences of endangered and threatened species and natural communities, but they do not cover all known habitat for endangered and threatened species in New Jersey. If information is needed on whether or not endangered or threatened species have been documented from a particular piece of land, a Natural Heritage Database search can be requested by contacting the Office of Natural Lands Management at the address below.

What do the boundaries of the sites contain?
The boundaries of each Natural Heritage Priority Site are drawn to encompass critical habitat for the rare species or natural communities. Often the boundaries extend to include additional buffer lands that should be managed to protect the habitat. A justification for the boundary is provided for each site. The term "primary bounds" is sometimes used to refer to boundaries enclosing critical habitat. The term "secondary bounds" is sometimes used to refer to boundaries enclosing additional buffer. In maps where both primary and secondary boundaries are described, only the outermost boundary is provided in the mapping.

What is the background map that the sites are drawn upon?
The sites are portrayed on background maps produced from a digital copy of the U.S. Geological Survey 7.5 minute topographic maps. The background maps contain topographic lines as well as streams, lakes, roads, towns and place names. These background maps do not always reflect recent changes in land development. Some may be more than 20 years old. Some sites appear to be shifted in position against this topo map. This shift is due to the fact that most sites have been digitized against a background of rectified aerial photography, and some of the digitized USGS topo maps do not align with this photography.

What do "public lands" depict on the maps?
The "public lands" shaded on these maps are state-owned open space lands that have been digitized as a GIS coverage by the state Green Acres Program. This information is provided to show patterns of State land ownership in the vicinity of the Priority Site. The public lands are areas such as State Parks and Forests, Wildlife Management Areas, and Natural Lands Trust preserves. They do not currently include lands owned by other state

agencies, federal, county or municipal governments or nonprofit conservation organizations. This GIS coverage is constantly being updated, and therefore future editions of the maps will likely contain additional public lands that are not currently mapped as such.

What is the biodiversity significance rank and how is it used?

Each site is ranked according to its significance for biological diversity using a scale developed by The Nature Conservancy and the network of Natural Heritage Programs. The ranks can be used to distinguish between sites that are of global significance for conservation of biological diversity vs. those that are of state significance. The scale ranges from B1 to B5 with sites ranked B1-B3 generally being of global significance and sites ranked B4-B5 being of state significance. The specific definitions for each rank are as follows:

B1 - Outstanding significance, generally the "last of the least" in the world, such as the only known occurrence of any element (species or natural community), the best or an excellent occurrence of an element ranked critically imperiled globally, or a concentration (4+) of good or excellent occurrences of elements that are imperiled or critically imperiled globally. The site should be viable and defensible for the elements or ecological processes contained.

B2 - Very high significance, such as the most outstanding occurrence of any natural community. Also includes areas containing other occurrences of elements that are critically imperiled globally, a good or excellent occurrence of an element that is imperiled globally, an excellent occurrence of an element that is rare globally, or a concentration (4+) of good occurrences of globally rare elements or viable occurrences of globally imperiled elements.

B3 - High significance, such as any other viable occurrence of an element that is globally imperiled, a good occurrence of a globally rare element, an excellent occurrence of any natural community, or a concentration (4+) of good or excellent occurrences of elements that are critically imperiled in the State.

B4 - Moderate significance, such as a viable occurrence of a globally rare element, a good occurrence of any natural community, a good or excellent occurrence or only viable state occurrence of an element that is critically imperiled in the State, an excellent occurrence of an element that is imperiled in the State, or a concentration (4+) of good occurrences of elements that are imperiled in the State or excellent occurrences of elements that are rare in the State.

B5 - Of general biodiversity interest.

How can I obtain Natural Heritage Priority Site maps for an area of interest to me?

Natural Heritage Priority Site hard copy maps can be obtained by submitting a written request accompanied by a check or money order made payable to the Office of Natural Lands Management at the following address:

Office of Natural Lands Management
P.O. Box 404
Trenton, NJ 08625-0404
Phone: 609-984-1339; Fax: 609-984-1427; Email: ONLM@dep.state.nj.us

Individual 8.5" X 11" maps are available at the following rate:

1 - 10 site maps & reports:	$1.50/site
11 - 20 site maps & reports:	$1.00/site
> 20 sites:	$0.50/site

Full sets of the June 1999 atlas (389 sites) are available for $40

Digital GIS Coverage of Natural Heritage Priority Sites

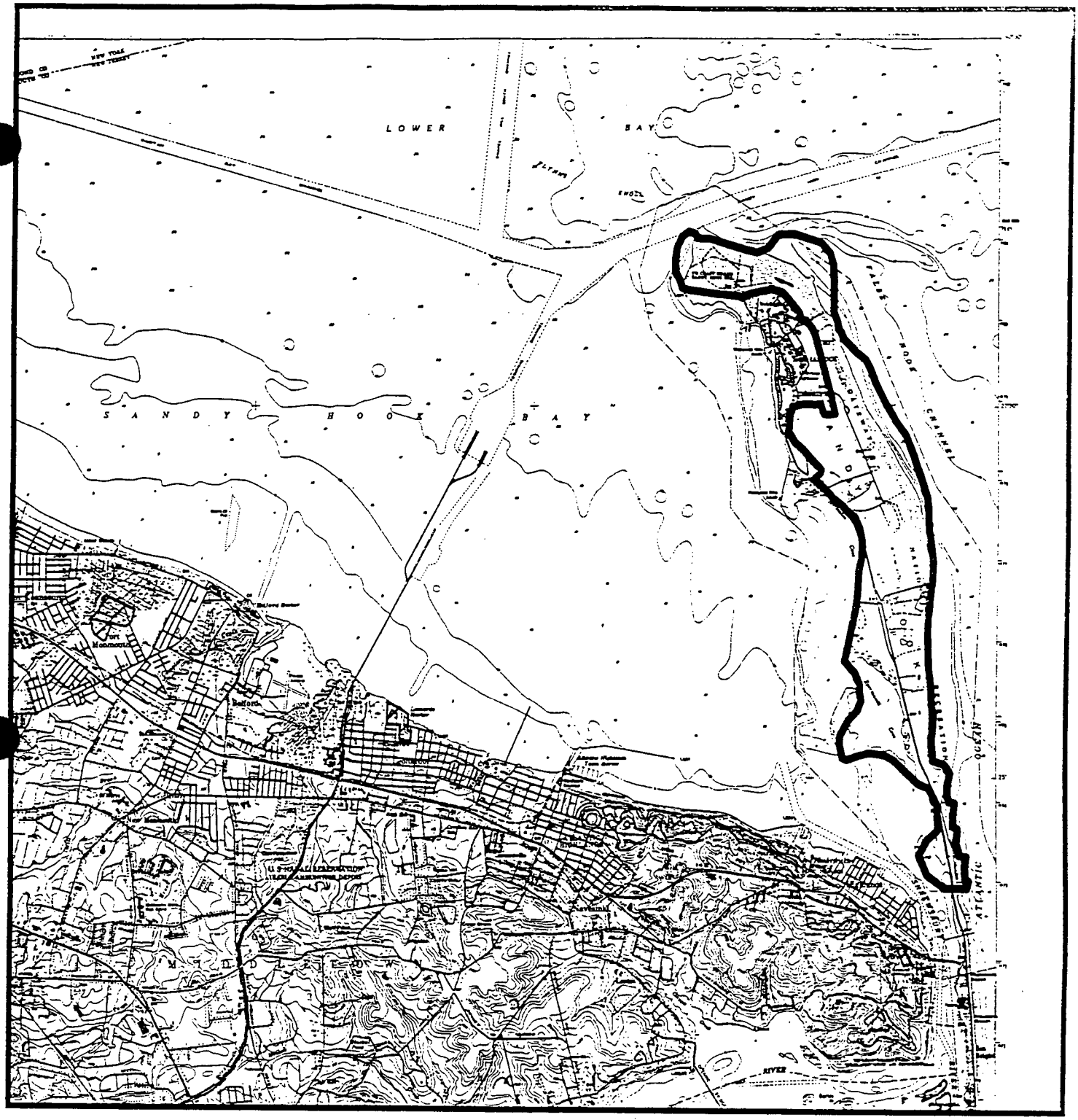
A final digital version of the ArcView GIS file of the Natural Heritage Priority Sites will be available in the near future. Until then, a beta test version of the digital files can be obtained on the internet at the following address:
http://www.state.nj.us/dep/gis/ -Click on "GIS Data Downloads" and then "Select a data layer" and then "statewide". There is no charge for downloading the GIS data.

How often are the maps updated?

The Natural Heritage Priority Site information is constantly being updated in the Natural Heritage Database. New sites will be added and some of the boundaries will be revised in the next edition of the maps, to be made available in October 1999.

August 13, 1999

NJ Department of Environmental Protection
Division of Parks and Forestry
Natural Lands Management



Natural Heritage Priority Site

Sandy Hook

Monmouth County

NJ Department of Environmental Protection
Division of Parks and Forestry
Natural Lands Management

0.9 0 0.9 Miles

Priority Site
Public Land

N
S

p.10

Natural Heritage Priority Site

Sandy Hook

Locational Information

Quad Name: Sandy Hook
County: Monmouth
Municipality: Middletown Twp

Description of Site

The site contains extensive beach and undeveloped dune natural communities along the Sandy Hook spit.

Boundary Justification

Secondary bounds include all undeveloped dune and beach communities on the Sandy Hook spit. Developed portions of Fort Hancock and marshes immediately north of Horseshoe Cove are excluded.

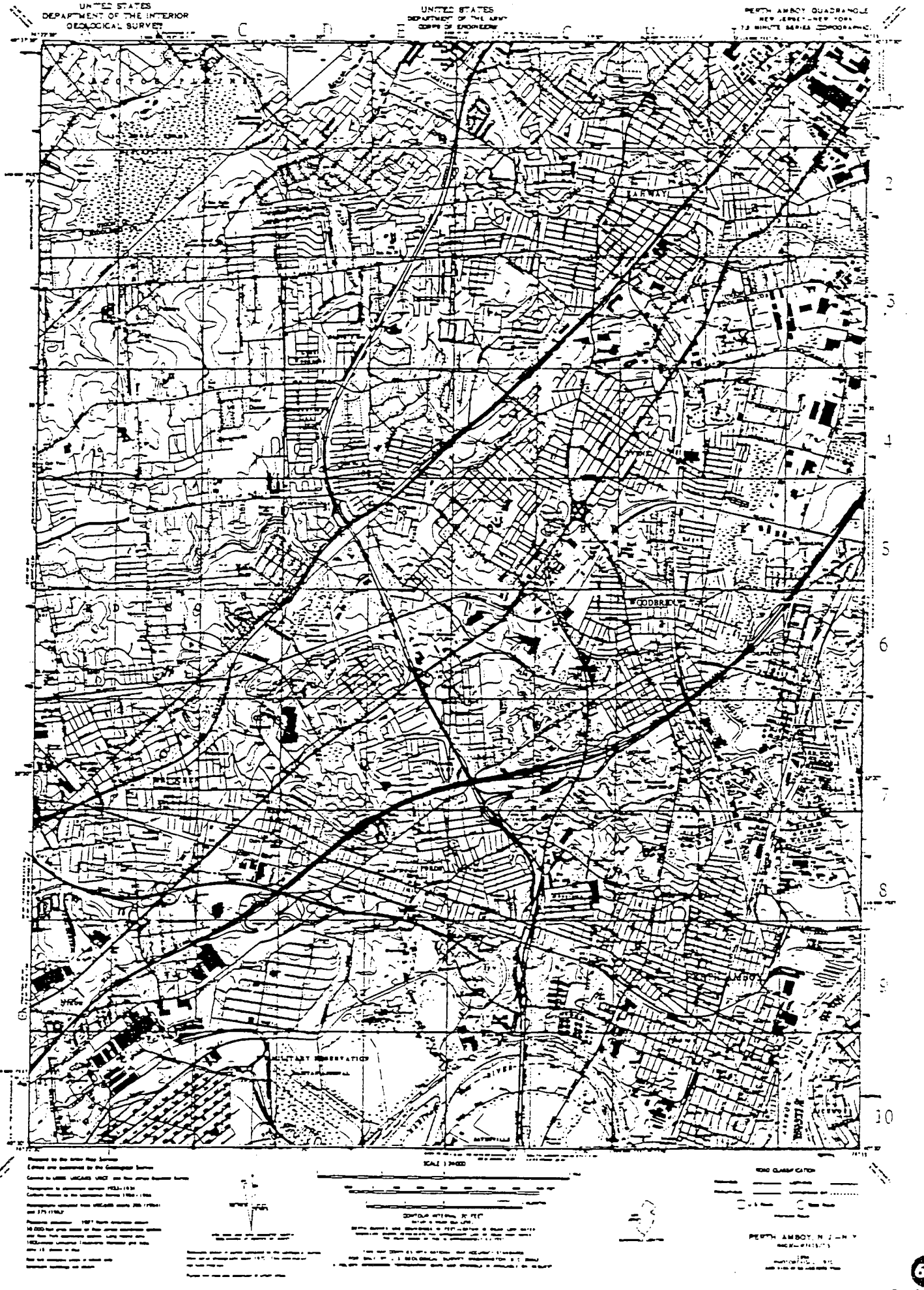
Biodiversity Rank B2

Contains excellent populations of a globally rare State Endangered bird species, good stands of two globally rare natural communities, populations of two additional State Endangered bird species, and a migratory shorebird concentration site.

NATURAL HERITAGE INDEX MAPS

The Natural Heritage Database contains several thousand records of individual occurrences of endangered and threatened species and ecosystems. Many of these occurrences either have not been documented in recent years or have not had habitat boundaries delineated. Because much work remains to be done to delineate habitat boundaries and determine current status for these occurrences, Natural Heritage Index Maps were devised to red flag general areas in which the occurrences are located. The index maps are meant to be used as a tool to point to areas which may be of significance for endangered biological diversity. These maps do not depict all endangered species habitat in the state, but merely general areas which contain documented occurrences. Many additional areas may contain unidentified or poorly documented occurrences.

The maps have been produced using a computer generated grid which shades a grid cell approximately 330 acres in size if an endangered or threatened species or ecosystem has been documented anywhere within the cell. To use these maps, we suggest that you first find the location to be checked on the quad maps and then refer to the same grid location of the Natural Heritage Index Maps. The Natural Heritage Program can be contacted for additional information as specific projects are planned.


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
PERTH AMBOY QUADRANGLE
NEW JERSEY—NEW YORK
7.5 MINUTE SERIES (TOPOGRAPHIC)
EARWAY
WOODBRIDGE
MILITARY RESERVATION
SCALE 1:24000
CONTOUR INTERVAL 20 FEET
ROAD CLASSIFICATION
PERTH AMBOY, N.J.—N.Y.

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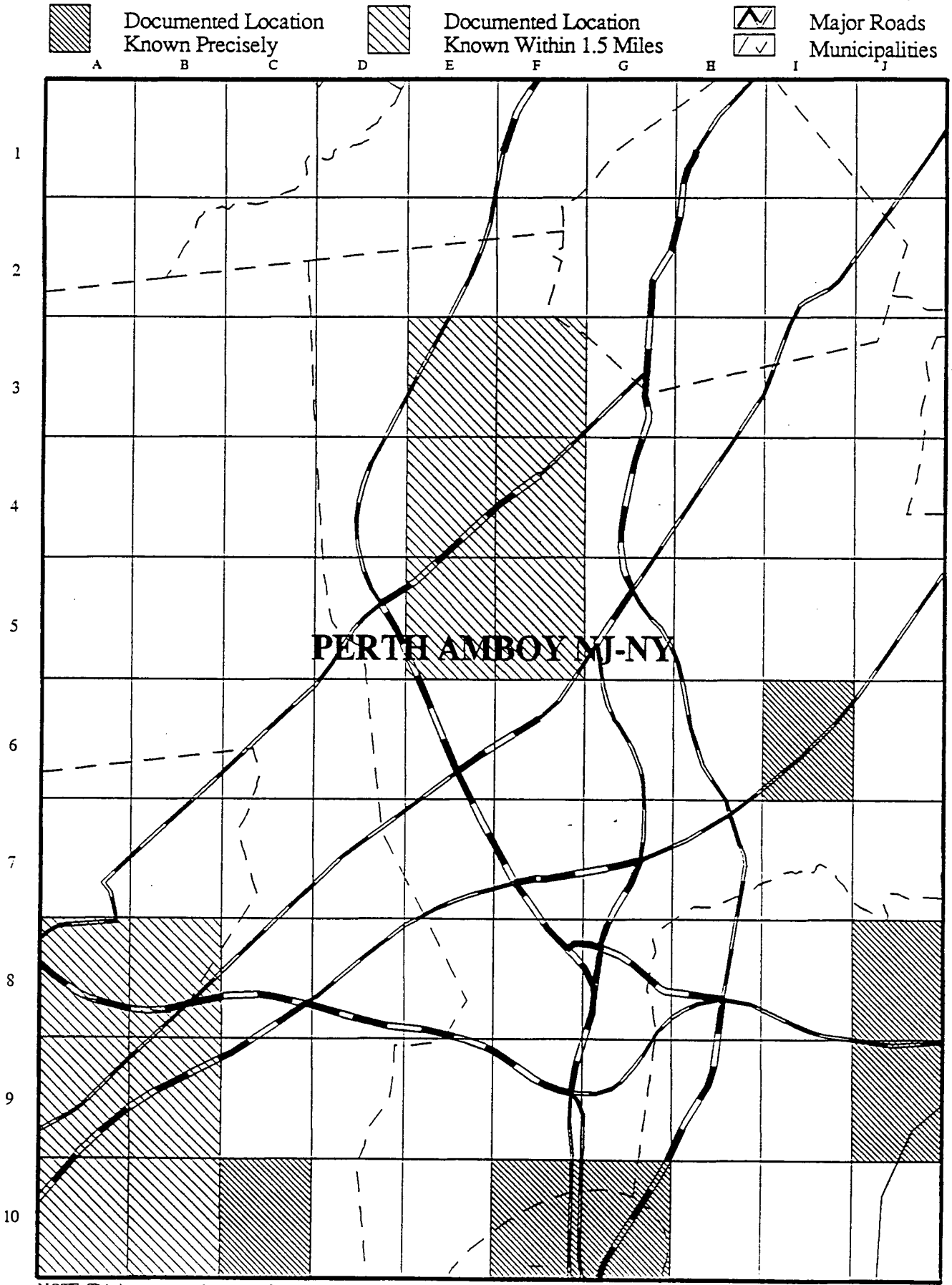
Generalized Natural Heritage Index Map

Generalized Locations for Rare and Endangered Elements of Natural Diversity



NOTE: This is not a complete map of rare and endangered species habitat for this area. It reflects data on known occurrences compiled as of the above date. It includes both historically and recently documented habitat. Additional occurrences may be found on unsurveyed habitat. For more information, contact the Office of Natural Lands Management, CN404, Trenton, NJ 08625.

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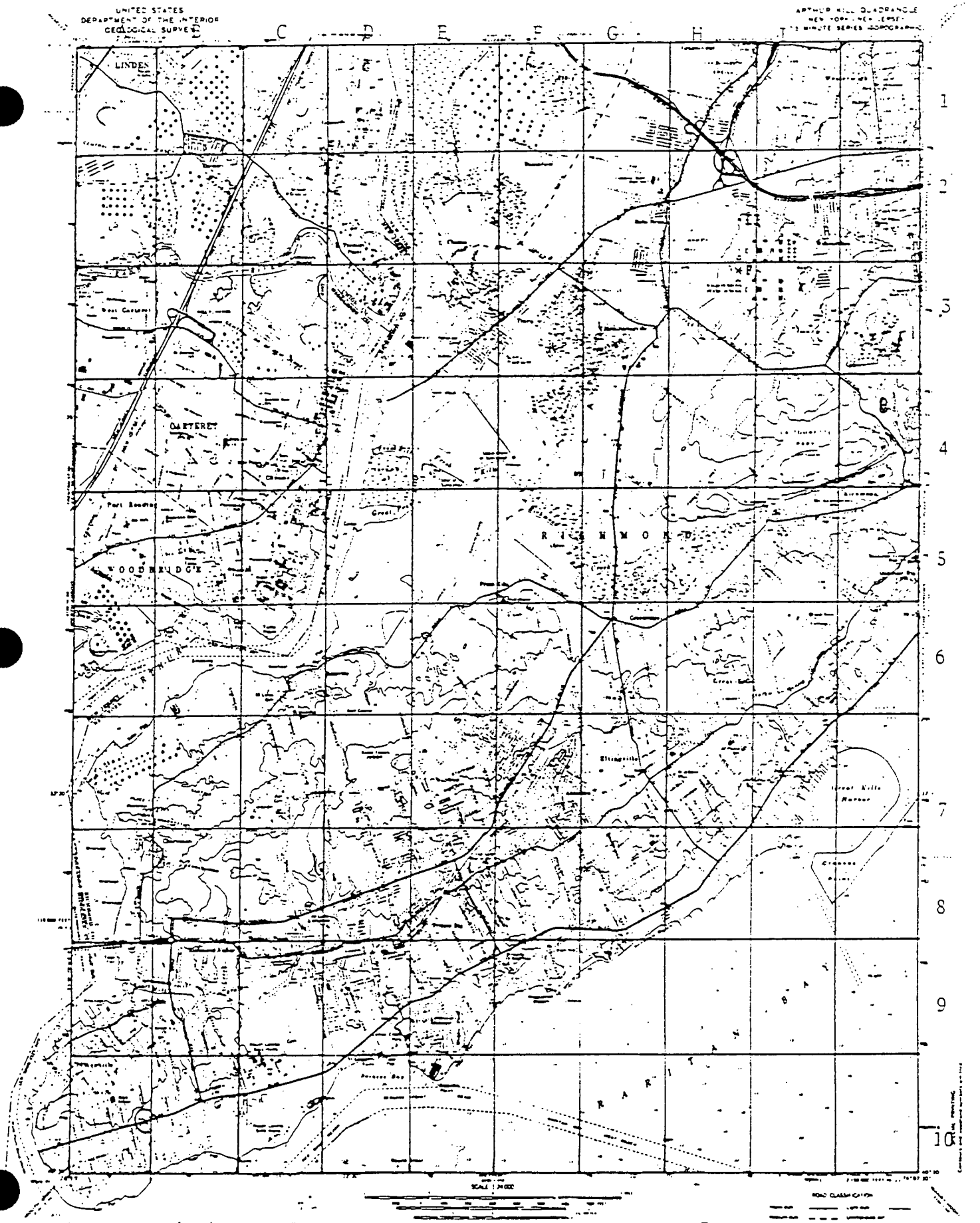
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
ARTHUR KILL QUADRANGLE
NEW YORK - NEW JERSEY
LINDEN
CARTERET
Port Reading
WOODBRIDGE
RICHMOND
Great Kills Harbor
RARITAN BAY
1
2
3
4
5
6
7
8
9
10
SCALE 1:24 000
ROAD CLASSIFICATION
ARTHUR KILL, N.Y.-N.J.

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Generalized Natural Heritage Index Map

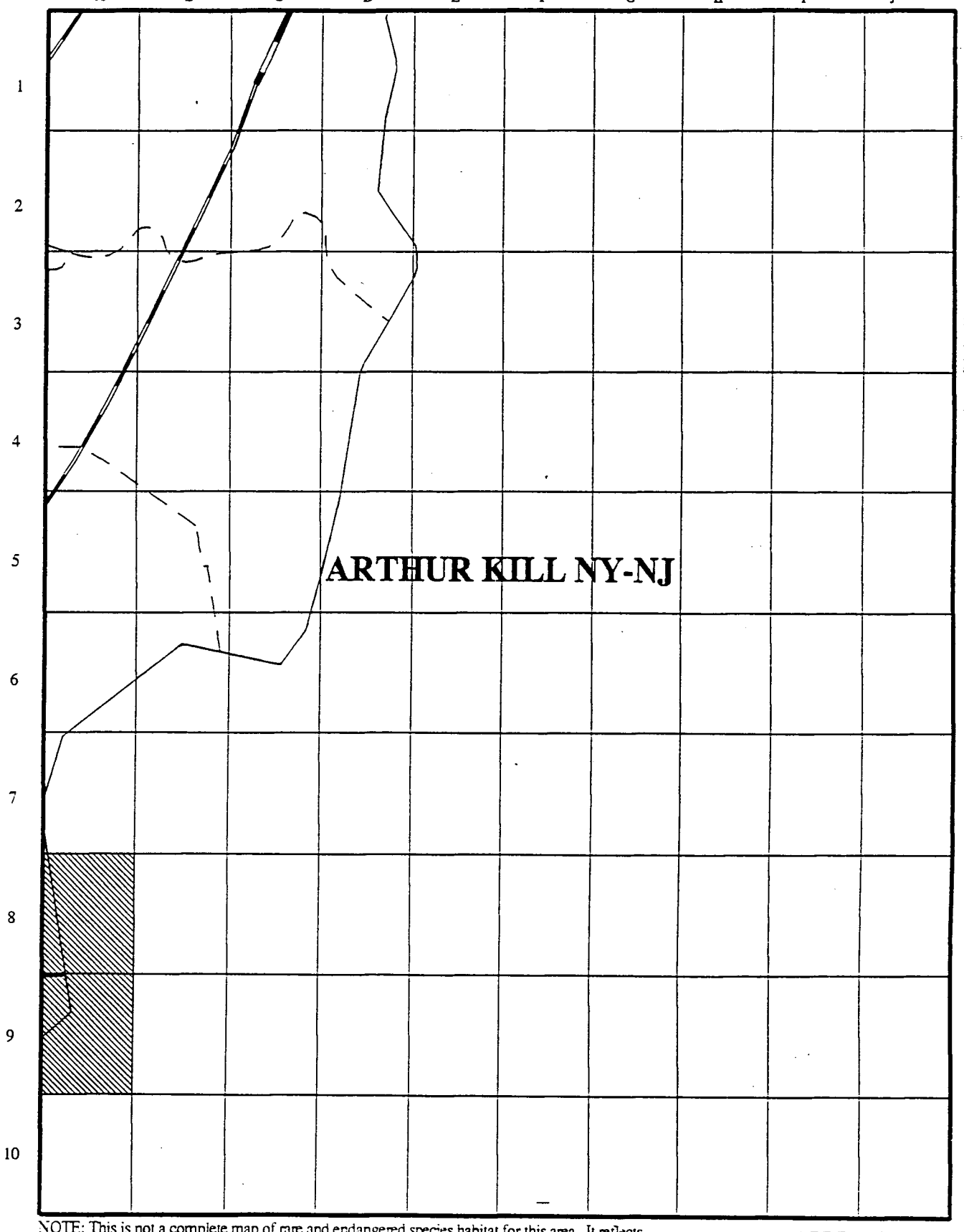
Generalized Locations for Rare and Endangered Elements of Natural Diversity

Documented Location Known Precisely

Documented Location Known Within 1.5 Miles

Major Roads

Municipalities



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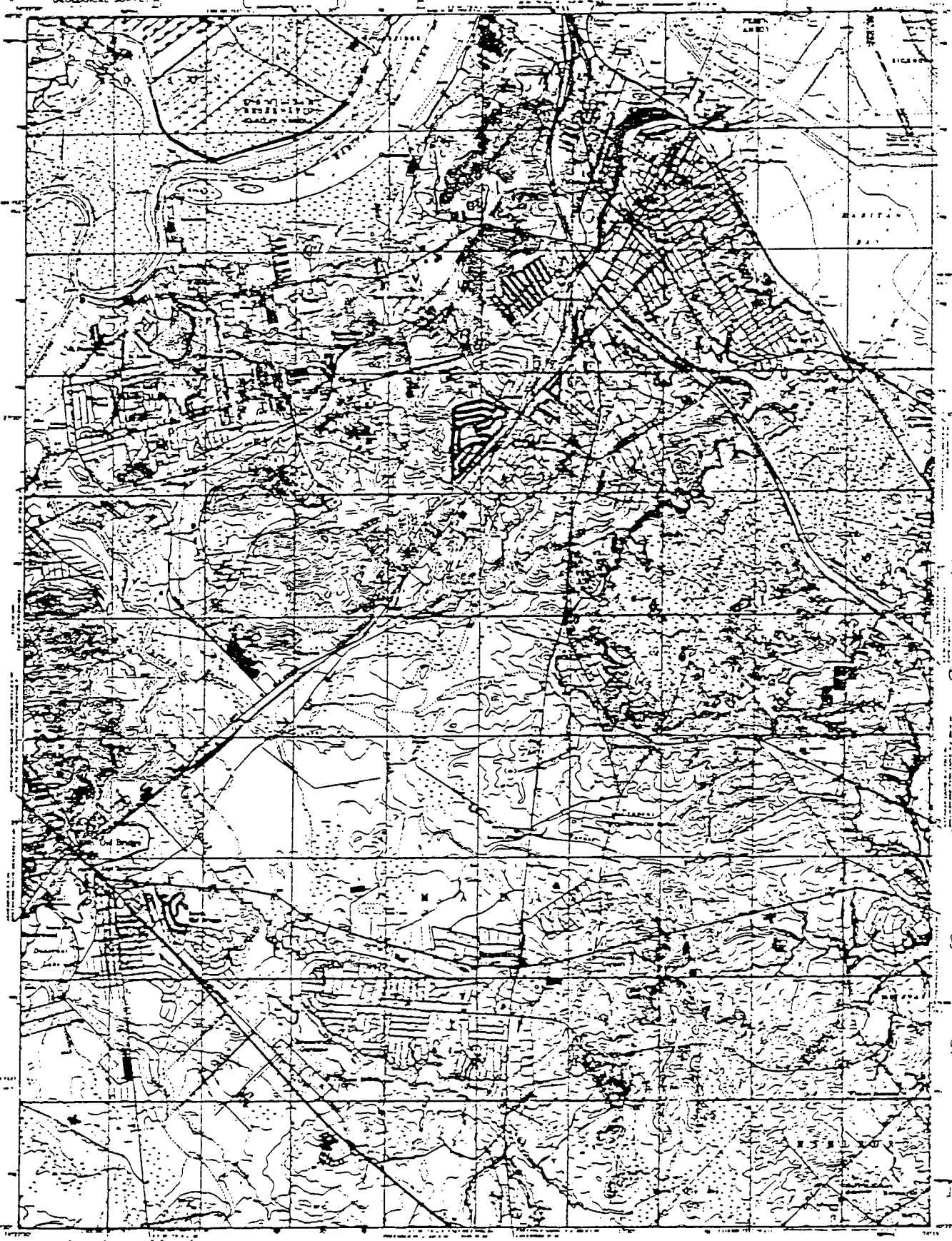
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

SOUTH AMBOY QUADRANGLE
NEW JERSEY-NEW YORK
7.5 MINUTE SERIES (TOPOGRAPHIC)



SCALE 1:24000

Produced by the Geological Survey and U.S. Corps of Engineers
Edited and published by the Geological Survey

ROAD CLASSIFICATION

CONTOUR INTERVAL 10 FEET

SOUTH AMBOY

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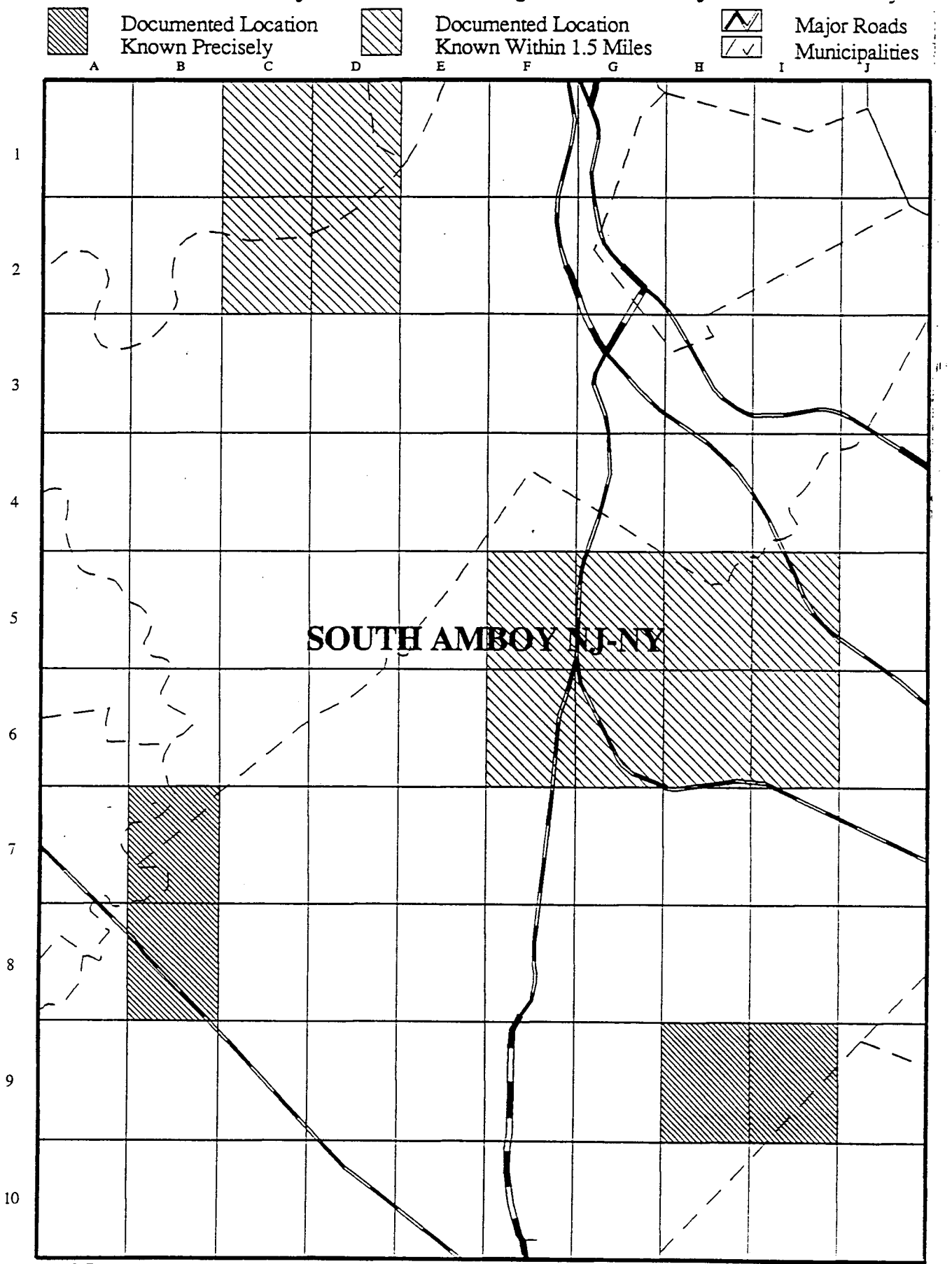
Generalized Natural Heritage Index Map

Generalized Locations for Rare and Endangered Elements of Natural Diversity



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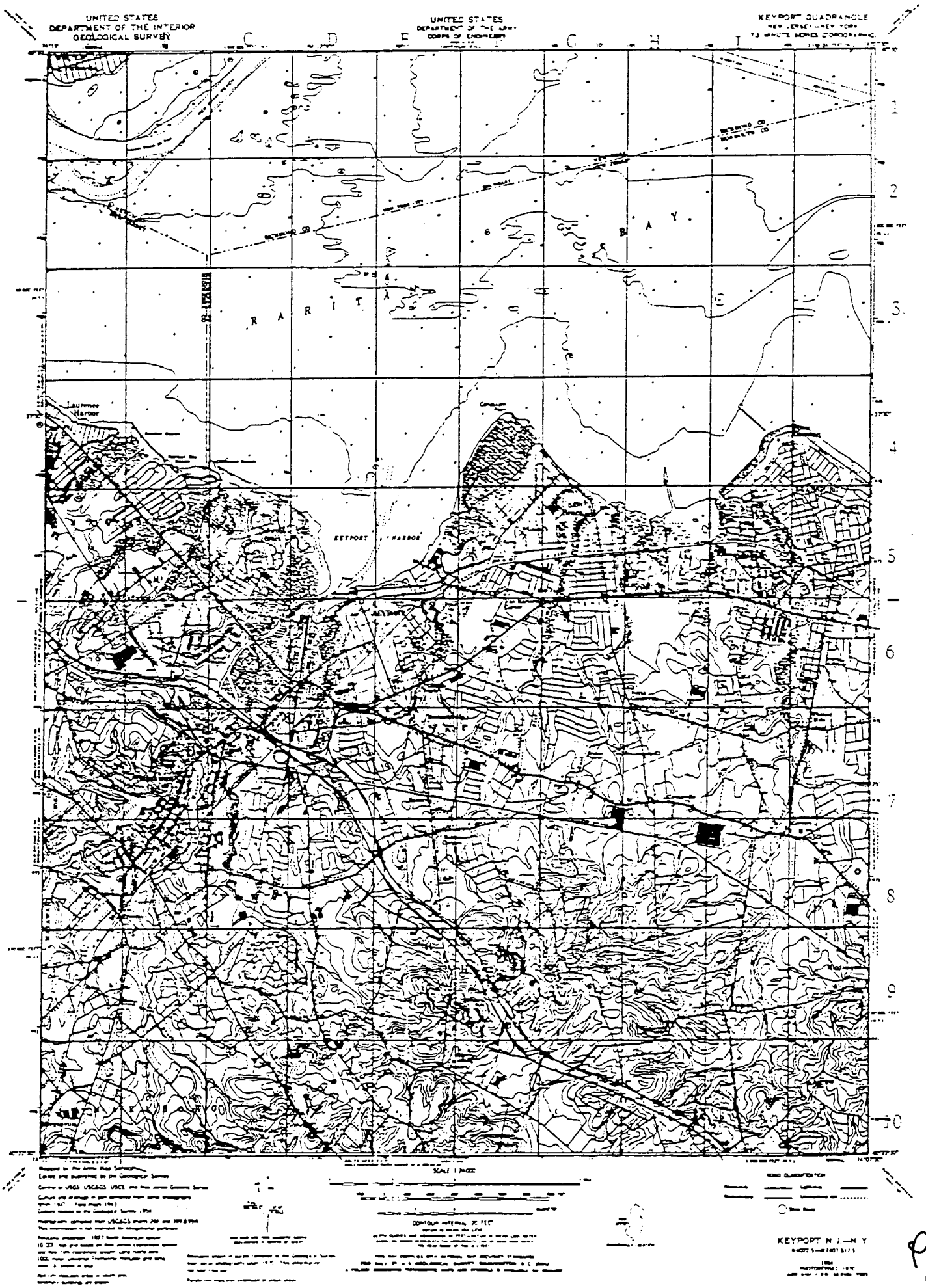
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
KEYPORT QUADRANGLE
NEW JERSEY—NEW YORK
7.5 MINUTE SERIES (TOPOGRAPHIC)
RARITAN
BAY
Laurence Harbor
KEYPORT HARBOR
SCALE 1:24 000
CONTOUR INTERVAL 20 FEET
ROAD CLASSIFICATION
KEYPORT N.J.—N.Y.

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Generalized Natural Heritage Index Map

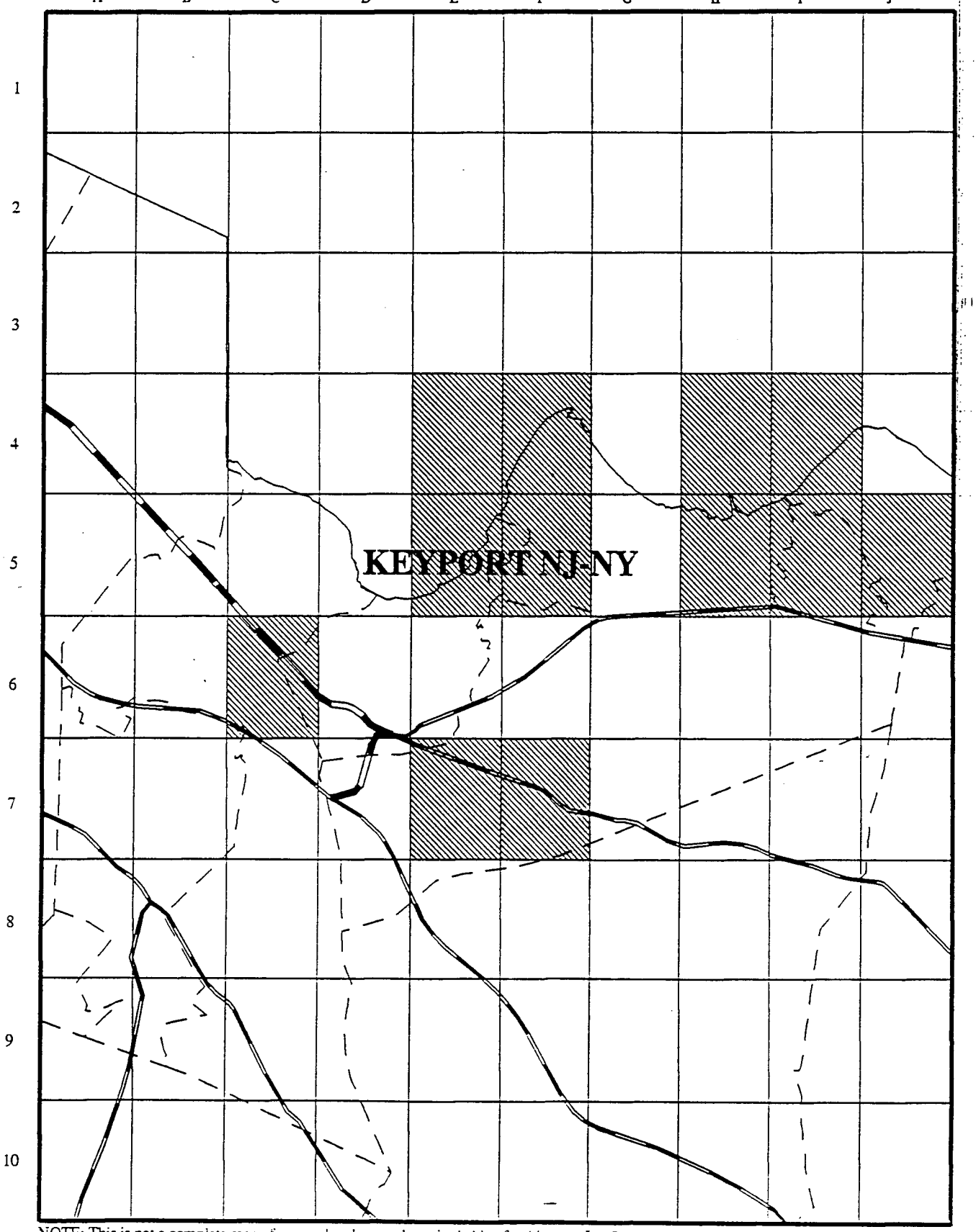
Generalized Locations for Rare and Endangered Elements of Natural Diversity

Documented Location Known Precisely

Documented Location Known Within 1.5 Miles

Major Roads

Municipalities



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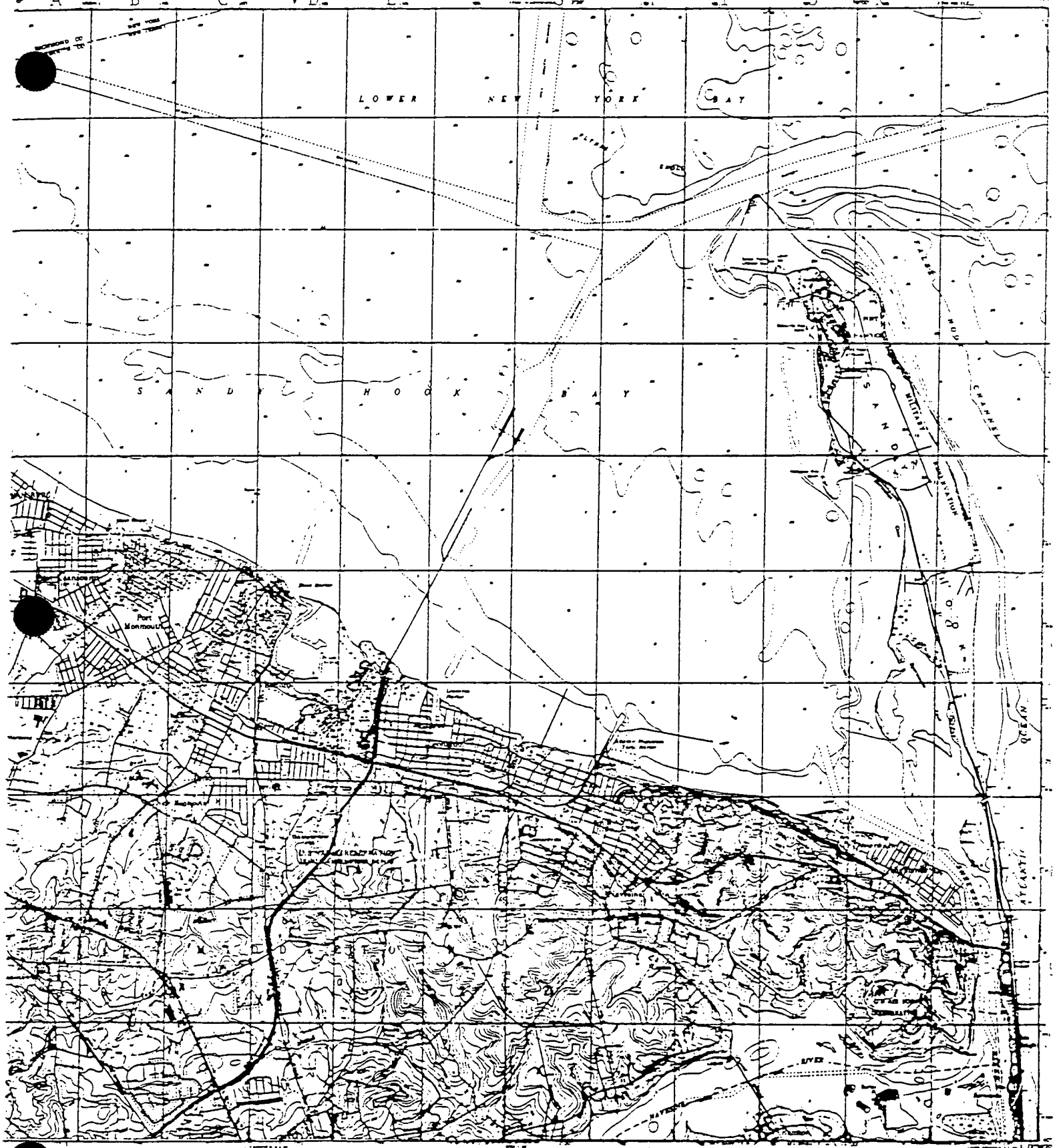
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

SANDY HOOK QUADRANGLE
NEW JERSEY-NEW YORK
7.5 MINUTE SERIES (TOPOGRAPHIC)



SCALE 1:24000

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION

SANDY HOOK N.J.-N.Y.

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Generalized Natural Heritage Index Map

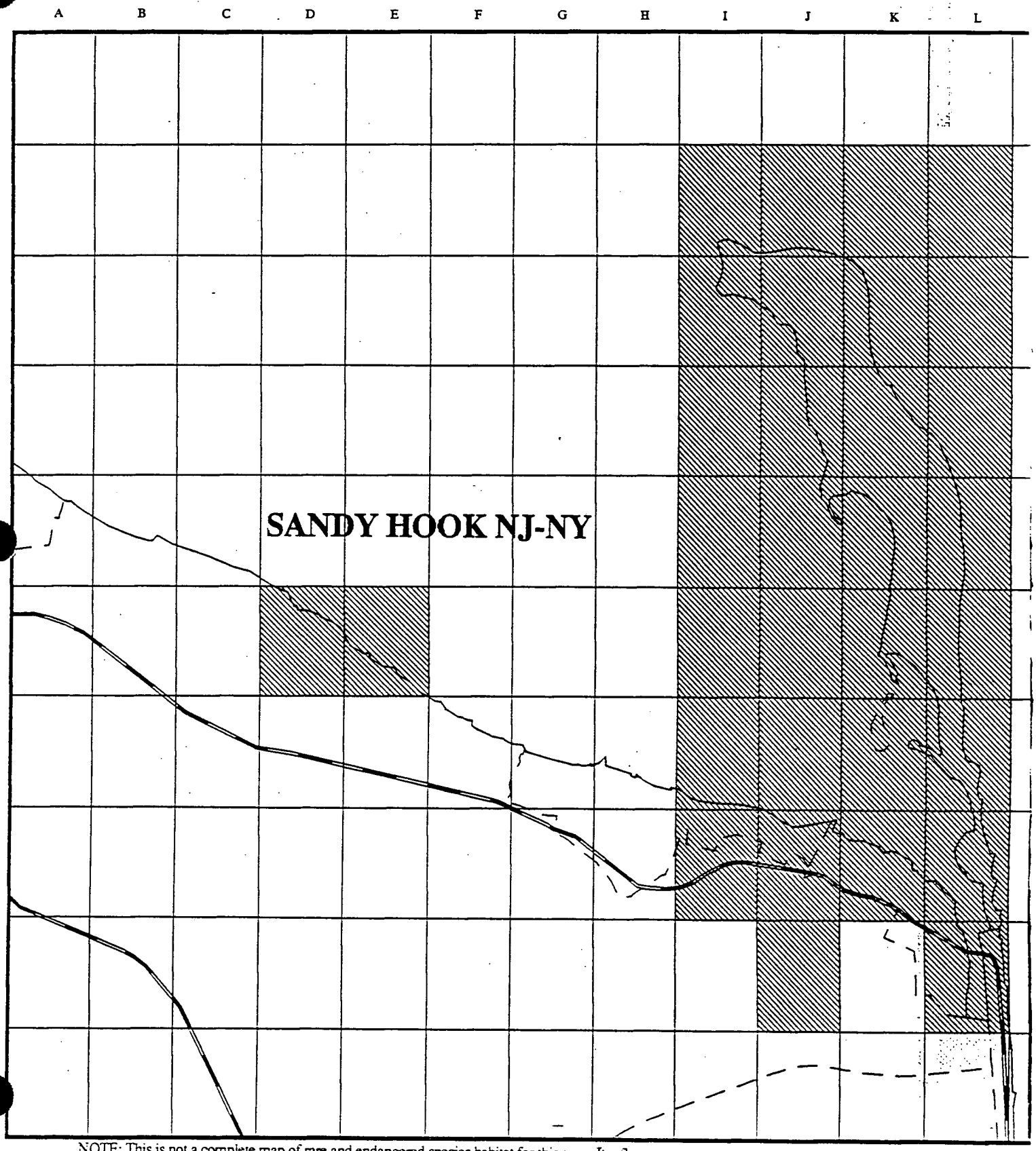
Generalized Locations for Rare and Endangered Elements of Natural Diversity

Documented Location Known Precisely

Documented Location Known Within 1.5 Miles

Major Roads

Municipalities



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OCTOBER 1997

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18 NOV 1999

MIDDLESEX COUNTY

RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN

THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
*** Vertebrates						
AMMODRAMUS HENSLOWII	HENSLOW'S SPARROW		E		G4	S1B
AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW		T/S		G5	S2B
ASIO OTUS	LONG-EARED OWL		T/T		G5	S2B,S2N
BARTRAMIA LONGICAUDA	UPLAND SANDPIPER		E		G5	S1B
CIRCUS CYANEUS	NORTHERN HARRIER		E/U		G5	S1B,S3N
CLEMMYS INSCULPTA	WOOD TURTLE		T		G4	S3
CLEMMYS MUHLENBERGII	BOG TURTLE	LT	E		G3	S2
DOLICHONYX ORYZIVORUS	BOBOLINK		T/T		G5	S2B
FALCO PEREGRINUS	PEREGRINE FALCON		E		G4	S1B,S?N
HYLA ANDERSONII	PINE BARRENS TREEFROG		E		G4	S3
LANIUS LUDOVICIANUS MIGRANS	MIGRANT LOGGERHEAD SHRIKE		E		G5T3Q	S1B,S1N
NYCTANASSA VIOLACEA	YELLOW-CROWNED NIGHT-HERON		T/T		G5	S2B
PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW		T/T		G5	S2B,S4N
PODILYMBUS PODICEPS	PIED-BILLED GREBE		E/S		G5	S1B,S3N
*** Invertebrates						
AESHNA CLEPSYDRA	MOTTLED DARNER				G4	S2S3
ALASMIDONTA UNDULATA	TRIANGLE FLOATER				G4	S3
ANAX LONGIPES	COMET DARNER				G5	S2S3
BOLORIA SELENE MYRINA	A SILVER-BORDERED FRITILLARY				G5T5	S2
CALLOPHRYS IRUS	FROSTED ELFIN				G3	S2S3
CALLOPHRYS POLIOS	HOARY ELFIN				G5	S3
CELITHEMIS MARTHA	MARTHA'S PENNANT				G4	S3S4
ENALLAGMA BASIDENS	DOUBLE-STRIPED BLUET				G5	S3
ENALLAGMA PICTUM	SCARLET BLUET				G3	S3
ERYNNIS PERSIUS PERSIUS	A PERSIUS DUSKY WING				G5T2T3	SH
HESPERIA LEONARDUS	LEONARD'S SKIPPER				G4	S2S3
LASMIGONA SUBVIRIDIS	GREEN FLOATER				G3	SH
LESTES EURINUS	AMBER-WINGED SPREADWING				G4	S2

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MIDDLESEX COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
METARRANTHIS PILOSARIA	COASTAL SWAMP METARRANTHIS				G3G4	S3S4
PAPAIPEMA NECOPINA	SUNFLOWER BORER MOTH				G4?	SH
PONTIA PROTODICE	CHECKERED WHITE				G5	S1
SPEYERIA APHRODITE	APHRODITE FRITILLARY				G5	S2S3
SPEYERIA IDALIA	REGAL FRITILLARY				G3	SX
SYMPETRUM AMBIGUUM	BLUE-FACED MEADOWHAWK				G5	S2
*** Vascular plants						
AGALINIS AURICULATA	EARED FALSE FOXGLOVE				G3	SX
AGASTACHE NEPETOIDES	YELLOW GIANT HYSSOP				G5	S2
ARTEMISIA CAMPESTRIS SSP CAUDATA	WILD WORMWOOD				G5T5	S2
ASCLEPIAS RUBRA	RED MILKWEED			LP	G4G5	S2
ASCLEPIAS VERTICILLATA	WHORLED MILKWEED				G5	S2
ASTER RADULA	LOW ROUGH ASTER		E		G5	S1
BIDENS BIDENTOIDES	BUR-MARIGOLD		E		G3	S2
BIDENS EATONII	EATON'S BEGGARS-TICK		E		G2	S1.1
CALAMOVILFA BREVIPILIS	PINE BARREN REEDGRASS			LP	G4	S4
CAREX BARRATTII	BARRATT'S SEDGE			LP	G3G4	S4
CAREX LOUISIANICA	LOUISIANA SEDGE		E		G5	S1.1
CAREX POLYMORPHA	VARIABLE SEDGE		E		G3	S1
CAREX ROSTRATA	BEAKED SEDGE				G5	S2
CAREX WILLDENOWII	WILLDENOW'S SEDGE				G5	S2
CRATAEGUS CALPODENDRON	PEAR HAWTHORN		E		G5	S1
CYPERUS LANCASTRIENSIS	LANCASTER FLATSEDGE				G5	S1
DRABA REPTANS	CAROLINA WHITLOW-GRASS		E		G5	SH
ELATINE AMERICANA	AMERICAN WATERWORT				G4	S2
EUPATORIUM ALTISSIMUM	TALL THOROUGHWORT				G5	S2
GENTIANA SAPONARIA	SOAPWORT GENTIAN				G5	S3
HELONIAS BULLATA	SWAMP-PINK	LT	E	LP	G3	S3

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MIDDLESEX COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
HOTTONIA INFLATA	FEATHERFOIL		E		G4	S1
HYDROCOTYLE RANUNCULOIDES	FLOATING PENNYWORT		E		G5	S1
ISOETES RIPARIA	RIVER-BANK QUILLWORT				G5?	S3
LATHYRUS OCHROLEUCUS	PALE VETCHLING PEAVINE		E		G4G5	SH
LIATRIS SCARIOSA VAR NOVAE-ANGLIAE	NORTHERN BLAZING STAR		E		G5?T3	SH
LISTERA AUSTRALIS	SOUTHERN TWAYBLADE			LP	G4	S2
LYSIMACHIA HYBRIDA	LANCE-LEAVED LOOSESTRIFE				G5	S3
MELANTHIUM VIRGINICUM	VIRGINIA BUNCHFLOWER		E		G5	S1
MICRANTHEMUM MICRANTHEMOIDES	NUTTALL'S MUDWORT		E		GH	SH
MIMULUS ALATUS	WINGED MONKEY FLOWER				G5	S3
MYRIOPHYLLUM TENELLUM	SLENDER WATER-MILFOIL		E		G5	S1
MYRIOPHYLLUM VERTICILLATUM	WHORLED WATER-MILFOIL		E		G5	SH
PHORADENDRON SEROTINUM	MISTLETOE			LP	G5	S2
PLANTAGO MARITIMA	SEA-SIDE PLANTAIN				G5	S2
PLATANTHERA FLAVA VAR FLAVA	SOUTHERN REIN ORCHID		E		G4T4?Q	S1
PLATANTHERA PERAMOENA	PURPLE FRINGELESS ORCHID		E		G5	S1
POLYGALA POLYGAMA	RACEMED MILKWORT				G5	S2
POLYGONUM GLAUCUM	SEA-BEACH KNOTWEED		E		G3	S1
POTAMOGETON VASEYI	VASEY'S PONDWEED				G4	SH.1
PUCCINELLIA FASCICULATA	TORREY'S MEADOW GRASS				GU	S2
PYCNANTHEMUM TORREI	TORREY'S MOUNTAIN MINT		E		G2	S1
RANUNCULUS PUSILLUS	LOW SPEARWORT				G5	S2
RHODODENDRON CANADENSE	RHODORA		E		G5	S1
SAGITTARIA AUSTRALIS	SOUTHERN ARROW HEAD		E		G5	S1
SAGITTARIA CALYCINA VAR SPONGIOSA	TIDAL ARROWHEAD				G4	S3
SCIRPUS MARITIMUS	SALT MARSH BULRUSH		E		G5	SH
SCUTELLARIA LEONARDII	SMALL SKULLCAP		E		G4T4	S1
SOLIDAGO ELLIOTTII	ELLIOTT'S GOLDENROD				G5	S3

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MIDDLESEX COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
SOLIDAGO RIGIDA	STIFF GOLDENROD		E		G5	S1
STACHYS HYSSOPIFOLIA	HYSSOP HEDGE-NETTLE				G5	S2
TRIGLOCHIN MARITIMUM	SEA-SIDE ARROW-GRASS		E		G5	S1
UTRICULARIA GIBBA	HUMPED BLADDERWORT			LP	G5	S3
UTRICULARIA PURPUREA	PURPLE BLADDERWORT			LP	G5	S3
VERBENA SIMPLEX	NARROW-LEAVED VERVAIN		E		G5	S1
VICIA AMERICANA	AMERICAN PURPLE VETCH				G5	S2
VIOLA BRITTONIANA	COAST VIOLET				G4G5	S3
ZIGADENUS LEIMANTHOIDES	OCEANORUS		E		G4Q	S1

91 Records Processed

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EXPLANATIONS OF CODES USED IN NATURAL HERITAGE REPORTS

FEDERAL STATUS CODES

The following U.S. Fish and Wildlife Service categories and their definitions of endangered and threatened plants and animals have been modified from the U.S. Fish and Wildlife Service (F.R. Vol. 50 No. 188; Vol. 61, No. 40; F.R. 50 CFR Part 17). Federal Status codes reported for species follow the most recent listing.

LE	Taxa formally listed as endangered.
LT	Taxa formally listed as threatened.
PE	Taxa already proposed to be formally listed as endangered.
PT	Taxa already proposed to be formally listed as threatened.
C	Taxa for which the Service currently has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.
S/A	Similarity of appearance species.

STATE STATUS CODES

Two animal lists provide state status codes after the Endangered and Nongame Species Conservation Act of 1973 (NSSA 23:2A-13 et. seq.): the list of endangered species (N.J.A.C. 7:25-4.13) and the list defining status of indigenous, nongame wildlife species of New Jersey (N.J.A.C. 7:25-4.17(a)). The status of animal species is determined by the Nongame and Endangered Species Program (ENSP). The state status codes and definitions provided reflect the most recent lists that were revised in the New Jersey Register, Monday, June 3, 1991.

D	Declining species-a species which has exhibited a continued decline in population numbers over the years.
E	Endangered species-an endangered species is one whose prospects for survival within the state are in immediate danger due to one or many factors - a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow.
EX	Extirpated species-a species that formerly occurred in New Jersey, but is not now known to exist within the state.
I	Introduced species-a species not native to New Jersey that could not have established itself here without the assistance of man.
INC	Increasing species-a species whose population has exhibited a significant increase, beyond the normal range of its life cycle, over a long term period.
T	Threatened species-a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate.
P	Peripheral species-a species whose occurrence in New Jersey is at the extreme edge of its present natural range.
S	Stable species-a species whose population is not undergoing any long-term increase/decrease within its natural cycle.
U	Undetermined species-a species about which there is not enough information available to determine the status.

Status for animals separated by a slash(/) indicate a duel status. First status refers to the state breeding population, and the second status refers to the migratory or winter population.

Plant taxa listed as endangered are from New Jersey's official Endangered Plant Species List N.J.S.A. 131B-15.151 et seq.

E Native New Jersey plant species whose survival in the State or nation is in jeopardy.

REGIONAL STATUS CODES FOR PLANTS

LP Indicates taxa listed by the Pinelands Commission as endangered or threatened within their legal jurisdiction. Not all species currently tracked by the Pinelands Commission are tracked by the Natural Heritage Program. A complete list of endangered and threatened Pineland species is included in the New Jersey Pinelands Comprehensive Management Plan.

EXPLANATION OF GLOBAL AND STATE ELEMENT RANKS

The Nature Conservancy has developed a ranking system for use in identifying elements (rare species and natural communities) of natural diversity most endangered with extinction. Each element is ranked according to its global, national, and state (or subnational in other countries) rarity. These ranks are used to prioritize conservation work so that the most endangered elements receive attention first. Definitions for element ranks are after The Nature Conservancy (1982: Chapter 4, 4.1-1 through 4.4.1.3-3).

GLOBAL ELEMENT RANKS

G1 Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout it's range; with the number of occurrences in the range of 21 to 100.

G4 Apparently secure globally; although it may be quite rare in parts of its range, especially at the periphery.

G5 Demonstrably secure globally; although it may be quite rare in parts of its range, especially at the periphery.

GH Of historical occurrence throughout its range i.e., formerly part of the established biota, with the expectation that it may be rediscovered.

GU Possibly in peril range-wide but status uncertain; more information needed.

GX Believed to be extinct throughout range (e.g., passenger pigeon) with virtually no likelihood that it will be rediscovered.

G? Species has not yet been ranked.

STATE ELEMENT RANKS

S1 Critically imperiled in New Jersey because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres).

Elements so ranked are often restricted to very specialized conditions or habitats and/or restricted to an extremely small geographical area of the state. Also included are elements which were formerly more abundant, but because of habitat destruction or some other critical factor of its biology, they have been demonstrably reduced in abundance. In essence, these are elements for which, even with intensive searching, sizable additional occurrences are unlikely to be discovered.

S2 Imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically many of these elements may have been more frequent but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences.

S3 Rare in state with 21 to 100 occurrences (plant species in this category have only 21 to 50 occurrences). Includes elements which are widely distributed in the state but with small populations/acreage or elements with restricted distribution, but locally abundant. Not yet imperiled in state but may soon be if current trends continue. Searching often yields additional occurrences.

S4 Apparently secure in state, with many occurrences.

S5 Demonstrably secure in state and essentially ineradicable under present conditions.

SA Accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded; examples include European strays or western birds on the East Coast and vice-versa.

SE Elements that are clearly exotic in New Jersey including those taxa not native to North America (introduced taxa) or taxa deliberately or accidentally introduced into the State from other parts of North America (adventive taxa). Taxa ranked SE are not a conservation priority (viable introduced occurrences of G1 or G2 elements may be exceptions).

SH Elements of historical occurrence in New Jersey. Despite some searching of historical occurrences and/or potential habitat, no extant occurrences are known. Since not all of the historical occurrences have been field surveyed, and unsearched potential habitat remains, historically ranked taxa are considered possibly extant, and remain a conservation priority for continued field work.

SP Element has potential to occur in New Jersey, but no occurrences have been reported.

SR Elements reported from New Jersey, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. In some instances documentation may exist, but as of yet, its source or location has not been determined.

SRF Elements erroneously reported from New Jersey, but this error persists in the literature.

SU Elements believed to be in peril but the degree of rarity uncertain. Also included are rare taxa of uncertain taxonomical standing. More information is needed to resolve rank.

SX Elements that have been determined or are presumed to be extirpated from New Jersey. All historical occurrences have been searched and a reasonable search of potential habitat has been completed. Extirpated taxa are not a current conservation priority.

SXC Elements presumed extirpated from New Jersey, but native populations collected from the wild exist in cultivation.

SZ Not of practical conservation concern in New Jersey, because there are no definable occurrences, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped and

protected. In other words, the migrant regularly passes through the state, but enduring, mappable element occurrences cannot be defined.

Typically, the SZ rank applies to a non-breeding population (N) in the state - for example, birds on migration. An SZ rank may in a few instances also apply to a breeding population (B), for example certain lepidoptera which regularly die out every year with no significant return migration.

Although the SZ rank typically applies to migrants, it should not be used indiscriminately. Just because a species is on migration does not mean it receives an SZ rank. SZ will only apply when the migrants occur in an irregular, transitory and dispersed manner.

B Refers to the breeding population of the element in the state.

N Refers to the non-breeding population of the element in the state.

T Element ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species. For example *Stachys palustris* var. *homotricha* is ranked "G5T? SH" meaning the full species is globally secure but the global rarity of the var. *homotricha* has not been determined; in New Jersey the variety is ranked historic.

Q Elements containing a "Q" in the global portion of its rank indicates that the taxon is of questionable, or uncertain taxonomical standing, e.g., some authors regard it as a full species, while others treat it at the subspecific level.

.1 Elements documented from a single location.

Note: To express uncertainty, the most likely rank is assigned and a question mark added (e.g., G2?). A range is indicated by combining two ranks (e.g., G1G2, S1S3).

IDENTIFICATION CODES

These codes refer to whether the identification of the species or community has been checked by a reliable individual and is indicative of significant habitat.

Y Identification has been verified and is indicative of significant habitat.

BLANK Identification has not been verified but there is no reason to believe it is not indicative of significant habitat.

? Either it has not been determined if the record is indicative of significant habitat or the identification of the species or community may be confusing or disputed.

Revised September 1998

REFERENCE NO. 14

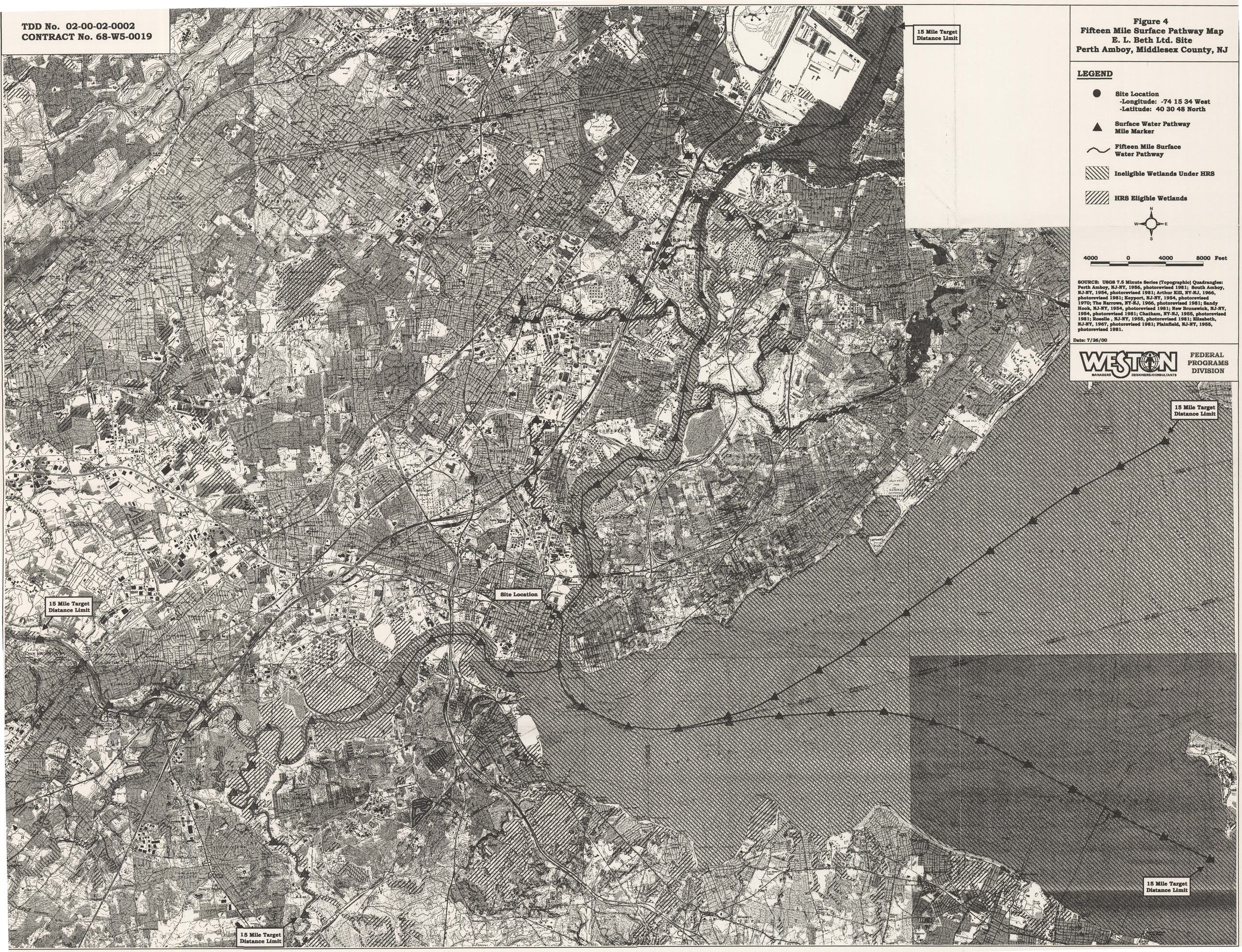
TDD No. 02-00-02-0002
CONTRACT No. 68-W5-0019

Figure 3
Four Mile Radius Map
E. L. Beth Ltd. Site
Perth Amboy, Middlesex County, NJ

REFERENCE NO. 15

TDD No. 02-00-02-0002
CONTRACT No. 68-W5-0019

Figure 4
Fifteen Mile Surface Pathway Map
E. L. Beth Ltd. Site
Perth Amboy, Middlesex County, NJ



SOURCE: USGS 7.5 Minute Series (Topographic) Quadrangles: Perth Amboy, NJ-NY, 1956, photorevised 1981; South Amboy, NJ-NY, 1954, photorevised 1981; Arthur Kill, NY-NJ, 1966, photorevised 1981; Keyport, NJ-NY, 1954, photorevised 1970; The Narrows, NY-NJ, 1966, photorevised 1981; Sandy Hook, NJ-NY, 1954, photorevised 1981; New Brunswick, NJ-NY, 1954, photorevised 1981; Chatham, NY-NJ, 1955, photorevised 1981; Roselle , NJ-NY, 1955, photorevised 1981; Elizabeth, NJ-NY, 1967, photorevised 1981; Plainfield, NJ-NY, 1955, photorevised 1981.

Date: 7/26/00

WESTON
MANAGERS DESIGNERS/CONSULTANTS
FEDERAL PROGRAMS DIVISION

REFERENCE NO. 16

WATER QUALITY REGULATIONS

SURFACE WATER AND GROUNDWATER CLASSIFICATIONS AND STANDARDS

New York State
Codes, Rules and Regulations
Title 6, Chapter X
Parts 700-705

New York State Department of Environmental Conservation

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701.7 Class B fresh surface waters. The best usages of Class B waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

701.8 Class C fresh surface waters. The best usage of Class C waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

701.9 Class D fresh surface waters. The best usage of Class D waters is fishing. Due to such natural conditions as intermittency of flow, water conditions not conducive to propagation of game fishery, or stream bed conditions, the waters will not support fish propagation. These waters shall be suitable for fish survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

SALINE SURFACE WATERS

701.10 Class SA saline surface waters. The best usages of Class SA waters are shellfishing for market purposes, primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

701.11 Class SB saline surface waters. The best usages of Class SB waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

701.12 Class SC saline surface waters. The best usage of Class SC waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

701.13 Class I saline surface waters. The best usages of Class I waters are secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

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701.14 Class SD saline surface waters. The best usage of Class SD waters is fishing. These waters shall be suitable for fish survival. This classification may be given to those waters that, because of natural or man-made conditions, cannot meet the requirements for primary and secondary contact recreation and fish propagation.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

GROUNDWATERS

701.15 Class GA fresh groundwaters. The best usage of Class GA waters is as a source of potable water supply. Class GA waters are fresh groundwaters.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

701.16 Class GSA saline groundwaters. The best usages of Class GSA waters are as a source of potable mineral waters, for conversion to fresh potable waters, or as raw material for the manufacture of sodium chloride or its derivatives or similar products. Class GSA waters are saline groundwaters.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

701.17 Class GSB saline groundwaters. The best usage of Class GSB waters is as a receiving water for disposal of wastes. Class GSB waters are saline groundwaters that have a chloride concentration in excess of 1,000 milligrams per liter or a total dissolved solids concentration in excess of 2,000 milligrams per liter.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

701.18 Assignment of groundwater classifications. (a) The groundwater classifications defined in sections 701.15 through 701.16 of this Part are assigned to all the groundwaters of New York State.

(b) The Class GSB shall not be assigned to any groundwaters of the State, unless the commissioner finds that adjacent and tributary groundwaters and the best usages thereof will not be impaired by such classification.

Historical Note

Sec. added by renum. 701.3, filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

701.19 Severability. If any provision of this Part or its application to any person or circumstance is held to be invalid, the remainder of this Part and the application of that provision to other persons or circumstances will not be affected.

Historical Note

Sec. added by renum. and amd. 701.4, filed July 3, 1985; amd. filed Sept. 20, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

701.20

Historical Note

Sec. added by renum. 701.5, filed July 3, 1985; amd. filed Sept. 20, 1985; repealed, filed Aug. 2, 1991 eff. 30 days after filing.

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REFERENCE NO. 17

STATE OF NEW YORK

OFFICIAL COMPILATION

OF

CODES, RULES AND REGULATIONS

GEORGE E. PATAKI
Governor

ALEXANDER F. TREADWELL
Secretary of State

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ARTICLE 13

New York City Waters Series

PART
890 New York City Waters
891 Jamaica Bay Drainage Basin

PART 890

NEW YORK CITY WATERS

(Statutory authority: Environmental Conservation Law, § 17-0301)

Sec.
890.1 Adopting order
890.2 Designated waters
890.3 Definitions
890.4 Special conditions
890.5 Assigned classifications and standards of quality and purity
890.6 Table I
890.7 Map 1
890.8 Map 2
890.9 Map 3
890.10 Map 4
890.11 Quadrangle maps

Historical Note

Part amd. filed June 20, 1988 eff. 30 days after filing. Amended statutory authority.

§ 890.1 Adopting order.

(a) Pursuant to article 12 of the Public Health Law, the Water Resources Commission, after proper study and following public hearings held on due notice, hereby adopts and assigns the following classifications and standards of quality and purity to all surface waters within the designated drainage basins of New York Bay, Raritan Bay and a portion of the Atlantic Ocean, including the subbasins of Arthur Kill, Kill Van Kull, the Harlem River and the Lower East River as hereinafter described.

(b) This adoption and assignment of standards of quality and purity to the above designated waters shall be effective December 22, 1964.

§ 890.2 Designated waters.

(a) The designated waters are within the following areas:

(1) the drainage basin of New York Bay below the mouth of the Hudson River at the south tip of Manhattan Island, including Gravesend Bay, Coney Island Creek, Atlantic Basin, Erie Basin, Gowanus Bay, Gowanus Canal, Upper New York Bay, Lower New York Bay, The Narrows and the Atlantic Ocean waters, including the drainage area off Coney Island and lying westerly of a north-south line from Light Inlet at the southeasterly tip of Coney Island peninsula to the southwesterly tip of Rockuway Point; thence along the jetty to Rockaway jetty light; thence due south to the New York - New Jersey boundary line;

(2) the lower East River drainage basin from the mouth to a line across the East River north of Wards Island between Stony Point in Bronx County and Lawrence Point in Queens County; and

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

(b) The above designated waters are located as shown on Map 1, section 890.7 *infra*, and as contained within the topographical or basin limit line on the reproduced topographical reference maps set forth in section 890.11, *infra*. Classifications of primary waters are outlined on Map 3, section 890.9, *infra*.

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§ 890.3 Definitions.

The several terms, words or phrases hereinafter mentioned shall be construed as follows:

(a) *Item No.* In Table I an item number is assigned consecutively to each specifically designated waters or portion thereof.

(b) *Waters index number* as appearing in Table I shall mean that number or abbreviation assigned to any designated waters or portion thereof for the purpose of identification.

(1) The numbering or index system used to identify specific waters of New York State was adapted from that used by the New York State Conservation Department in its biological survey series of reports on watersheds of the State. The primary waters of a drainage area, such as a river, large lake, bay or sound is usually referred to by name or an abbreviation. Tributaries of primary river waters are consecutively numbered progressing upstream from the mouth. Tributaries of primary lake, bay or sound waters are consecutively numbered in a clockwise order from a defined point, usually the outlet of the primary waters. Subtributaries are numbered as encountered along the tributary proceeding from its mouth to the source, and in like manner all of its other stream courses are so numbered. Ponds and lakes are numbered in the order they are encountered within the system. Tributaries of such lakes and ponds are numbered consecutively as they enter, progressing clockwise around the lake or pond from its outlet or mouth. The numbers assigned to such lakes and ponds are prefixed by the letter P. When isolated lakes and ponds are referenced by a waters index number, it is merely for convenience of their identification and location within a subdrainage basin, and it is not necessarily indicative of their being tributary to any waters to which no surface connection is shown on the reference maps.

(2) This system was applied to the waters under consideration by the New York State Conservation Department in its *Biological Survey of the Lower Hudson Watershed* and *Biological Survey of the Fresh Waters of Long Island* in 1936 and 1938, respectively, and has been closely followed in connection with the numerical identification of the waters with the following exceptions: some of the stream numbers do not run consecutively due to the omission of streams originally shown on the older maps employed by the Conservation Department at the time of its 1936 and 1938 surveys but not shown on later editions of maps reproduced herein. Conversely, streams, lakes and ponds not shown on the older maps but appearing on the newer maps are designated by suffix letters a, b, c, etc.

(3) The system as applied to the identification of the designated waters may be outlined as follows: There are several primary indices used to identify the designated waters. Those waters that drain Staten Island proper are identified by waters index numbers prefixed by the abbreviation SI. Waters draining Long Island proper are identified by waters index numbers prefixed by the abbreviation LI. Waters of the East River are identified by waters index numbers prefixed by ER. Accordingly, those waters within the designated basin that have not been assigned waters index numbers, such as New York Bay, Raritan Bay, Arthur Kill, Kill Van Kull and Atlantic Ocean, have been identified by name only.

(4) The following table will illustrate how the designated waters may be identified through use of the waters index system:

Waters index number	*Name of waters*	*Explanation*
None assigned	Atlantic Ocean	Primary waters identified by description and not used to index tributaries.
	New York Bay	
	Raritan Bay	
	Arthur Kill	
	Gowanus Bay	
	Gravesend Bay	
	Newark Bay	
	Kill Van Kull	

Waters index number	*Name of waters*	*Explanation*
SI 8-1-1	Springville Creek	Springville Creek is the first tributary of SI 8-1 (Main Creek) and Main Creek is the first tributary of SI 8 (Fresh Kills) located on Staten Island.
LI 253	Coney Island Creek	The 253rd stream encountered on Long Island proceeding in a clockwise direction around the island from Fort Hamilton.
ER	East River	Primary waters.
ER 1	Harlem River	The first tributary entering East River above the mouth.
ER 1-5	Tibbetts Brook	The fifth tributary entering Harlem River above the mouth.
ER 1-5-P 1043	Van Cortlandt Lake	The 1043rd pond or lake encountered in the biological survey area of the Lower Hudson River watershed.
ER 1-5 (1.0)	Tibbetts Brook	A point on Tibbetts Brook one mile above the mouth.

(5) There are instances where a parenthetical decimal number appears following the waters index number. Such number appearing within the parentheses indicates the distance in miles above the mouth to a point on the identified watercourse.

(c) The abbreviations *trib.* and *tribs.*, indicating tributary and tributaries, shall mean any stream, pond or other body of surface water which flows into any other stream, pond or other body of surface water; where no tributary or tributaries are mentioned, the specifically designated waters shall include only the stream, pond or other body of water referenced by such waters index number; where a tributary or tributaries are mentioned after the waters index number, the specifically designated waters shall include the stream, pond or other body of water referenced by such waters index number and all tributaries thereof, which are shown on the reference maps, excluding numbered ponds, unless exceptions are expressly stated.

(d) *Name* as appearing in Table I shall mean the name by which the specifically designated waters are known and which name may appear on the reference maps. In cases of specifically designated waters which have no name, the named waters to which the unnamed waters are tributary are identified as far as possible.

(e) *Description.* The column headed "Description" contains designations of segments or sections of waters under consideration to which a particular assignment of a class or standards shall apply. Also included in this column is any useful information pertinent to the classification and standards.

(f) *Map Ref. No.*, as appearing in Table I, means map reference number and indicates one or more of the following numbered maps reproduced herein completely or in part in section 890.11, *infra*, on which maps the specifically designated waters and their index numbers are shown within the topographical limit line of the described drainage basins or areas. An index for map numbers is shown on Map 2, quadrangle arrangement, reproduced in section 890.8, *infra*. The following maps were produced from original maps which may be procured through the Washington Distribution Section, Geological Survey, Silver Spring, Maryland.

Map Ref. No.	*Quadrangle name*	*Edition*	*Published by*
R-24nw	Yonkers	1956	U.S. Geological Survey
R-24ne	Mount Vernon	1956	U.S. Geological Survey
R-24sw	Central Park	1956	U.S. Geological Survey
S-22se	Perth Amboy	1956	U.S. Geological Survey
S-23nw	Elizabeth	1955	U.S. Geological Survey
S-23ne	Jersey City	1955	U.S. Geological Survey
S-23sw	Arthur Kill	1955	U.S. Geological Survey
S-23se	The Narrows	1955	U.S. Geological Survey
S-24nw	Brooklyn	1956	U.S. Geological Survey
S-24ne	Jamaica	1956	U.S. Geological Survey
S-24sw	Coney Island	1955	U.S. Geological Survey
S-24se	Far Rockaway	1954	U.S. Geological Survey
S-25sw	Lawrence	1954	U.S. Geological Survey
T-22ne	South Amboy	1954	U.S. Geological Survey
T-23nw	Keyport	1954	U.S. Geological Survey
T-23ne	Sandy Hook	1954	U.S. Geological Survey

(g) *Class*, as appearing in Table I and denoted by the letters AA, B, C, SA, SB, SC or SD, and the Roman numeral I opposite each specifically designated waters, shall mean Class AA, B, C, SA, SB, SC or SD, as the case may be, as set forth in Part 701, *supra;* and in the case of Roman numeral I shall mean Class I as set forth in Part 702, *supra*.

(h) *Standards*, as appearing in Table I and denoted by the letters AA, B, C, SA, SB, SC or SD, and the Roman numeral I opposite each specifically designated waters, shall mean the quality standards established for Class AA, B, C, SA, SB, SC, SD or I as the case may be, established by the aforementioned rules.

Historical Note

Sec. amd. filed June 20, 1988 eff. 30 days after filing. Amended (b)(3)-(5), (c), (e)-(h).

§ 890.4 Special conditions.

(a) All streams, ponds, estuaries or other bodies of water which appear as lines, to indicate natural waters, on the reference maps herein, and which are not specifically designated in Table I, shall be assigned the same classes and standards of quality and purity as the specifically designated waters to which they are directly tributary.

(b) All streams, ponds, estuaries or other bodies of water which are not shown on the reference maps herein shall be assigned to Class D, as set forth in part 701, *supra*, except that any continuous flowing natural stream which is not shown on the reference maps shall have the same classification and assigned standards as the waters to which it is directly tributary; or, if they be tidal salt waters, such waters which are not shown on the reference maps herein shall be assigned to Class SD, as set forth in Part 701, *supra*, except that any continuous flowing natural stream which is not shown on the reference maps shall have the same classification and assigned standards as the waters to which it is directly tributary.

(c) All references to mile distances are in statute miles.

Historical Note

Sec. repealed, new filed June 20, 1988 eff. 30 days after filing.

§ 890.5 Assigned classifications and standards of quality and purity.

The classifications and standards of quality and purity assigned to the surface waters specifically designated and described herein are set forth in Table I, subject to the definitions and conditions stated above.

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TABLE I

CLASSIFICATIONS AND STANDARDS OF QUALITY AND PURITY ASSIGNED TO FRESH SURFACE WATERS AND TIDAL SALT WATERS, INCLUDING CERTAIN TIDAL WATERS OF THE INTERSTATE SANITATION DISTRICT WITHIN DESIGNATED DRAINAGE BASINS OF NEW YORK BAY, RARITAN BAY AND A PORTION OF THE ATLANTIC OCEAN, INCLUDING THE SUBBASINS OF ARTHUR KILL, KILL VAN KULL, THE HARLEM RIVER AND THE LOWER EAST RIVER, BRONX, KINGS, NEW YORK, QUEENS, RICHMOND AND WESTCHESTER COUNTIES, NEW YORK

Item No.	*Waters Index Number*	*Name*	*Description*	*Map Ref. No.*	*Class*	*Standards*
			ATLANTIC OCEAN AND NEW YORK BAY			
1		Atlantic Ocean portion	That portion of the ocean within New York State opposite Rockaway peninsula bounded on the west by a line from the tip of Rockaway Point, thence south along the jetty to Rockaway jetty light, thence due south to the state boundary line; and bounded on the north by the shore of Rockaway peninsula from the western tip to the Nassau-Queens county line at East Rockaway Inlet; and bounded on the east by the Nassau-Queens county line along East Rockaway Inlet, thence south to the state boundary line.	S-24sw S-24se	SA	SA
2		Atlantic Ocean and Lower New York Bay east portions	Ocean and bay waters within New York State opposite Coney Island peninsula and Staten Island bounded on the west by a north-south line drawn from the south limits of Fort Wadsworth Military Reservation and passing through West Bank light to New York-New Jersey boundary line; and bounded on the north by a line drawn from the south limits of	S-23se S-24sw	SB	SB

TABLE I (*cont'd*)

Item No.	*Waters Index Number*	*Name*	*Description*	*Map Ref. No.*	*Class*	*Standards*
			ARTHUR KILL, NEWARK BAY AND KILL VAN KULL			
12	SI (0.0 - 2.0)* portion	Arthur Kill	That portion within New York State from mouth (at an east-west line drawn from southern-most point of Staten Island at Ward Point to southernmost point of Perth Amboy, New Jersey, at Ferry Point) to Outerbridge Crossing.	S-22se S-23sw T-22ne T-23nw	I	I
13	SI (2.0 - 12.9) portion	Arthur Kill	That portion within New York State from Outerbridge Crossing to Newark Bay outlet.	S-22se S-23sw S-23nw	SD	SD
14	SI (12.9 - 14.6) portion	Newark Bay	Southern portion of Bay lying north of Staten Island within New York State between outlet to Arthur Kill and outlet to Kill Van Kull.	S-23nw	SD	SD

* Segment of waters measured in miles upstream from mouth of Arthur Kill.

TABLE I (*cont'd*)

Item No.	Waters Index Number	Name	Description	Map Ref. No.	Class	Standards
28	SI 6 portion	Mill Creek	Tidal portion.	S-23sw	I	I
29	SI 6 portion	Mill Creek	Fresh waters portion.	S-23sw	C	C
30	SI 7a, 7b including P 1061, 7c	Tribs. of Arthur Kill	Tidal portion. Fresh waters portion. Tappan's Creek (trib. 7a).	S-23sw	SD C	SD C
31	SI 7d portion and tribs.	Sleight Creek	Tidal portion.	S-23sw	SD	SD
32	SI 7d portion	Sleight Creek	Fresh waters portion.	S-23sw	C	C
33	SI 7e and tribs.	Benedic Creek		S-23sw	SD	SD
34	SI 8 portion	Fresh Kills	From mouth to trib. 1.	S-23sw	SD	SD
35	SI 8 portion	Fresh Kills or Richmond Creek	From trib. 1 to Richmond Hill Road culvert.	S-23sw	SC	SC
36	SI 8 portion	Fresh Kills or Richmond Creek	From Richmond Hill Road culvert to source. Tidal portion. Fresh waters portion.	S-23sw	SC B	SC B
37	SI 8-1 and tribs. except trib. 8-1-1	Main Creek		S-23sw	SC	SC

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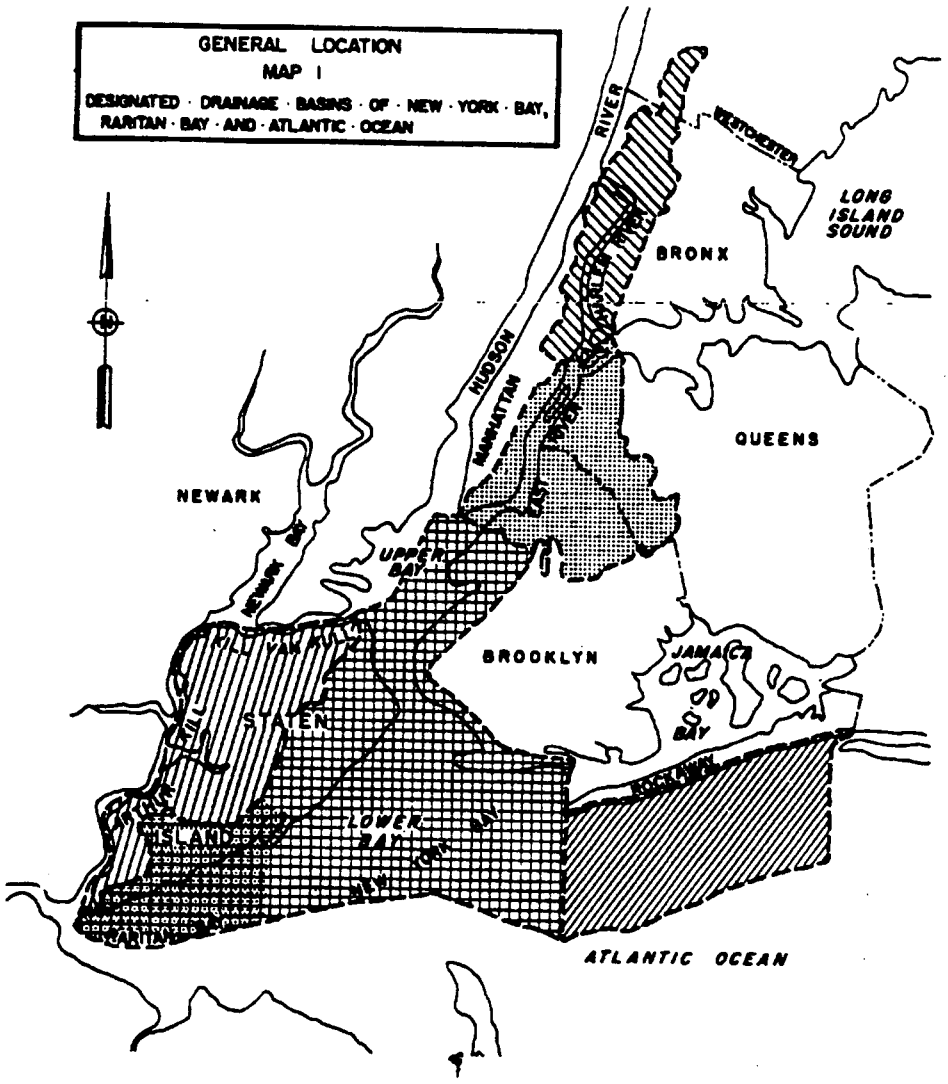
TABLE I (*cont'd*)

Item No.	*Waters Index Number*	*Name*	*Description*	*Map Ref. No.*	*Class*	*Standards*
38	SI 8-1-1	Springville Creek	Tidal portion. Fresh waters portion.	S-23sw	SC B	SC B
39	SI 8-1a, 3 and trib. including P 1067a, 2 and trib. 5	Tribs. of Fresh Kills or Richmond Creek	Tidal portions. Fresh waters portions.	S-23sw	SC B	SC B
39.1	SI 8-4	Trib. of Fresh Kills or Richmond Creek		S-23sw S-23se	B	B
40	SI P 1069a, P 1069b, P 1069c, P 1069d, P 1069e	Tribs. of Arthur Kill	Isolated ponds and lake. Walker Pond (P 1069a). Ohrback Lake (P 1069b). Stamp Pond (P 1069c).	S-23se	B	B
41	SI 9, 9a, 9b, and tribs.	Tribs. of Arthur Kill	Neck Creek (trib. 9). Sawmill Creek (trib. 9a).	S-23sw	SD	SD
42	SI 9c and tribs.	Trib. of Arthur Kill		S-23sw	SD	SD
43	SI 9d and tribs.	Old Place Creek	Tidal portion. Fresh waters portions.	S-23nw S-23sw	SD C	SD C
44	SI 9e	Bridge Creek	Near Port Ivory.	S-23nw	SD	SD

§ 890.7 Map 1.



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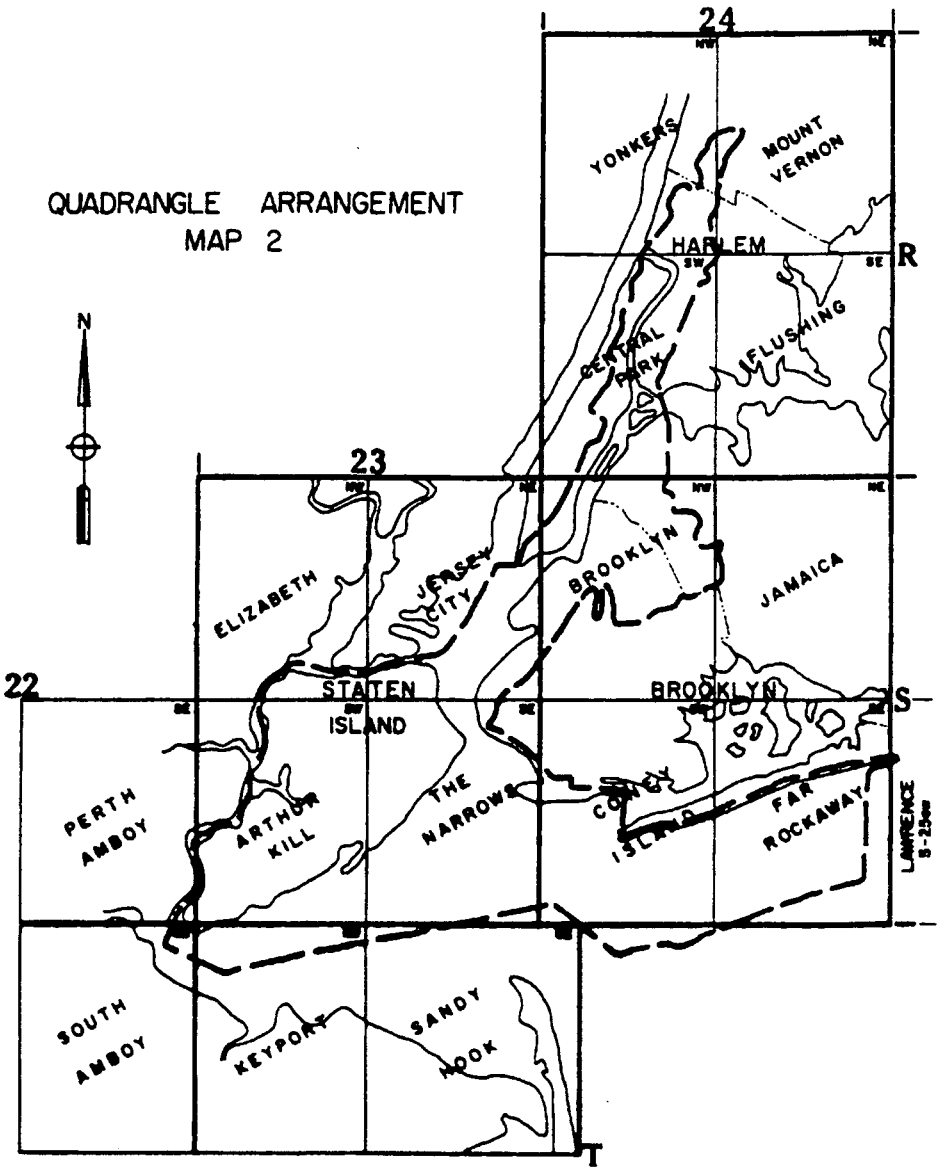
§ 890.8 Map 2.



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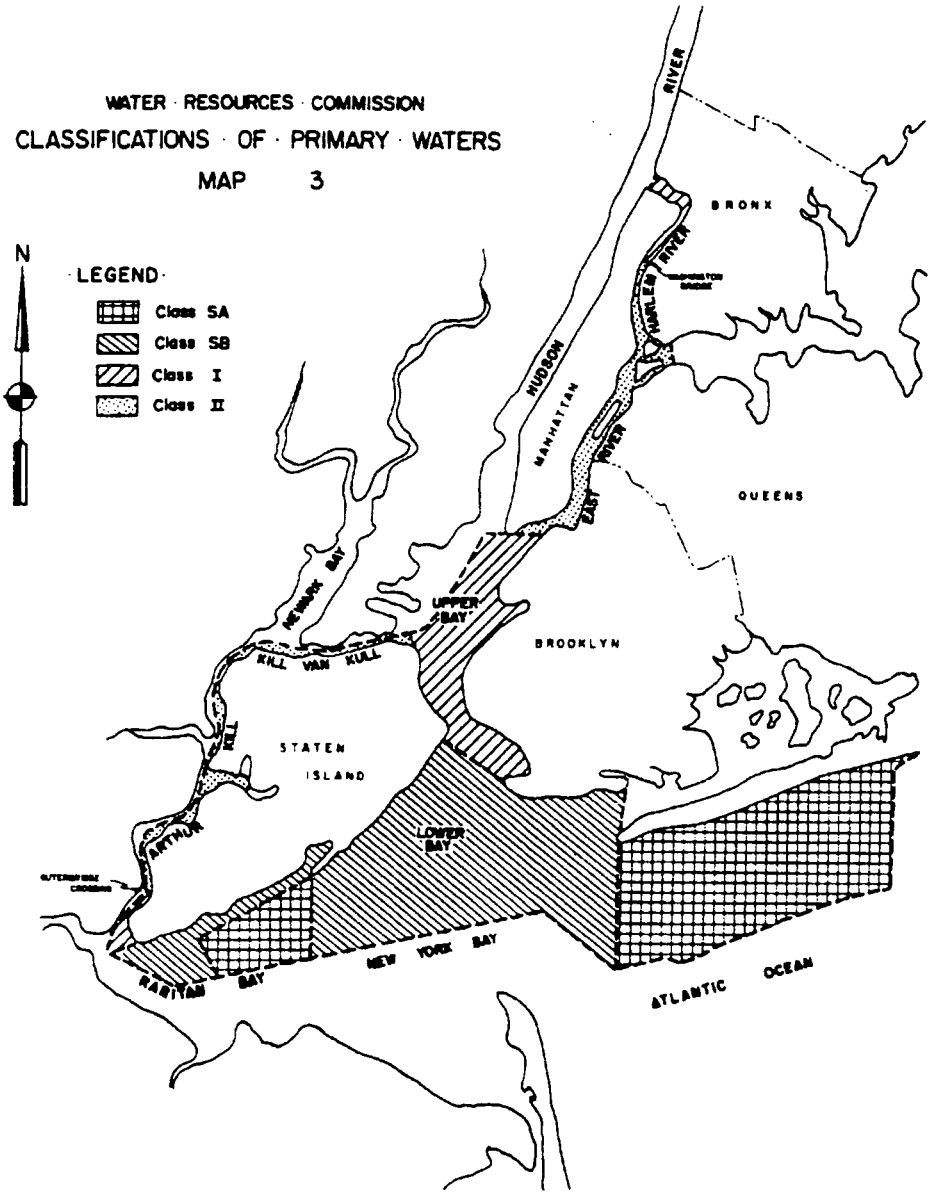
§ 890.9 Map 3.



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